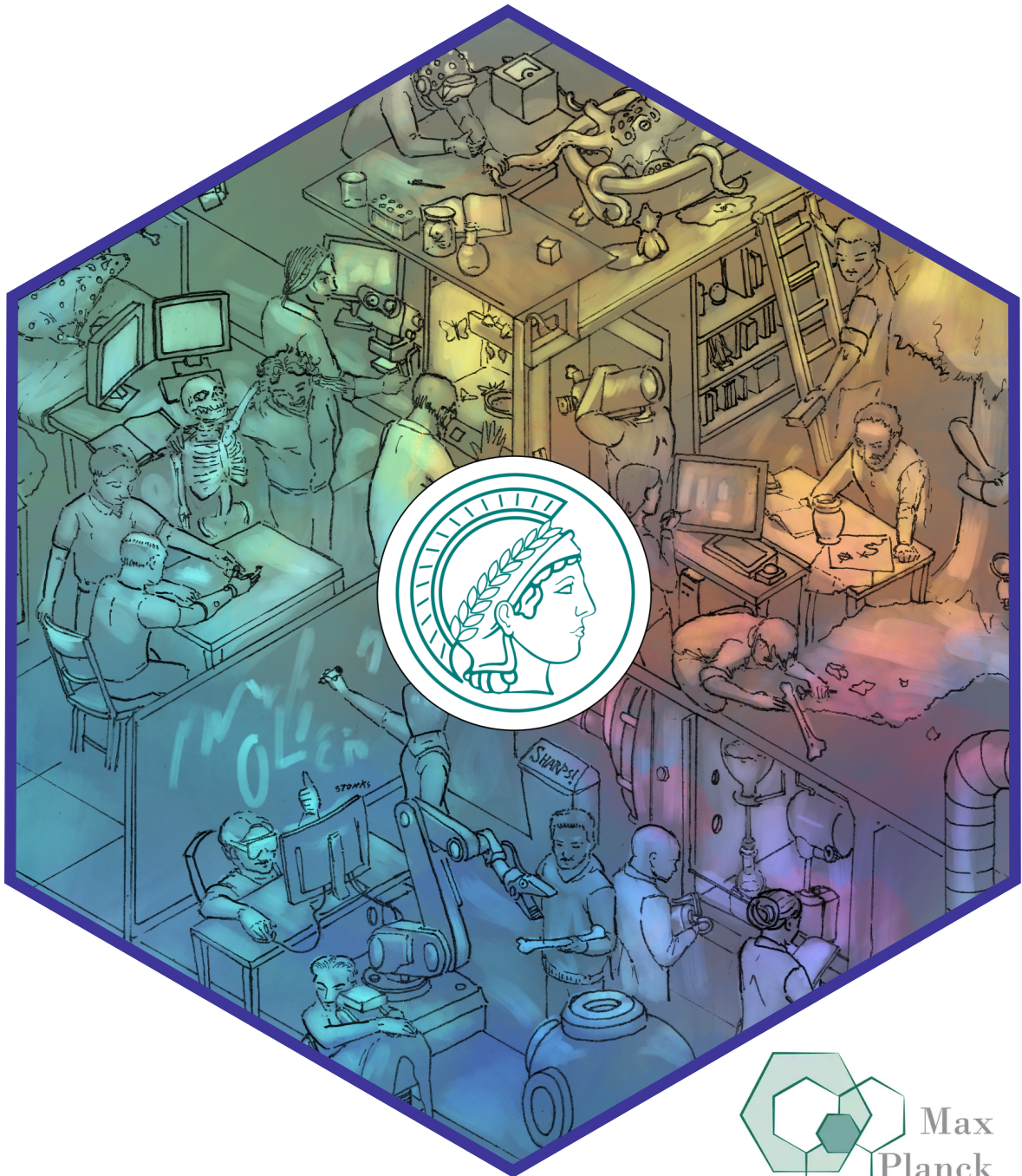


# MAX PLANCK PhDnet

The doctoral network of the Max Planck society



# 2021 Survey Report

# PhDnet Report 2021

PhDnet Survey Group

19 December 2022

# Contents

	<b>Page</b>
<b>1 Introduction</b>	<b>3</b>
<b>2 Demographics</b>	<b>6</b>
<b>3 Working Conditions</b>	<b>9</b>
3.1 Employment Situation and Funding . . . . .	9
3.2 Unpaid Doctoral Researchers . . . . .	14
3.3 Salary . . . . .	14
3.4 Duration of contracts . . . . .	18
3.5 Possibility for Extension . . . . .	19
3.6 Holidays and Working Hours . . . . .	21
<b>4 Career Development &amp; Integration</b>	<b>24</b>
4.1 Career Development . . . . .	24
4.2 Integration . . . . .	26
<b>5 Supervision Quality &amp; Support</b>	<b>28</b>
5.1 General Support . . . . .	28
5.2 Supervisory relationship . . . . .	29
5.3 Meetings and Feedback . . . . .	31
5.4 Hiring Opinion . . . . .	32
<b>6 Satisfaction</b>	<b>33</b>
6.1 High satisfaction leads to high productivity . . . . .	33
6.2 General Areas of Satisfaction with PhD . . . . .	33
6.3 General Areas needing Improvement . . . . .	34
6.4 Considering Quitting the PhD Track . . . . .	34
6.5 The Employee and Manager Assistance Program (EMAP) . . . . .	35
<b>A Supplementary Figures: Working Conditions</b>	<b>38</b>
<b>B Supplementary Figures: Career Development</b>	<b>40</b>
<b>C Supplementary Figures Supervision &amp; Support</b>	<b>41</b>
<b>D Methods</b>	<b>43</b>
D.1 General Analysis . . . . .	43
D.2 Variable re-categorization . . . . .	43
D.3 Demographics . . . . .	44
D.4 Working Conditions . . . . .	44

D.5 Career Development . . . . .	44
D.6 Supervision and Support . . . . .	44
D.7 Satisfaction . . . . .	45
<b>E Acknowledgements</b>	<b>46</b>
<b>F About the authors</b>	<b>47</b>

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# Chapter 1

## Introduction

The Max Planck Society (MPS) is a globally recognized research institution that conducts innovative research. In 2021, more than 5000 Doctoral Researchers (DRs), composing about 40% of scientific personnel, worked in 86 Max Planck Institutes (MPIs), broadly contributing to the excellence of the MPS. The Max Planck PhDnet is a network of all DRs of the MPS which was founded in 2003. Since then, the main goals of PhDnet are to improve interdisciplinary cooperation, optimize doctoral education and scientific exchange, improve working conditions, bridge communication between DRs and the MPS administration, and strengthen academic solidarity. Initiated in 2006, the PhDnet conducts an annual survey that serves as a pivotal tool to collect the voices of DRs. To further amplify our collective voices, the PhDnet has collaborated with DRs of the Helmholtz Association of German Research Centres (Helmholtz Juniors), the Leibniz Association (Leibniz PhD Network), and the Institute of Molecular Biology Mainz since 2019, forming what is known as the Network of Doctoral Research Networks (N2).

The aims of the PhDnet survey are as follows:

- Collect anonymous feedback from DRs from all three sections of the MPS: Biology and Medicine (BM), Chemistry, Physics and Technology (CPT), and Human Science (HS) - in order to be able to reflect on the different aspects of the doctoral education and work as

DRs. Further, a comprehensive analysis addresses the most urgent concerns and evaluates the situation of DRs. We have been interested in topics such as working conditions, support structures, power abuse, satisfaction with holidays, salary, and mental health. The collected data is important evidence used for advocacy purposes by the PhDnet Steering Group, and further encourages the collaborative efforts with the General Administration (GA) of the MPS and to improve DRs' working conditions.

- Investigate and discover latent issues experienced by DRs. In previous years we were able to gain insight into pay gaps, supervisory relationships, discrimination, and microaggressions, among other concerns [12]. This year we received concerns over:
  - Contracts in HS: there are about 4 to 5 times more DRs with internal stipends (which are phasing out since 2015 due to it not providing basic social security benefits) representing the HS sections than there are making up CPT or BM.
  - Lack of mentor support: only 41.5% of DRs have both a written agreement with their supervisor and a thesis advisory committee (TAC).
  - Lack of mental health support: 65% of DRs feel that psychological support needs to be improved at their

local institutes.

- Lack of awareness about Employee and Manager Assistance Program (EMAP): 65% of participants also report never having heard of the EMAP as a free support for all MPS employees.
  - Being prepared for jobs outside science and academia: only 1 in 3 of DRs feel well prepared for jobs outside science/academia and less than 50 % of DRs doctoral researchers are satisfied with their own situation regarding career development.
  - Support during integration phase needs improvements: the majority of international DRs would have needed more support with finding accommodation, registering at local resident office, visa, immigration office and translation of working contracts and relevant documents.
- Conduction of yearly survey allows us to monitor satisfaction of DRs over policies that have been changed and helps in understanding the efficacy of the implemented changes and the following effects of changes (such as raising the DRs' payment from 50% to 65% of TVöD and raising the number of holidays from 20 to 30 days within the doctoral employment contract.)
  - Institute specific survey reports are distributed without harming the anonymity of participants. They help PhD representatives address local issues, voice opinions of DRs, provide opportunities to discuss adjustments of institute policies, and improve local support.

Survey topics were categorized into five chapters, namely:

- **Demographics**

An overview of the participant demographics serves to ensure this survey's

validity, and reveals correlations between certain topics and demographic groups.

- **Working Conditions**

Good working conditions attract excellent scientists and offer them stability during their research stay. We investigated some of the key aspects of DRs' working conditions including employment situations, salaries, possibilities for extensions, hours of work, and lastly, holiday usage. We particularly explore relations between these topics with demographics and fields of study.

- **Career Development & Integration**

Career Development aims to understand future career plans of DRs and current satisfaction about career opportunities inside or outside of academia. The Integration section investigates the existing support structures within MPS and their efficacy in addressing the community needs of international and domestic DRs.

- **Supervision Quality & Support**

The perceived quality of the supervision received as well as the support received during the PhD affects not only the perspective of proceeding the projects successfully and the chances of successfully submitting a PhD thesis but also the mental health of the candidate. Here we have a brief overview on the quality of received supervision, as well as available mechanisms of support.

- **Satisfaction**

In this chapter we included additional factors for assessing the overall satisfaction of DRs within the MPS that were not reported in previous chapters, such as: general areas that DRs felt they appreciated within MPS, areas they felt needed improvement, factors pushing them to consider quitting their tracks, and lastly, awareness of free counseling services available for navigating stressful graduate experiences.

In past surveys, we have reported here on the relationship between the above-mentioned topics and their influence on DRs' mental health, with regards to anxiety and depression. This year this topic will be discussed within the N<sup>2</sup> framework.

Lastly, we would like to thank you, the thousands of willing MPS DRs, that have participated in this year's survey. Together, we have accumulated input over an enormous demographic pool. Your voices matter, and provide us insight into what shapes (or, conversely, what could be preventing the shaping of) our institutes into environments fostering scientific excellence and, ultimately, what ingredients are necessary for transforming our workplaces into thriving ecosystems.

## Chapter 2

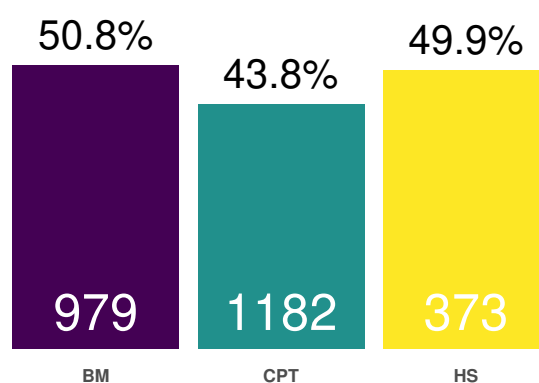
# Demographics

### Key Points:

- 2555 (47.2%) DRs across the MPS participated in the survey, representing all three sections at almost equal ratios.
- Women DRs are overall underrepresented in the MPS; they are vastly underrepresented in the CPT section, enough to counter the overrepresentation of women in the BM and HS sections.
- 42.0% of all respondents hold a German citizenship.

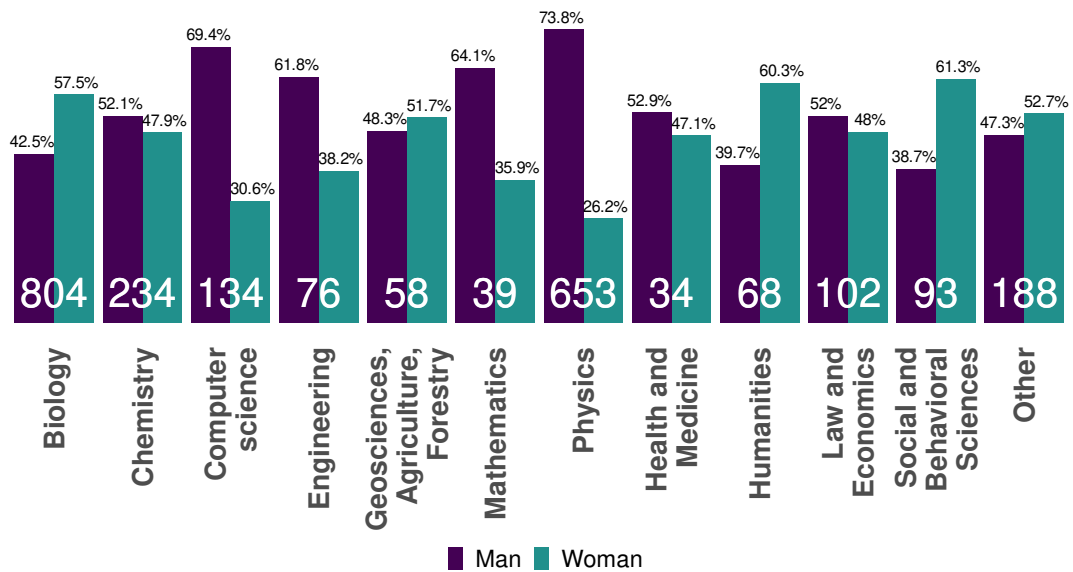
In the PhDnet survey 2021, a total of 5373 eligible Doctoral Researchers (DRs) were invited to participate from which we collected 2555 (47.2%) complete and valid responses. The overall response rate of 47.2% is slightly lower than in 2020 (48.4%). These answers provide us with an invaluable resource and representative insights to assess many aspects of being a DR in the MPS.

As shown in Figure 2.1, the participants in this year's survey come in similar percentages from all three sections of the MPS: Biology and Medicine (BM), Chemistry, Physics and Technology (CPT), and Human Science (HS).

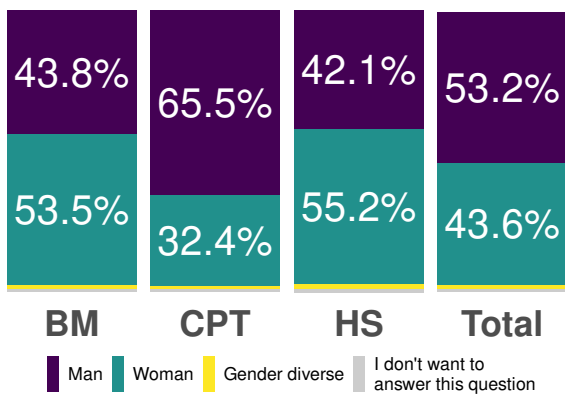


**Figure 2.1:** Survey Participation Rate per Section (total number of participants per section in bold white font).

53.3% of survey participants identify themselves as men, 44.1% as women, 1.1% as gender diverse and non-binary, and 1.4% did not provide their gender identity at all. Due to the small sample sizes of those identifying as gender diverse and/or non-binary, or unwilling to disclose gender, for this survey we decided to investigate gender-based correlations solely between women and men-identifying participants. The proportion of gender identities has not changed compared to the year before. Also, as shown in the previous year, the proportion of gender identities varies between the three sections of the MPS (Figure 2.2). Within the CTP section the lowest proportion of DRs identifies as women compared to the BM and HS sections.



**Figure 2.3:** Gender Distribution per field of study. Diverse gender identities and missing answers are not shown.

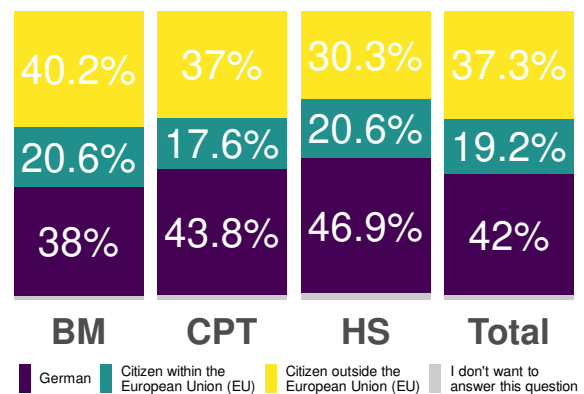


**Figure 2.2:** Gender Distribution per Section and in Total.

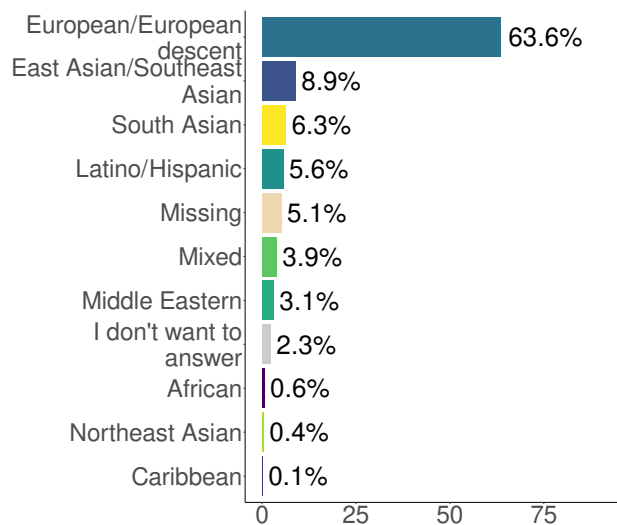
Differences in the proportions of men and women working in different fields are shown in Figure 2.3. More women work in fields such as Biology, Humanities, Social and Behavioral Sciences while more men work in Computer Science, Engineering, Mathematics, and Physics fields.

The majority of DRs holds a citizenship from the European Union, with 42.0% holding a German citizenship and 19.2% a citizenship within the European Union (except Germany). Finally, 37.3% of DRs hold citizenship outside the European Union (Figure 2.4). Of all respondents, a total of 63.6%

identified as of European descents, followed by 8.9% East and Southwest Asian, 5.6% Latino/Hispanic, 6.3% South Asian, 3.1% Middle Eastern (Figure 2.5).



**Figure 2.4:** Citizenship of DRs per Section.



**Figure 2.5:** V2: Ethnicity of DRs.

The average age of DRs at the start of their PhD is 26.3 years old. 8.1% of the DRs have or are expecting children.

Ultimately, here we report the demographics of willing DR survey participants, and readers can infer from it their specific conditions within MPS. However, it is important to note that there are variables for which we cannot account for in this survey; namely, the willingness for certain demographics to respond to surveys. To extrapolate the experiences of all DRs across MPS by demographics and fields of study, we assume an equal willingness from all demographics to participate in our survey.



## Chapter 3

# Working Conditions

### Key Points:

- Studies relating to Human Sciences (HS) exhibited the largest income variability, while those in Biology and Medicine (BM) exhibited the smallest income variability.
- The fields of mathematics and humanities show the highest rate of unpaid DRs (approximately 10% and 8%, respectively).
- The standard length of a doctorate support contract in MPS is 36 months. However, only about 20% of all DRs expect to submit their PhD thesis within 3 years from the beginning of their contract. More than 50% of all DRs expect to submit their PhD thesis after more than 4 years from the beginning of their contracts.
- 50% of the unpaid DRs are currently working without pay because their funding ran out.
- 57% of unpaid employees are not collecting unemployment benefits.
- 50% of students on average are confident in their ability to receive extension of their working contracts to complete their PhD because more time is needed; the confidence drops to 30% average when considering parental leave as a reason for extension.

Working conditions are an important assessment that influence employees' physical and mental health, which directly relates to employee retention, competitiveness of fu-

ture applicant pools, and the tightness of community within the work ecosystem [2]. It is important to find indicators where working conditions need improvement so that there is a basic safety net for the doctoral researcher's well-being and financial situation.

### 3.1 Employment Situation and Funding

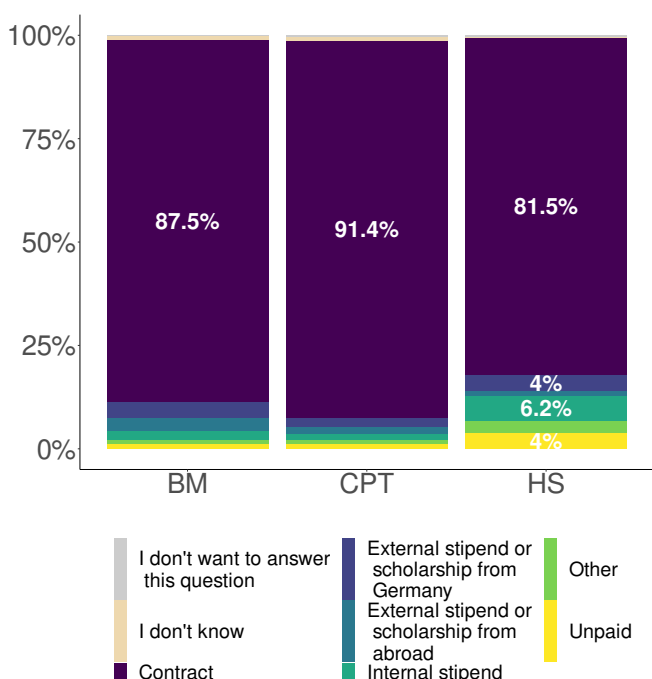
The aim of this section is to describe the employment situation of DRs in the MPS. We do so by categorizing DRs by sections, specific fields of study, gender, ethnicity and citizenship, and analyzing whether there are any visible trends in their employment situation. We also looked for commonly problematic employment situations such as no pay and extensive usage of stipend, to ensure that there is a basic safety net for the DRs' financial situation and well-being.

Employment can categorize into one of five types:

- Contract
- External funding within Germany
- External funding from abroad
- Internal funding within the MPS
- Unpaid.

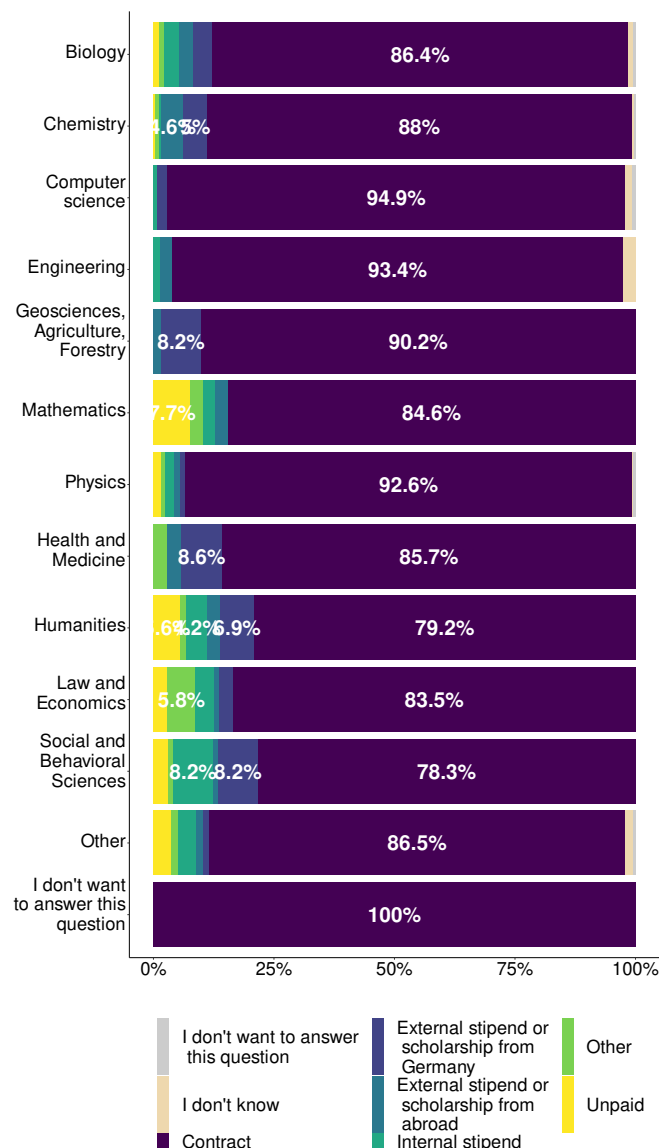
Contracts are a form of payment that is agreed upon for typically the entire duration of the DRs employment by DR and supervisor, which contains benefits such as a pension plan, social insurance, and health in-

surance. Stipends could be similar in terms of pay, but usually do not come with additional benefits and are typically not based by hours worked – these take the form of external funding from within Germany, international funding, and internal funding from the MPS. Internal stipends have been abolished from the MPS and are being phased out, however, we kept this as a category due to a small population of doctoral researchers still receiving funding this way [10].



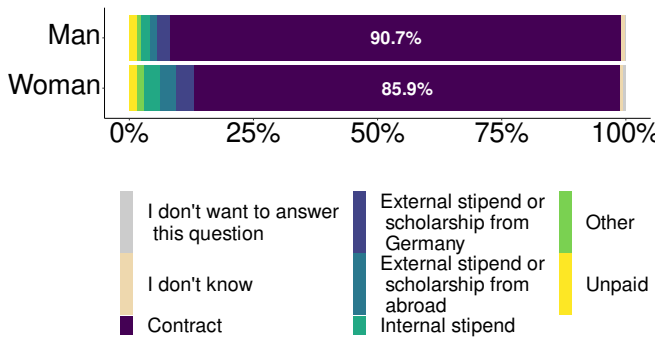
**Figure 3.1:** Distribution of DRs by employment situation and section.

We first categorized DRs into their respective sections: Biology and Medicine (BM), Chemistry, Physics and Technology (CPT), or Human Sciences (HS). The most common form of funding among all categories was a contract, with 80–90 % of those in each section employed by one. Contracts are most common in the CPT section, followed by the BM section, while the lowest percentage of contract holders is among DRs in the HS section. There are about 4 to 5 times more DRs with internal stipends representing the HS sections than there are making up CPT or BM, as well as 3 times the unpaid employment ratio (Figure 3.1).



**Figure 3.2:** Distribution of DRs by employment situation and field of study.

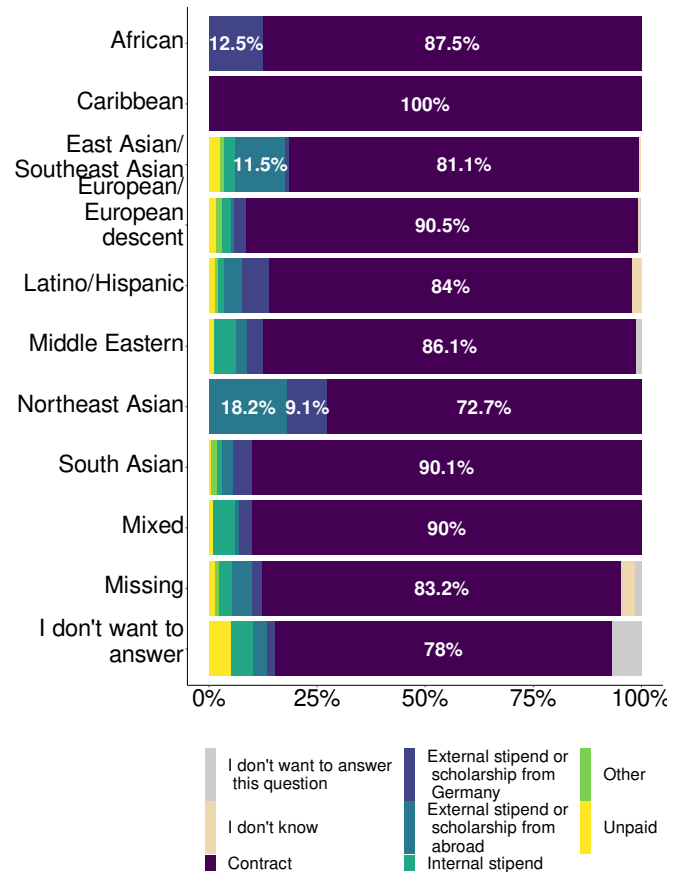
Similar tendencies were visible in employment when categorizing DRs into specific fields. The top three fields with highest percentage of contract holders are computer science, engineering and physics. The fields of social and behavioural sciences, humanities, and law and economics hold the least number of contract holders among DRs. Interestingly, the highest percentage of unpaid doctoral students works in the field of mathematics, with as much as 10% reportedly unpaid. The next highest unpaid population are those studying the humanities, with around 7–8% reportedly unpaid (Figure 3.2).



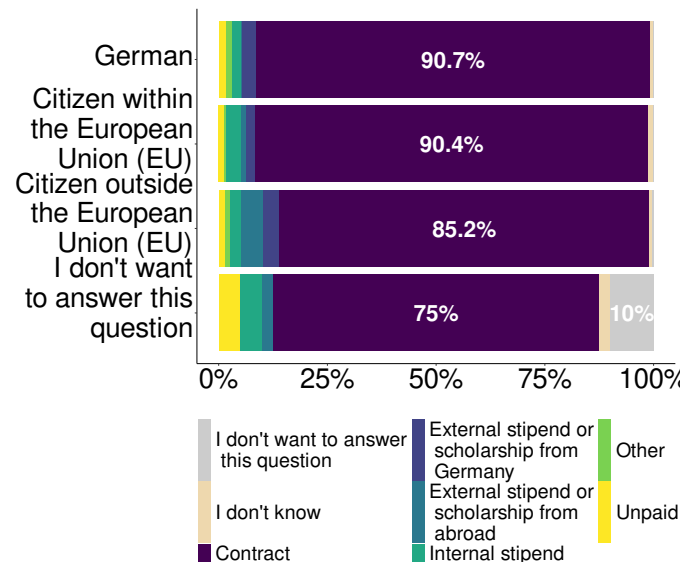
**Figure 3.3:** Distribution of DRs by employment situation and gender.

Next, we looked for correlation between gender and employment situation. More men (91%) than women (86%) are funded by contracts (Figure 3.3). Excluding the ratio of unpaid individuals, there were noticeably more women than men funded through non-contracts like scholarships and stipends. These results could imply one of several things: women could be applying for more scholarships and stipends, scholarships and stipends could be more actively geared towards women, or contracts could be given with a higher preference to men.

Employment situation across different ethnicity (Figure 3.4) reveals that African (12%), followed by Northeast Asian (10%) and Latino/Hispanic populations (8%) have the highest ratio of DRs in their respective ethnicity categories that have an external scholarship from Germany. Northeast Asians and East/Southeast Asians have the highest ratio of external funding from abroad, representing 20% and 15% of their populations, respectively.



**Figure 3.4:** Distribution of DRs by employment situation and ethnicity.



**Figure 3.5:** Distribution of DRs by employment situation and citizenship.

Finally, contracts are equally common amongst German DRs and DRs within the European Union, while for those with citizenship outside the EU, other forms of employ-

ment are more common, especially external stipends and scholarships from Germany and abroad (Figure 3.5). This last result could be a tendency for international researchers to seek internationally recognized scholarship opportunities in their home country before applying for a research position abroad.

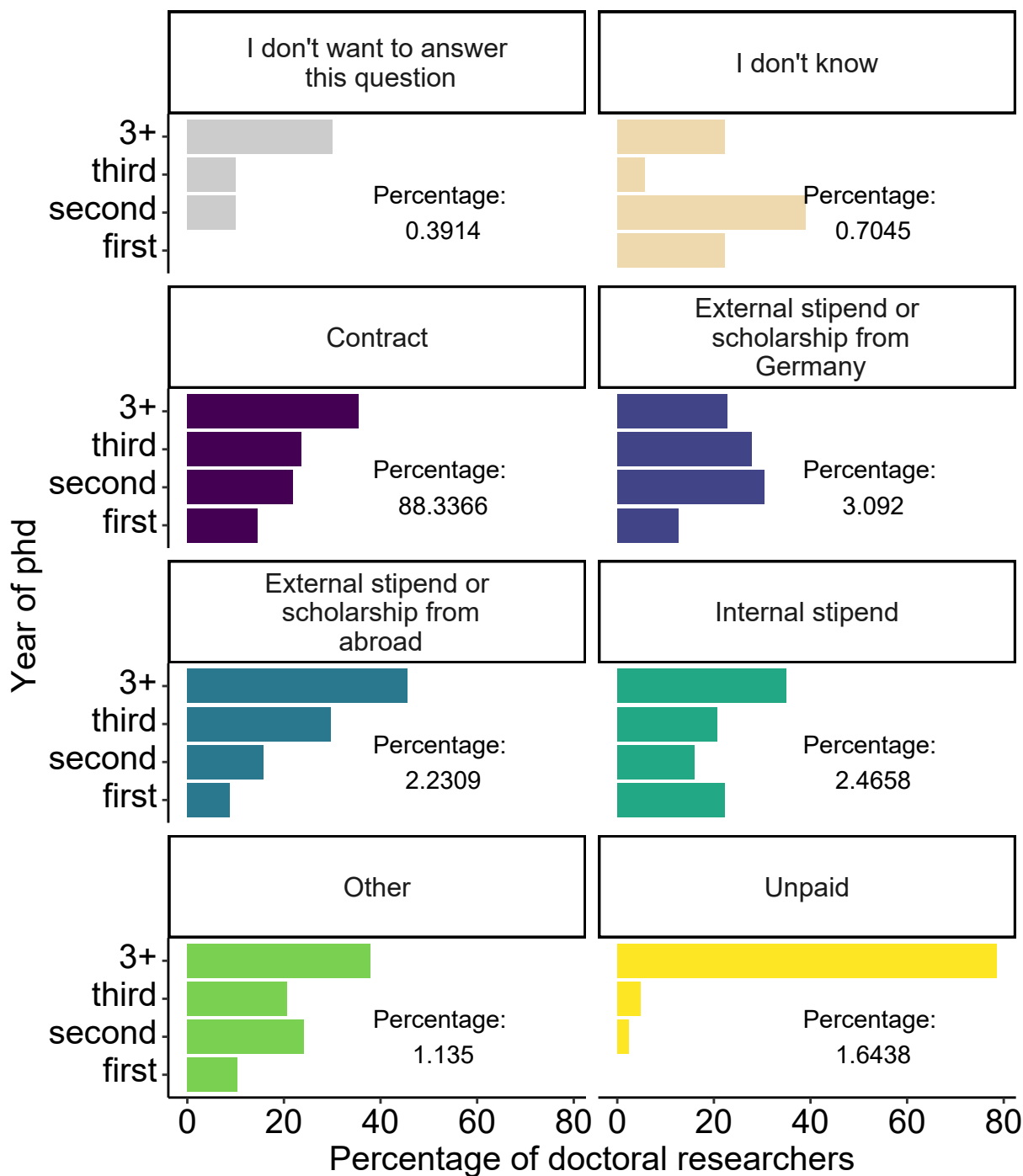


Figure 3.6: Distribution of DRs by employment situation and year of PhD project.

### 3.2 Unpaid Doctoral Researchers

In this section we focus our analysis on unpaid doctoral researchers. Figure 3.6 shows the distribution of DRs by their employment situation and year of their PhD project. The proportion of DRs who are currently unpaid is 1.6%. Seeing that 98.4% of the DR population participating in our survey have a funding source is reassuring. Among this 1.6 % of MPS DRs representing those unpaid, about 80% have been involved in their PhD for or greater than 4 years. It is likely that this group is mainly comprised of DRs at the end of their PhD project who could not or did not wish to extend their contracts. It is worth noting that 7–8% of the unpaid DRs are in the second and third years – it is puzzling as to why they would be unpaid, with one plausible explanation being that they are taking a shorter duration through exceptional means to complete their PhDs.

It is, nevertheless, of interest to explore in more detail the group of unpaid DRs. Figure 3.7 shows that 50% of the unpaid DRs are currently working without pay because their funding ran out. 27.5% are not granted an extension of their funding and the smallest proportion (22.5%) are working without pay by choice.

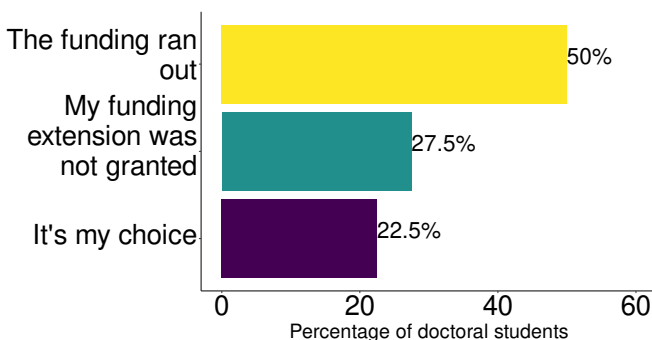


Figure 3.7: Reasons for current unpaid situations.

About half of the DRs who are currently unpaid (See Figure 3.8: 49.0%) have been working without pay for more than 6 months, and among them, most go unpaid for longer

than 12 months (26.2%). Most of the unpaid DRs are not collecting unemployment benefits (Figure 3.9, 57.1%), likely because they do not correlate "unpaid" with "unemployed".

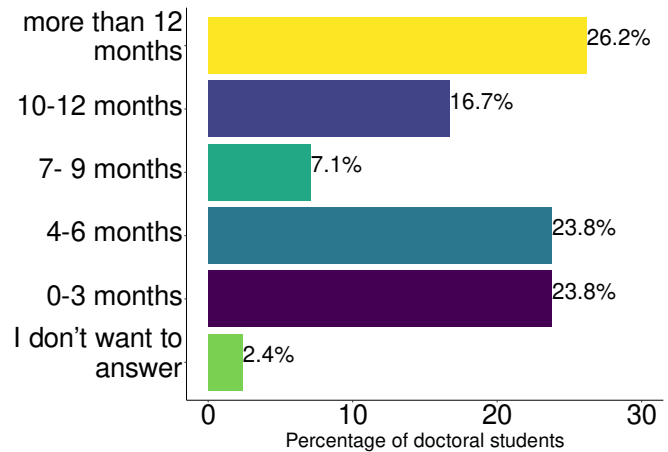


Figure 3.8: Duration of work without pay.

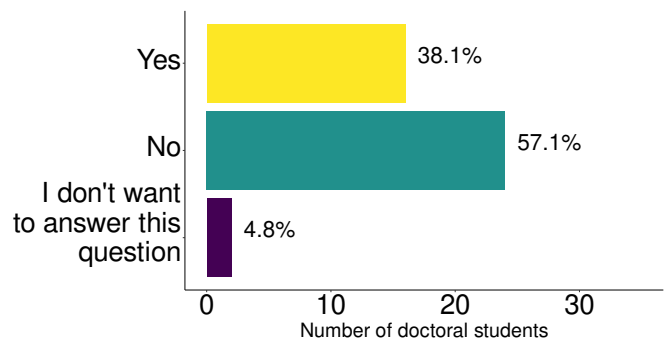


Figure 3.9: Collection of unemployment benefits (Arbeitslosengel).

### 3.3 Salary

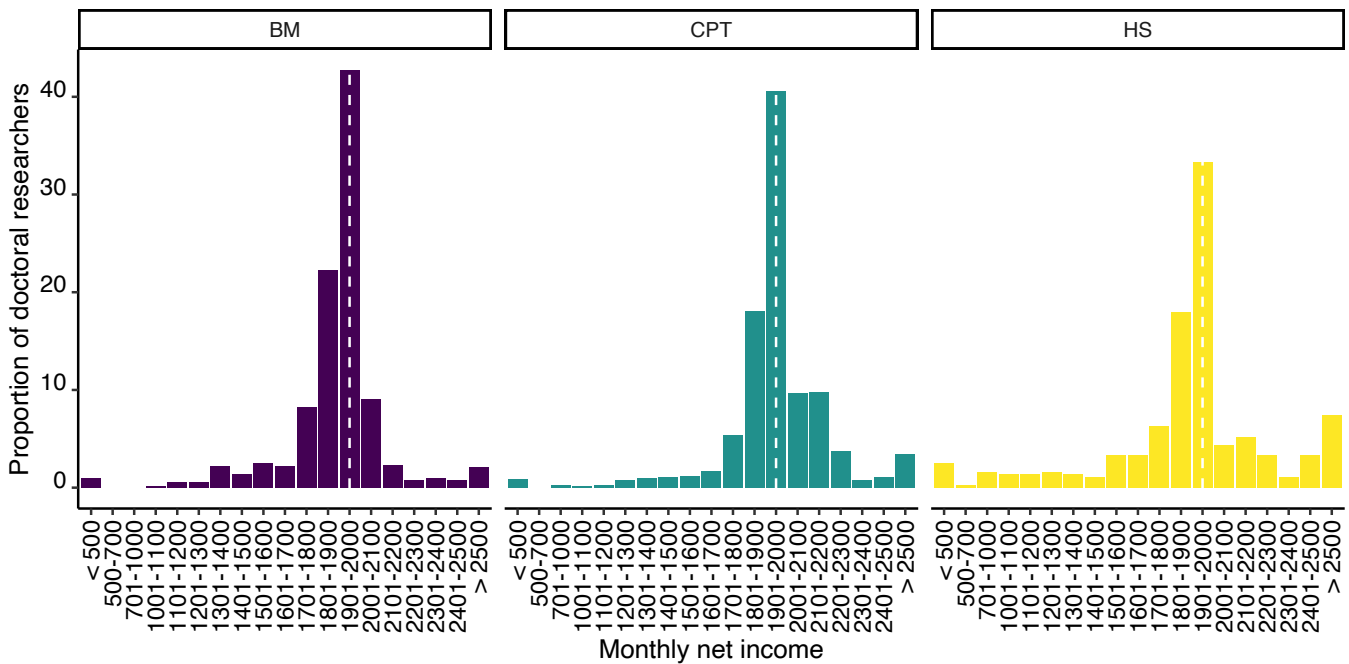
The goal of this section is to provide a better understanding of how salary is distributed among DRs in the MPS.

Specifically we will look at salary distribution by:

- Section
- Specific field of study
- Citizenship
- Ethnicity (See appendix: Figure A.3)

For each category we investigate the pay gaps between fields and likely causes.





**Figure 3.10:** Distribution of net income by section.

Figure 3.10 shows the income distribution of DRs according to their sections (BM, CPT, HS). Incomes ranged from less than 500 euros a month, to above 2500 euros. For all three sections, the median net income was 1901–2000 euros a month. This is a vast improvement from last year’s data [12], where significant differences in median net monthly income were observed between sections. The drastic improvements in pay are the result of PhDnet efforts in previous years, which granted the implementation of a minimum of 65% TvöD for all DRs within MPS, compared to the 50% from prior years.

Still, we noticed HS exhibited the largest income variability, while BM exhibited the smallest variability. 1–2% of each section’s population marked as having less than 500 euros a month (which are likely mostly the unpaid population, or stipend/scholarship’s holders). While this income categories represents a considerably small population of DRs, cumulatively they represent a population that exceeds those that marked themselves as unpaid. 1300 euros a month is less than the monthly minimum wage in Germany of 1621 euros a month (as of January 2021) [1]. These

doctoral researchers are likely funded by external stipends/scholarships, which may not have accounted for the living costs within Germany. This may indicate a need for granting a small internal contract to improve their living standards, as one option, since these doctoral researchers benefit MPS in reducing costs by bringing external funding.

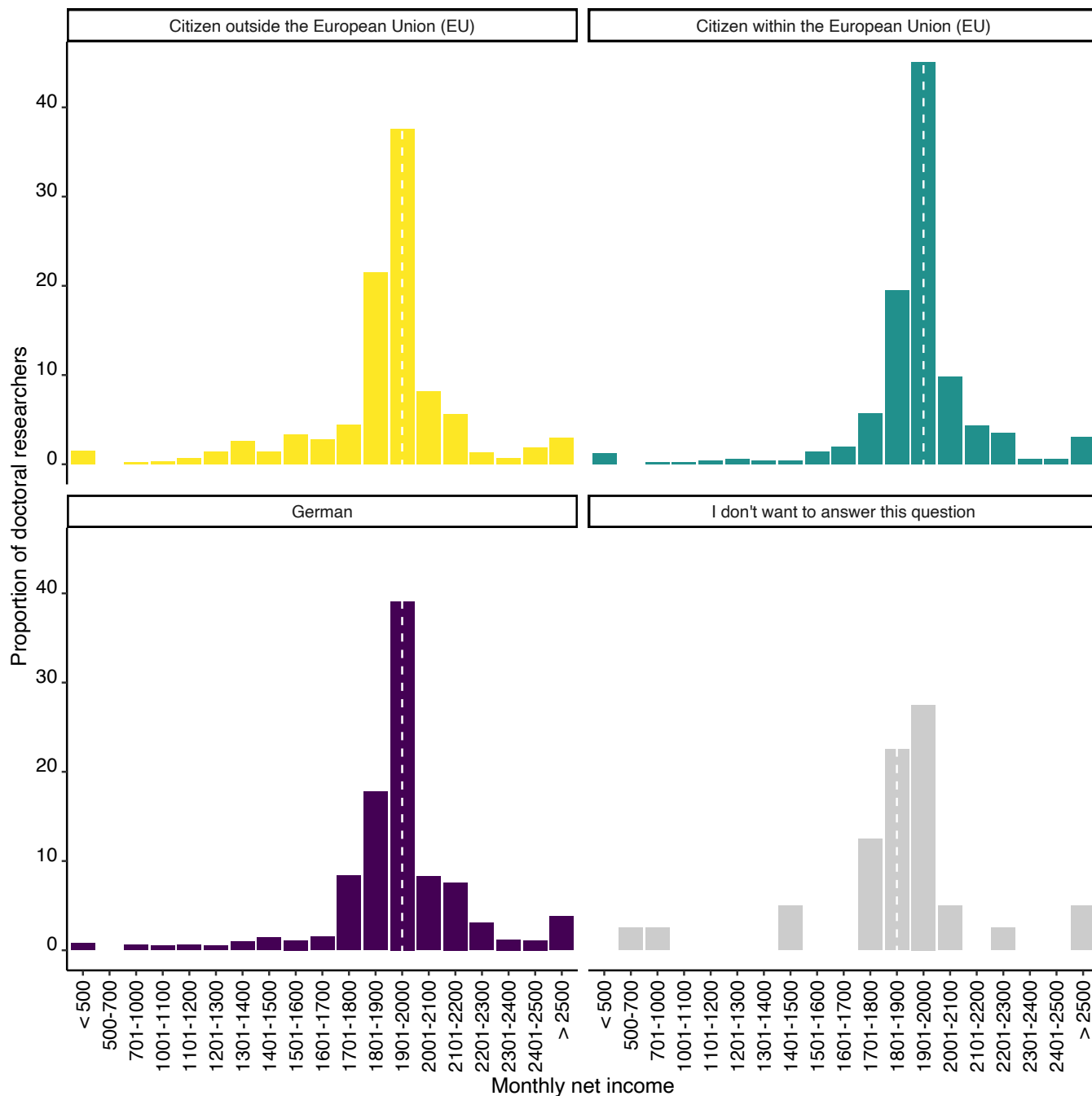


Figure 3.11: Distribution of net income by citizenship.

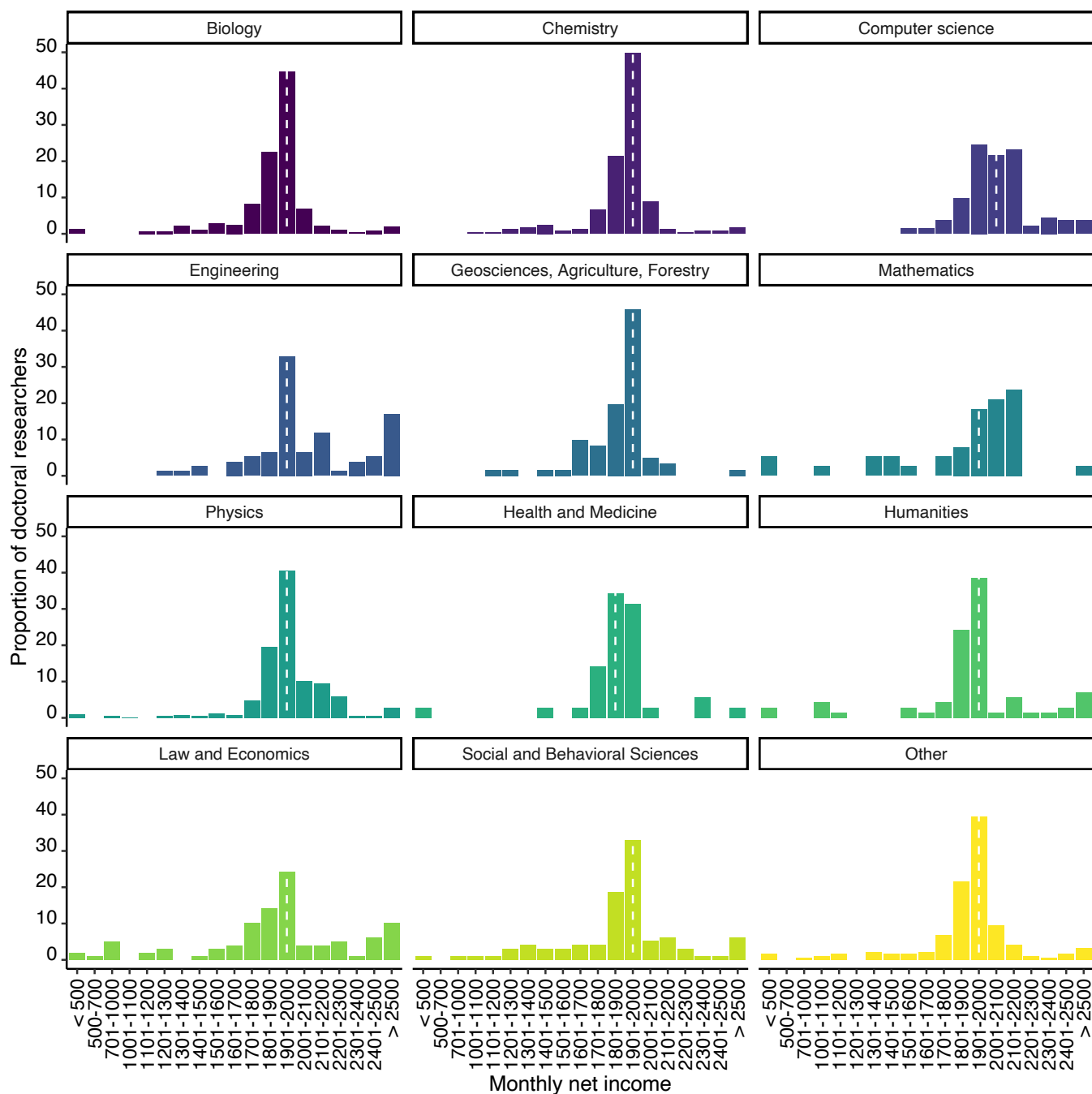


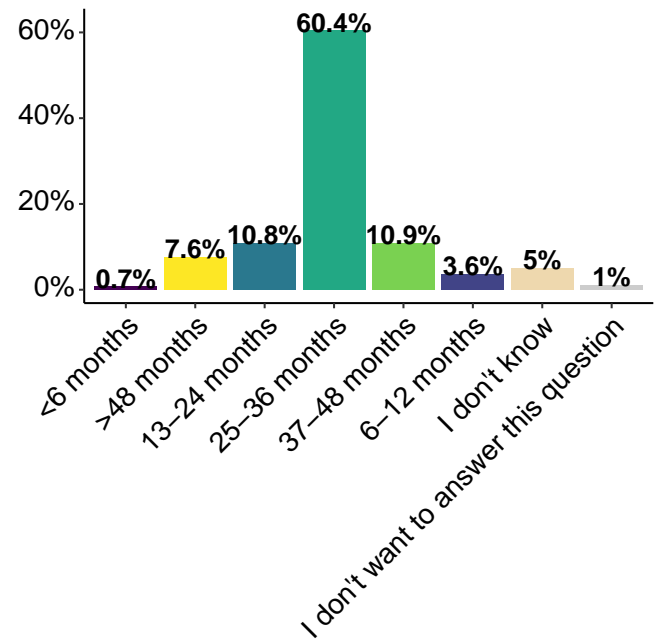
Figure 3.12: Distribution of net income by field.

When asked about citizenship, all participants reporting their citizenship shared the same median net monthly income between 1901–2000 euros a month, again an improvement from the year before (Figure 3.11). Those with non-EU citizenship did display a larger representation of DRs with lower monthly income than the other two categories. Further, we noticed that out of those that wished to not respond about citizenship, the median net income was lower, between 1801–1900 euros a month. This is a curious result, and paired with the earlier finding, could indicate that those with non-EU citizenship (who represent more of the underpaid individuals) feel less comfortable reporting on their citizenship in our surveys.

We next analyzed monthly net income by field. All fields, reported receiving the same median net income between 1901–2000 euros a month (Figure 3.12). Health and Medicine reported receiving the lowest median net income between 1801–1900 euros a month, while Computer Science DRs reported receiving the highest median of 2001–2100 euros a month.

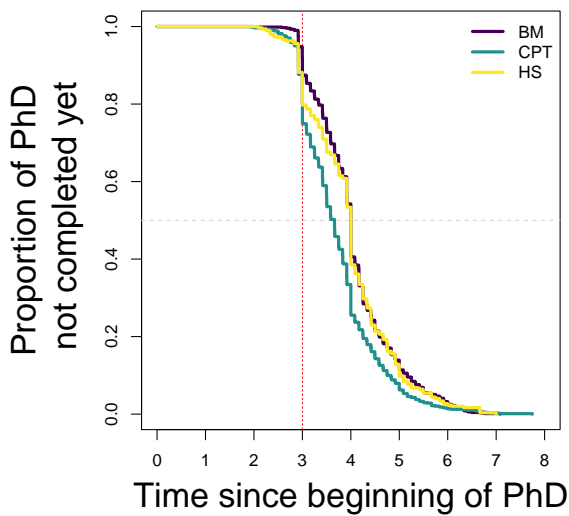
### 3.4 Duration of contracts

Currently, about 60% of the DRs who participated in the survey have or had a contract or stipend spanning between 25–36 months. The percentage of contract or stipends with duration longer than 36 months has increased with respect to last year's survey. A total of 15% of the DRs have contracts or stipends with the longest duration shorter than 2 years (Figure 3.13).



**Figure 3.13:** What was or is the longest duration of your contract or stipend related to your PhD project?

To evaluate whether contract/stipend duration covers the total time needed to submit the PhD thesis, we analyse the expected time to completion of the PhD project. We asked doctoral researchers about the estimated date of submission for their PhD thesis. If we assume that the PhD project is completed by this date, it is possible to model the amount of time doctoral students spent working on their thesis. We do so calculating and depicting the Kaplan–Meier curve. In Figure 3.14 the horizontal axis depicts the time from the beginning of a PhD project until the time of expected PhD thesis submission. The vertical axis represents the proportions of DRs who have not completed their PhD yet, 1 representing all DRs. At the beginning of the horizontal axis (Time since beginning of PhD = 0) no PhD thesis is being submitted, therefore the curve starts at 1. Then, whenever a PhD thesis is submitted (or expected to be submitted in our case), the Kaplan–Meier curve drops vertically by an amount proportional to the percentages of PhD thesis submitted after that fixed amount of time.



**Figure 3.14:** Estimated time to completion of the PhD project by section.

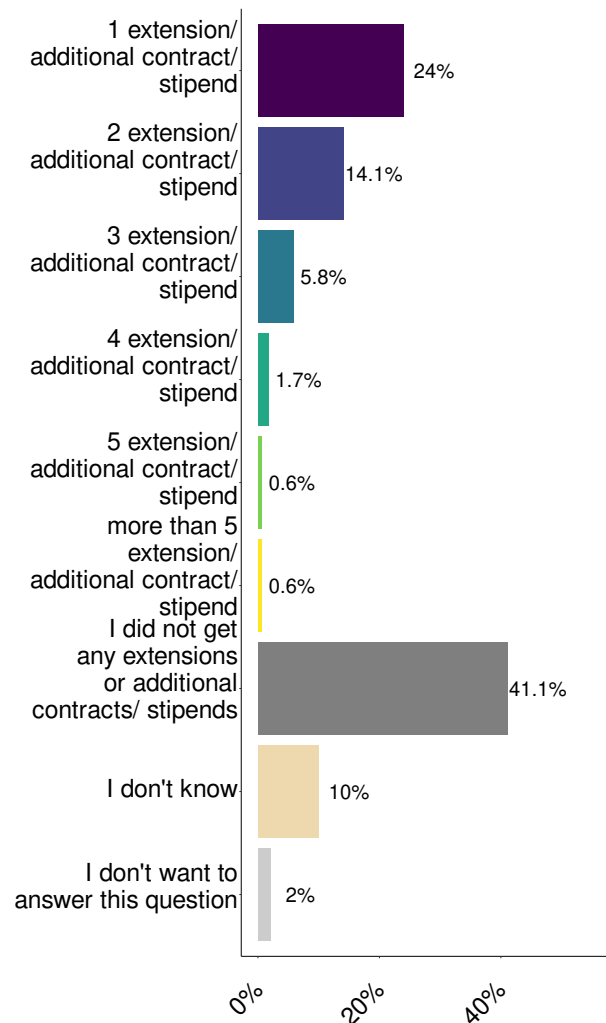
The doctoral support contract (Promotion-fördertrag) provided by MPS typically lasts 36 months, which is perceived as the standard length of a PhD. We mark the three years reference point with a red vertical line. By this point, only about 20% of all DRs have submitted their PhD thesis, or expect to do so (in Figure 3.14 the drop of the curve at the three years mark reaches about 0.8). After three years there is some variation in expected time of completion of PhD project by section, with students in the CPT section submitting their thesis on average earlier than students in the BM and HS sections.

By the end of the fourth PhD year, about 50% of all DRs expect to have submitted their thesis, leaving another 50% of DRs needing more than 4 years to complete their project.

DRs in their third or more year might predict the time of submission of their thesis more accurately than DRs in their first or second year. Figure A.2 shows longer expected times to submission of the PhD thesis for DRs in their third or more year, compared to DRs in their first or second year.

There is a clear discrepancy between the length of contracts and stipends offered to DRs and the actual time that DRs need to

complete their PhD project. Therefore, many DRs find themselves in need for an extension of their contract. In fact, over 40% of the DRs who answered our survey received at least one extension of their contract/stipend (Figure 3.15). We will explore the possibilities for contract extensions in the next section.



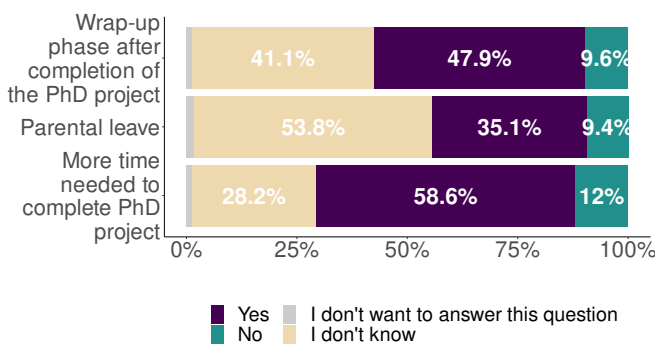
**Figure 3.15:** Number of extensions (or additional contracts/stipends) received during the PhD.

### 3.5 Possibility for Extension

During the course of the doctorate study, an assortment of unforeseen circumstances can arise. Time off due to family emergencies, illness, stalling after equipment malfunctions, paper "scoops", and experimental failures (which are arguably valuable scientific findings in themselves) can hinder the

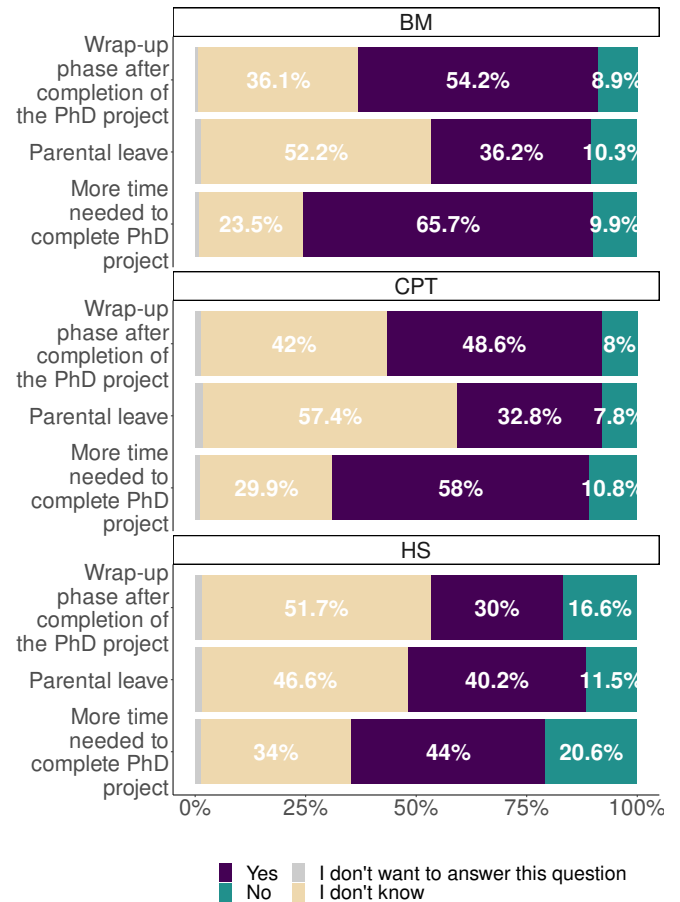
progress of a DR. Perhaps a DR successfully finishes their degree but remains at work to transfer knowledge to the next DRs before moving to a different career. In such cases, it is possible to ask for extensions of employment contracts and stipends, although this decision is often made by institute directors using their own judgment. However, do DRs know whether extensions are even available to them in these situations, and if they do, to what extent can they receive extensions? Is the possibility of getting an extension correlated to employment situation or to the satisfaction with the supervisor?

DRs were asked whether they knew if it is possible to either receive an extension for (1) parental leave, (2) wrap-up phase post-PhD, or (3) more time to complete the degree. The greatest uncertainty of 62% resided in the category of parental leave, while the least uncertainty of 28% resided in the category of extension for PhD completion. However, with only 1 in every 2 to 3 DRs certain of extension capabilities, this result might encourage DRs and advisors alike to raise extensions as an early discussion point so that there is a clear understanding about options in the case of unforeseeable stalling or inevitable obstacles.



**Figure 3.16:** Possibility for extending current contract/stipends for the following reasons.

The same responses were analyzed according to participant’s gender identity, section, and specific fields. As a positive, there were no correlations between gender and awareness of extension possibilities (see supporting figure A.5).

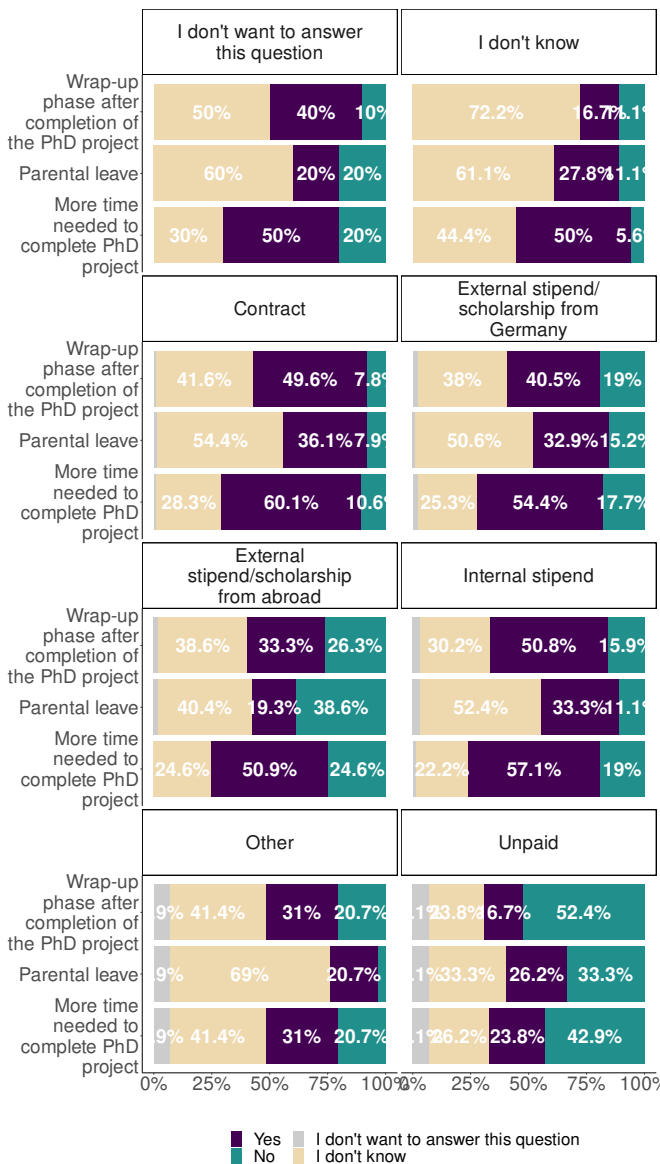


**Figure 3.17:** Possibility of extensions by section.

Interestingly, out of all three sections, participants in HS were least confident in their ability to receive extensions for any of the reasons provided. For example, over 20% were sure that they could not receive an extension for completing their degree in HS, while 50% of total answered the same in BM and CPT. This could potentially be explained by referring back to Figure 3.1 – according to this figure, DRs in HS have the highest percentage employed through a non-contract funding, which likely cannot be extended similarly to contracts.

This statement is supported by the results shown in Figure 3.18, which plots the responses of participants according to type of employment. Those with an external contract from abroad have noticeably less chances of receiving an extension compared to contracts, or even other forms of pay such as internal stipends and German funding sources.





**Figure 3.18:** Possibility of extensions by employment type.

External funding sources, while often prestigious and beneficial to the DR, fail to provide enough academic support, for example by not providing possibilities for extension. To avoid such cases, it would be highly useful for advisors and DRs to agree upon a plan for funding in case their external grant runs out.

### 3.6 Holidays and Working Hours

A large indicator of workplace well-being is not only work environment and employment

situation, but also the ability to take a break. Holidays and working hours play a large role in overall workplace satisfaction (see chapter 6: Satisfaction), and although the MPS does not enforce working hours and offers flexible holidays every year to employees, those supports are not necessarily taken advantage of from DRs for reasons such as workplace pressure, work overload, and pressing research. We decided to see whether there was a correlation between holidays taken and different fields of study, types of employment, as well as overall workload and supervision satisfaction.

**Working Hours** There exist studies showing that the amount of hours worked could have an inverse effect on productivity at work [9], and that time sovereignty could increase overall job satisfaction for workers [14]. Yet in much of academia, overworking remains a problem [5]. In this section we were interested in analysing the average working hours per week, to see whether doctoral researchers had differing patterns that deviated from working hours in a non-academic workplace.

We looked at average working hours in a week for different categories of DRs. Categorized by sections, about 50% of those in BM spend greater than 45 hours per week on average working. Those studying in BM account for the majority of those that report working 46–65 hours per week (9–13 hours a day for a five-day work week), followed by CPT and lastly by HS. There is no strong correlation with gender (see appendix: A.1).

Categorizing participants based on employment type, there is a large discrepancy in the number of DRs with internal stipends working less than 35 hours a week (17%) compared to DRs employed through other means, each category averaging 32.2 % of its population working under 35 hours a week.

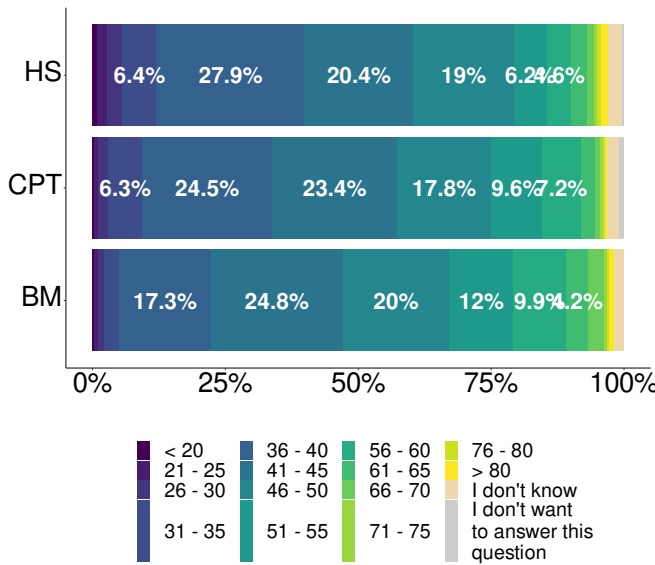


Figure 3.19: Hours worked per week by section.

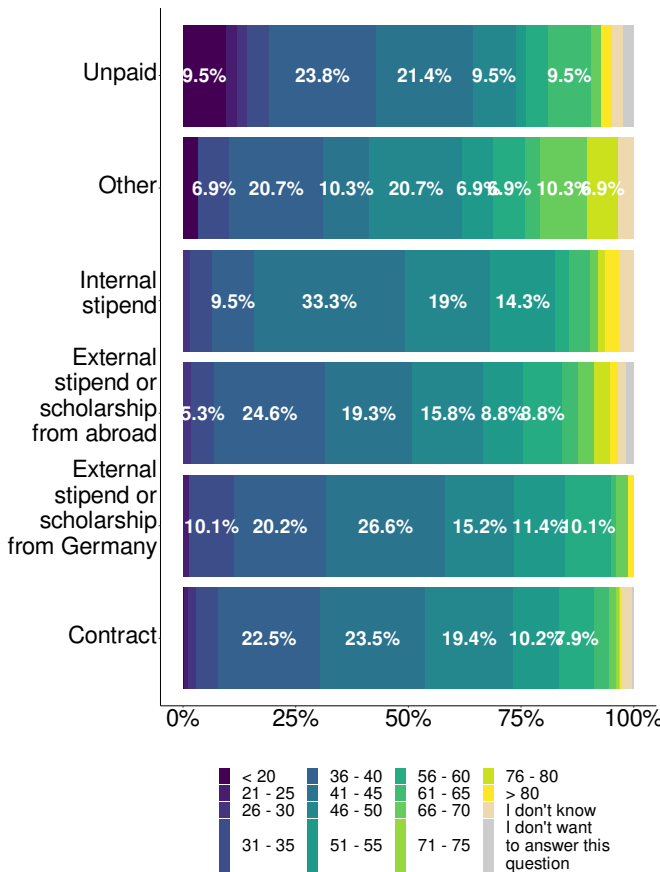


Figure 3.20: Hours worked per week by employment type.

To better understand if DRs work the exact amount of hours that they are required per week, or if we observe patterns of deviation, we plotted the difference between the average number of hours worked in a week

and the number of hours required by contract/stipend.

The results in Figure 3.21 show that the vast majority of DRs work on average many more hours than they are required (right side of the histogram) with some DRs working 30 or more hours more than they are required by their contract or stipend. This results is obtained from the 2186 responses to both questions.

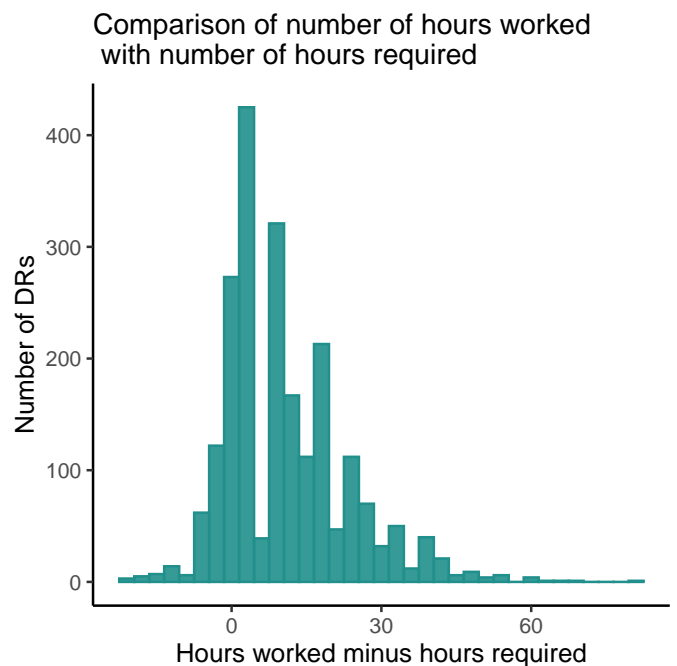
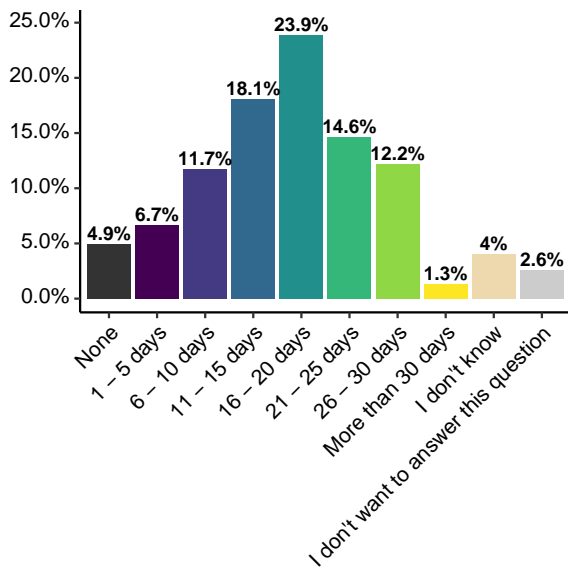


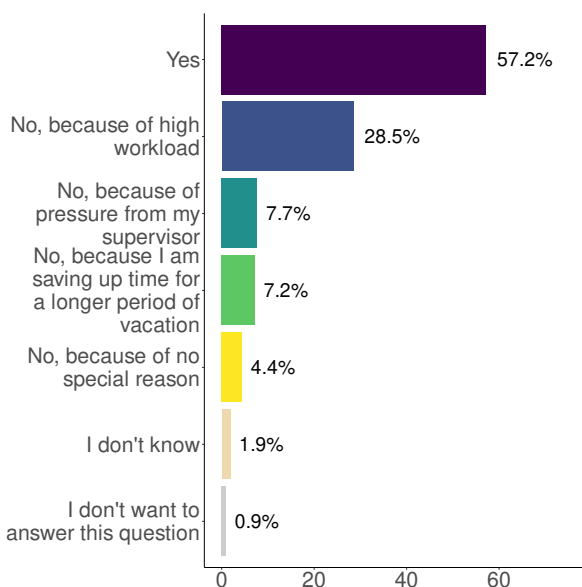
Figure 3.21: Comparison of average number of hours worked per week with the number of hours required per week.

**Holidays** Holidays offer time and flexibility for DRs to attend to family needs, travel, or time to simply relax. As of 2021, DRs holding doctoral support contract in the MPS are offered 30 days of holiday per year, most of which are flexible dates. As shown in 6.4 of this survey, holidays are among the most appreciated qualities of working in the MPS.



**Figure 3.22:** Holidays taken off in the last year.

As shown in Figure 3.22, 12.2% of participants reported using most (26–30 days) of their holidays. The largest percentage of participants (23.9%) took between 16–20 days of holiday in the past year. 41.4% of participants reported taking fewer than 15 days off, with as many as 5% of DRs taking no holidays.



**Figure 3.23:** Feeling able to take off holidays during the year.

Figure 3.23 shows that 57.2% of DRs feel free to take holidays, and the remainder of

participants had various reasons for not feeling able to take their holidays. The majority (28.5%) felt that their workload was too high, and another 7.7% felt pressured by their supervisor to work. These 36.2% of survey respondents are unable to use their available holidays due to external stressors. However, due to the ongoing COVID-19 pandemic and repeated lock-downs, many DRs did not have the opportunity/need to take holidays in 2021. Therefore, it is important to keep monitoring the amount of holidays taken by DRs in the coming years.

Direct encouragement from supervisors towards DRs to take their holiday time off could be of value towards alleviating stress, as well as to allow DRs time to rest and mentally recharge themselves.

## Chapter 4

# Career Development & Integration

### Key Points:

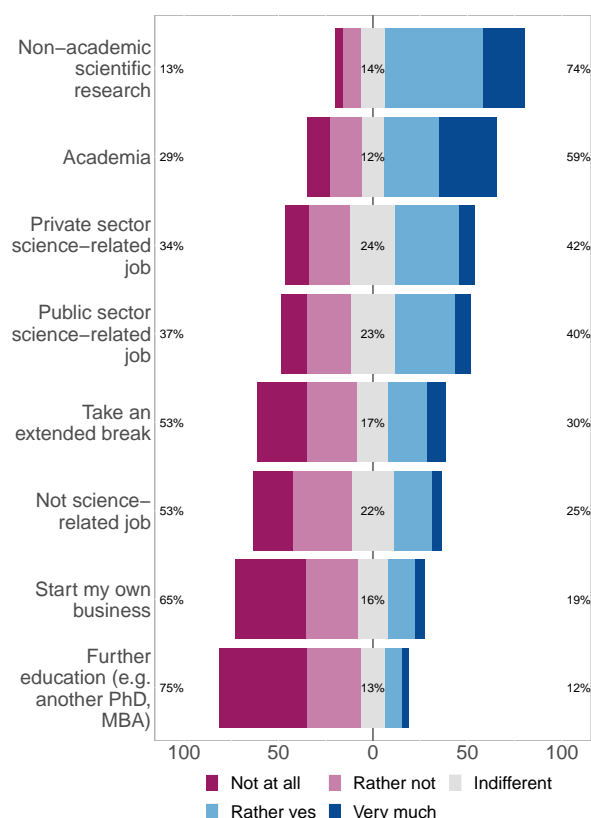
- 59.5% DRs would like to work in academia after their PhD.
- 66% DRs do not feel well prepared for jobs outside science/academia.
- International DRs especially seek more support in different aspects of integration.

### 4.1 Career Development

One of the concerns when it comes to choosing the career path after graduating with PhD is the shortage of permanent jobs in academia worldwide. Consequently, the vast majority of PhD holders find jobs outside academia [8], [15]. Certain professional skills such as leadership, communication, teamwork and project management can be developed during the PhD studies and are valued by many employers. Therefore, career development is an important part of higher education, that guides doctoral researchers towards future jobs inside or outside academia and science. Until now, reproduction of science and scientists have been on of the most important part of scientific education itself. To understand better what are the preferred fields of work and positions for doctoral researchers after completing their PhD, we asked several questions regarding future career.

Our analysis show very interesting results: 59.5% of the DRs would like to work in academia, but also 74.0% of them would

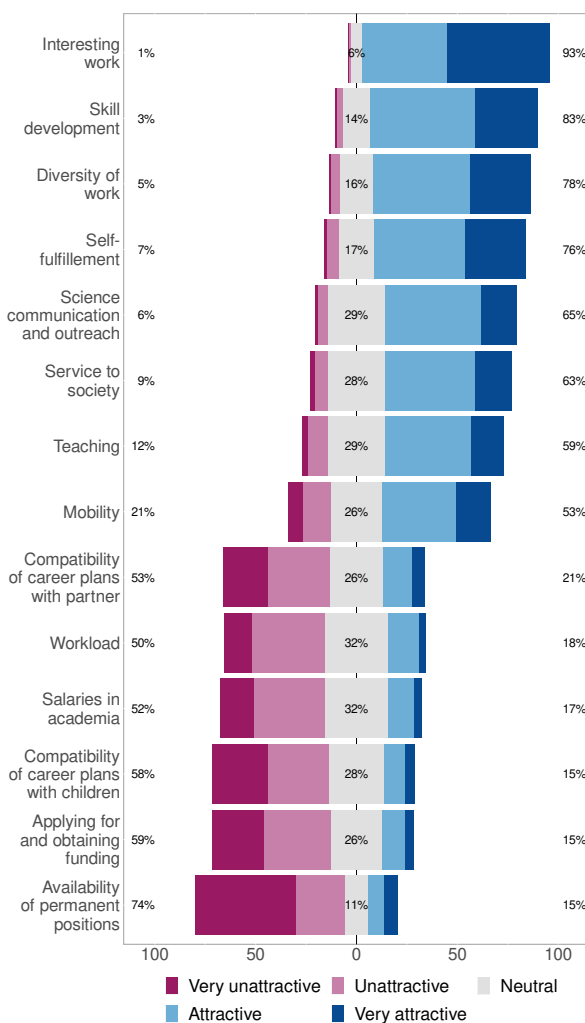
like to work in non-academic scientific research and finally 25.0% are considering non-science related jobs (Figure 4.1). These results show that DRs have diverse career plans.



**Figure 4.1:** Which field would you like to work in after completing the PhD?

Figure 4.2 exhibits the most attractive and, conversely, least attractive qualities of continuing onto an academic research career post-PhD. DRs feel that an academic research career will allow them to pursue interesting and diverse work that will give them a

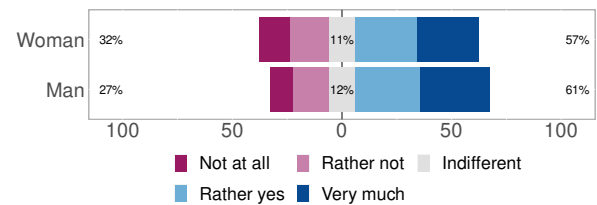
sense of self-fulfillment and further develop their research skills. On the other side of the spectrum, the top three factors deterring DRs from a post-PhD academic research career are the limited prospects of obtaining a secure position, funding and lack of compatibility of own career plans with career plans of the partner or with having children. When we compare the career choice of staying in science/academia between genders (Figure 4.3), we observe no big difference between men and women.



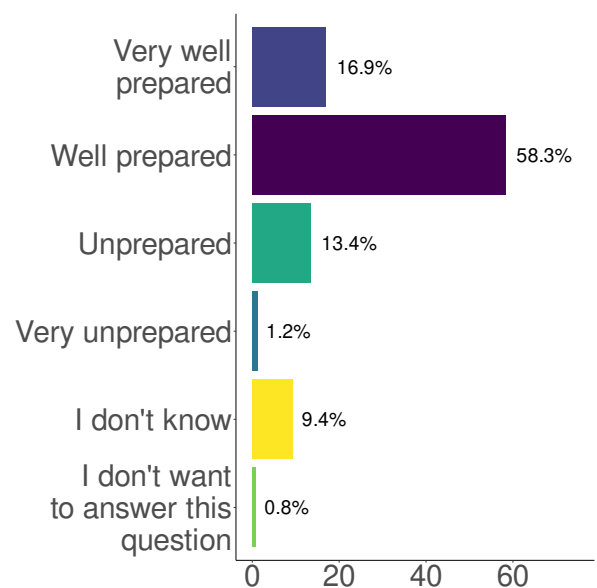
**Figure 4.2:** How do you judge the following aspects of an academic research career?

Further, we asked DRs if they think they are well-trained for a job inside science/academia and for a job outside science/academia (Figures 4.4 and 4.5). While 75.2% of participants think that they are

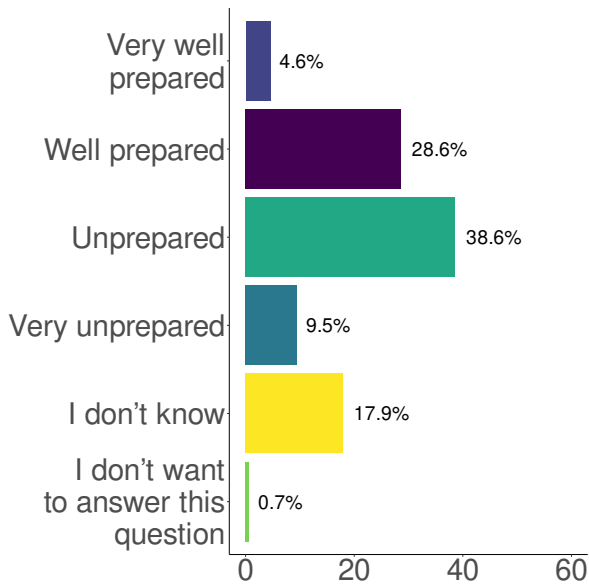
well trained for jobs related to science and academia, only 33.2% of answers stated that DRs feel well prepared for jobs outside science/academia. When correlating level of satisfaction with career development and being prepared for academia, we see that DRs who feel well prepared for academia are also satisfied with their career development status (Figure 4.6). Taken together, DRs at MPS feel optimistic towards an academic career because they feel well prepared. However, they are less confident about their competence in non-academic jobs.



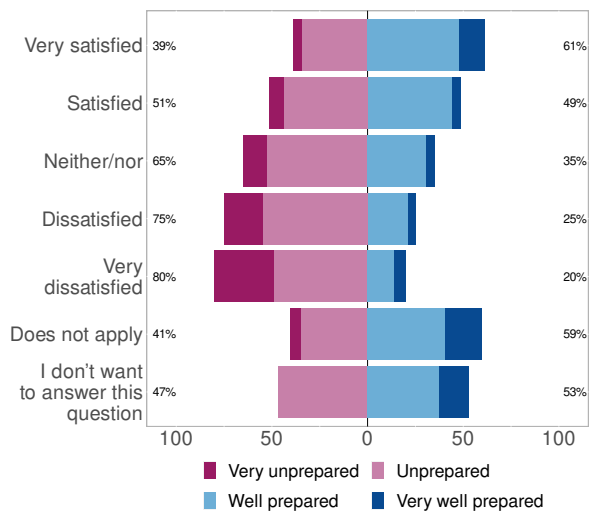
**Figure 4.3:** Would you like to work in academia after completing your PhD divided by gender.



**Figure 4.4:** Do you think you are well trained for a job inside science/academia?



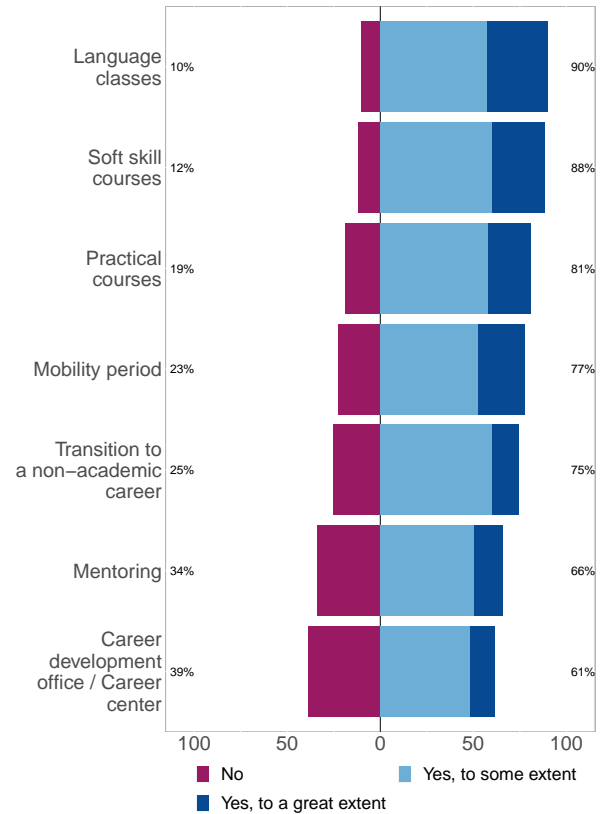
**Figure 4.5:** Do you think that you are well trained for a job outside science/academia?



**Figure 4.6:** Correlation between the level of satisfaction with career development and being prepared for academia.

Some local institutes have introduced, to some extent, different measures that support career development of young researchers like mobility period, language classes, mentoring, soft skills, practical courses, means of transitions to a non-academic career and career development office (Figure 4.7). Still, only 45.5% doctoral researchers are satisfied with their own situation regarding career development (Figure 6.1), moreover 79.1% of the DRs stated that they would like to

have improved career development at their workplace (Figure 6.2). These results indicate that improvements could still be made both at the institute and at the MPS level regarding career development opportunities.



**Figure 4.7:** Which of the following measures for your career development are supported by your center/institute/unit?

## 4.2 Integration

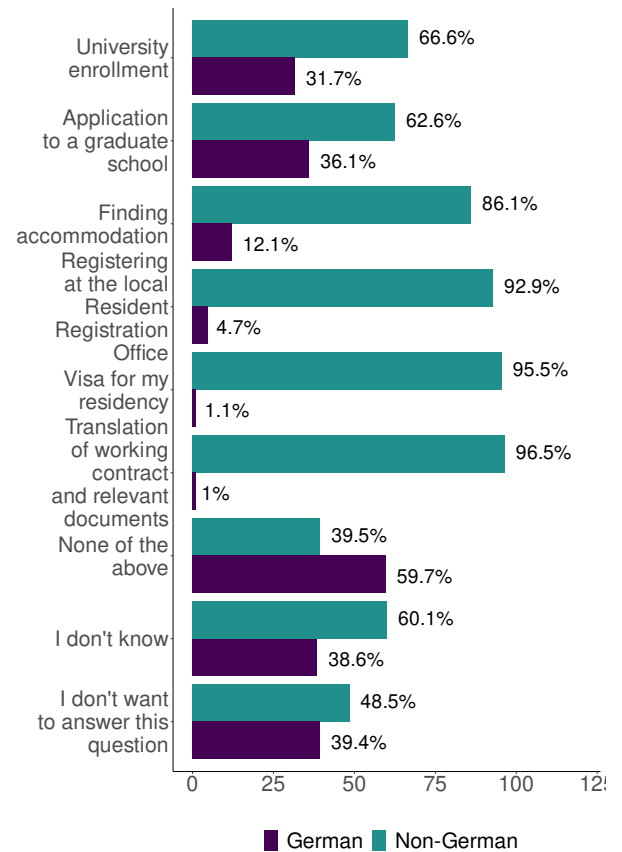
Certain level of integration is required for non-German DRs in order to be committed to their studies. Of all MPS DRs, 57.9 % come from countries other than Germany, which suggests the significance of offering necessary support to international and domestic DRs regarding work-related information and documents. This support comes, for example, as help with legal documents such as application for residence permits, and the bureaucracy surrounding the enrollment to Universities or graduate schools. In this regard we asked how integrated DRs feel at



their institute/center/unit in terms of language and support with administrative tasks.

Similarly to last year, 51.1% of international DRs reported that not all important information, such as group internal information, administrative information, and contract/stipend are provided in a language they understand (Figure B.1). Additionally, similar percentage of DRs as of last year (23.3%) found the language an obstacle for communication with the with people at their institutes/centers/units (Figure B.2. These results show that language barrier in some institutes is still an issue that has not been improved from the last year. Less than half (43.8%) of DRs are satisfied with support for international doctoral researchers while 63.8% are satisfied with bureaucracy and administrative support (Figure 6.1).

A successful integration in a new city and/or in a foreign country can benefit DRs also in terms of easier and better performance during their PhD. Therefore, it is valuable to understand in which aspects the non-German DRs would have needed more support from local institute/center/unit when they started their PhD journey. The survey results show that the majority of international DRs would have needed more support with finding accommodation, registering at local resident office, visa, immigration office and translation of working contracts and relevant documents (Figure 4.8). In conclusion, international DRs in comparison to their German colleagues seek for more support during their arrival to the Germany. Therefore, better integration strategies should be applied on local levels.



**Figure 4.8:** Percentage of DRs that would have needed more support in different aspects from institute/center/unit.

## Chapter 5

# Supervision Quality & Support

### Key Points:

- Only 41.5% of DRs have both a written agreement with their supervisor and a TAC.
- Lack of support is more prevalent in the CPT section
- Only 33.3% of the DRs report no problem with their supervision.
- Regular meetings with a supervisor are associated with a higher level of satisfaction.

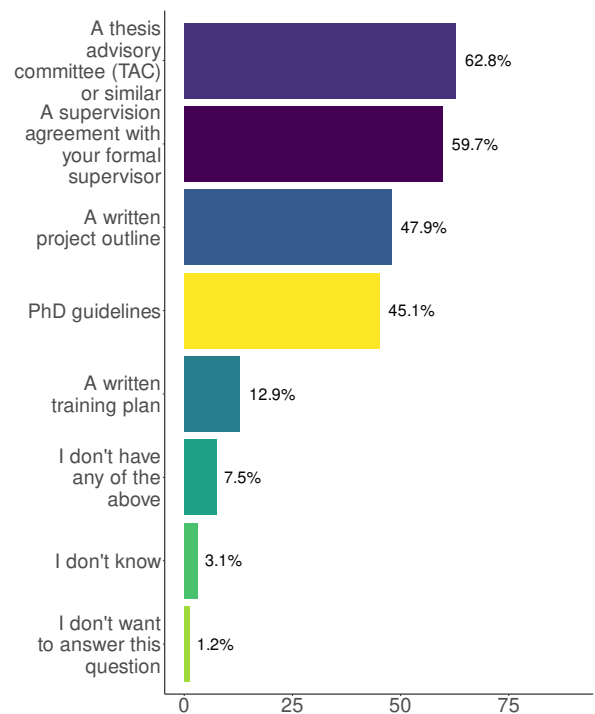
A successful doctorate relies not only on the capacities of the DRs but also on the quality of supervision and support received. According to the MPS guidelines on training doctoral students, it is recommended to be a written agreement between the DRs and their supervisors describing both rights and obligations to be observed during the course of the doctorate. Additionally, DRs should have the possibility to discuss their project with a second independent scientist. This often takes the shape of a Thesis Advisory Committee (TAC) which guide the DRs during their studies, offering independent and external advice [6].

### 5.1 General Support

While TAC members, supervision agreements, and written project outlines among others are recommended practices for a successful research project, these types of support are not fully spread across the various

institutes of the MPS. These supports aid the DRs in keeping track of the aims and goals of their project, as well as helping track time.

Most of the DRs have either a TAC or a supervision agreement with their supervisor, 62.8% and 59.7% respectively, but only 41.5% of the DRs fulfill both of these criteria. Furthermore, less than half of the DRs have a written project guideline (47.9%), a PhD guideline (45.1%) or even a training plan (12.9%). More worrying is that 10.6% of the DRs lack any of the supports here described or are unaware of their existence (Figure 5.1).



**Figure 5.1:** Do you have one of the following supports?

The lack of support, or lack of knowledge regarding it, is more prevalent in the CPT

section. 15.6% of the DRs in the CPT section are either not aware of such type of support or do not have any of the supports here listed. This is slightly more than the HS section (11.8%) and highly in contrast with the BM section (4.1%) Supplemental Figure C.1).

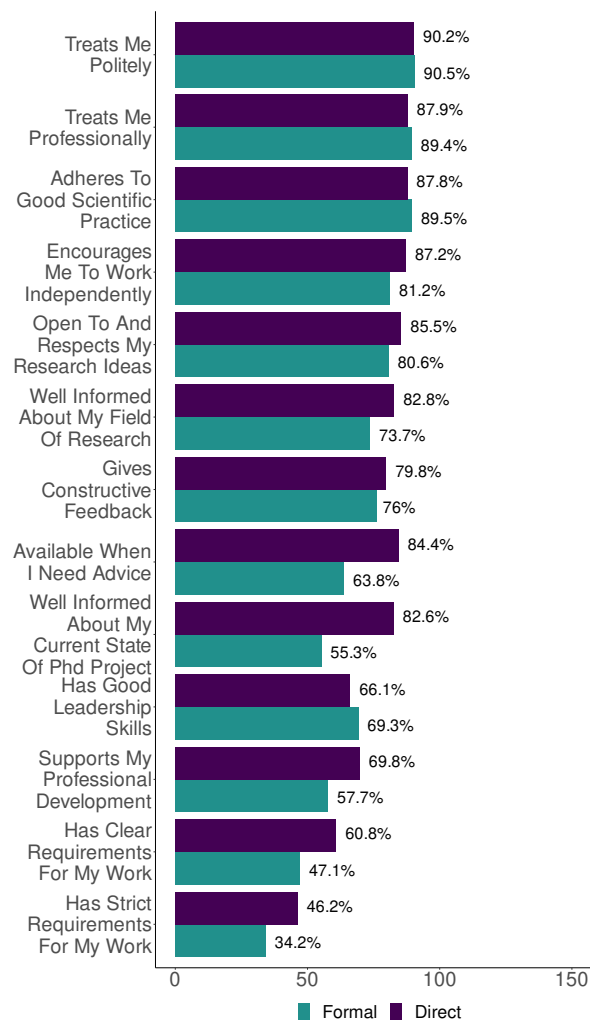
## 5.2 Supervisory relationship

Another essential criteria for a successful doctorate is the supervisor-supervisee relationship. DRs that feel well supported by their supervisors have a higher level of satisfaction [4].

To better characterize the quality of the supervision received we differentiate between a formal supervisor, referring to the main advisor of the thesis as present in the TAC committee, and a direct supervisor, with whom the project is discussed and consulted with on a regular basis.

Approximately half of the DRs (52.8%) have both direct and formal supervisors. When it comes to gender distribution, half of the DRs share the same gender with either their formal, 50.8%, or direct, 52.5%, supervisor, showing negligible gender-preference.

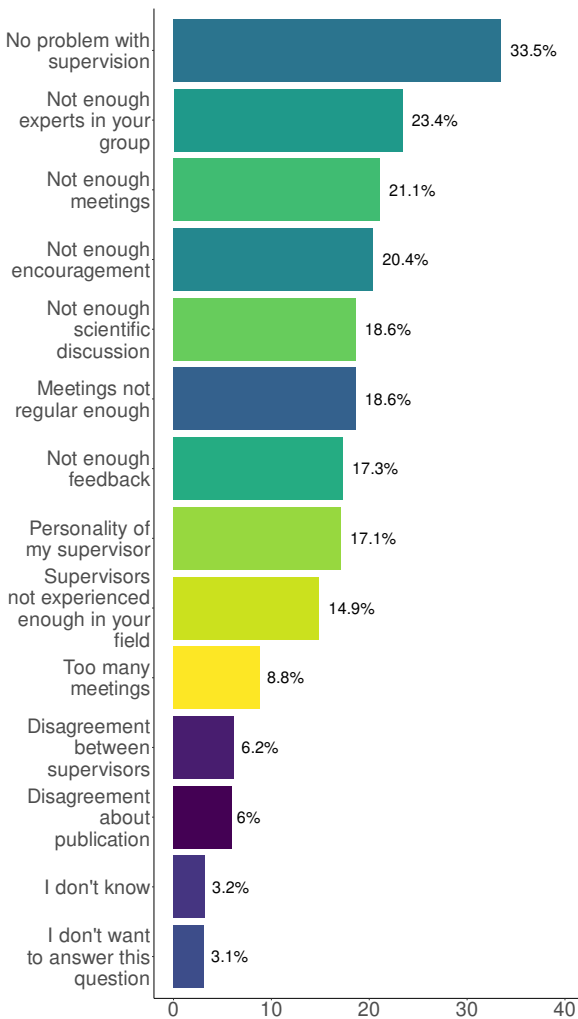
Supervisors, both formal and direct, are considered to treat the DRs politely, adhere to good scientific practices, encourage independent work and are open and respect their research ideas (Supplemental Figure C.2 and C.3). Overall, direct supervisors are more available to give advice when needed (84.4% to 63.8%), and are better informed both about the current state of the PhD project (82.58% to 55.26%) and the field of research (82.8% to 73.7%). In contrast, formal supervisors are considered to have slightly better leadership skills (69.3% to 66.1%) (Figure 5.2).



**Figure 5.2:** Agreement with the following statements for direct and formal supervisors.

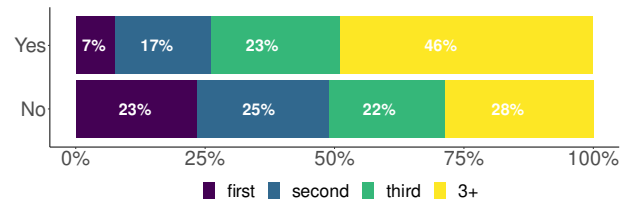
Most of the dissatisfaction with the supervisors is related to a lack of strict and/or clear requirements for the DRs' work, lack of supervisor leadership skills, and lack of professional development support (Supplemental Figures C.2 and C.3). Formal supervisors are reported to have higher leadership skills (69.3% in comparison to 66.1%). In contrast, direct supervisors are reported to be stricter (46.2% in 34.2%) and to have clearer work requirements. As expected, direct supervisors, who are more closely in contact with both the DR and their project, are better informed about the current status of the project (82.6% in comparison to 55.2%) and give better constructive feedback (79.8% in comparison to 76.0%). The most common reported issues are related to lack of ex-

perts in the group (23.4%), lack of meetings (21.1%) and of encouragement by supervisors (20.4%). Overall, only 33.5% of the DRs report they have not encountered any problems with their supervision (Figure 5.3).



**Figure 5.3:** Did you ever encounter problems regarding your supervision?

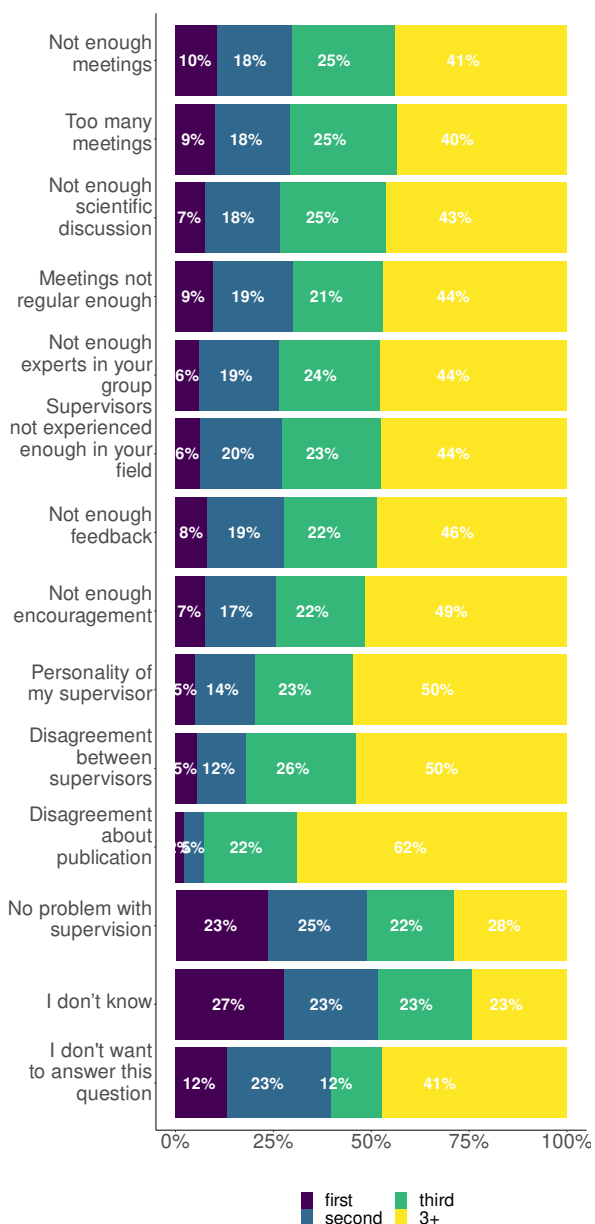
As expected, these issues tend to arise in the later stages of the project. Out of those who have encountered problems with the supervision in the past, the majority is composed of DRs that are on their third year or beyond (25.1% and 48.8% respectively) (Figure 5.5).



**Figure 5.4:** Did you ever encounter problems regarding your supervision? Proportion of answers by PhD year

The proportion of DRs who have had problems increases with every passing year. Older students report a higher number of problems in all categories. From lack of enough experts in the group (29.0%) and lack of meetings (24.2%) to disagreements between supervisors (8.7%) and publications (10.4%). In contrast, first year DRs have the lowest rate of problems, with 53.7% considering they have had no problems with the supervision received so far (Supplemental Figure C.5).

This is noticeable when looking at distribution of the answers related to supervision problems. Although only 10.4% of the older DRs (3+) report past disagreements regarding publications, these comprise 68.8% of all DRs who reported problems with publications disagreements. DRs who are on their third year, or above, comprise the majority of the DRs who report lack of encouragement (51.5%), disagreements between supervisors (53.7%), problems with the supervisor personality (54.5%) and disagreements regarding publications (68.8%) as mentioned above.

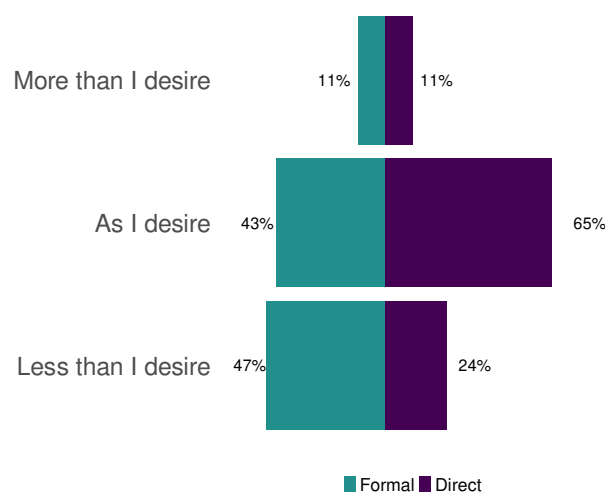


**Figure 5.5:** Proportion of DRs who encountered a problem regarding their supervision according to their PhD year

### 5.3 Meetings and Feedback

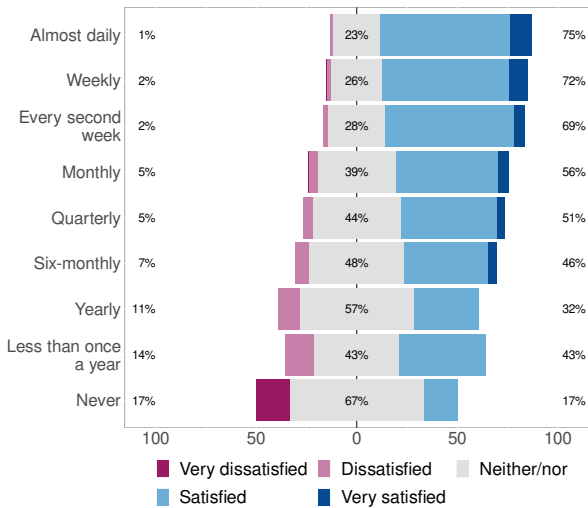
Less than half of the DRs, 42.72%, are happy with the frequency of their supervisor meetings. Meetings with formal supervisors are less frequent, occurring less than once per year, while meetings with direct supervisors occur more frequently in a weekly basis (Supplemental Figure C.4). 65.2% of the DRs are happy with the frequency they meet their direct supervisor, in contrast to the 42.7% that

are satisfied with how often they meet their formal supervisor. In fact, 46.9% of them would rather meet more frequently. The percentage of DRs who think they meet too often is relatively low in both cases (10.4% and 10.4% for formal and direct supervisor respectively)( Figure 5.6). Overall, those who meet with their direct supervisor more often report higher levels of satisfaction (75.1%) than those who do not (Figure 5.7).

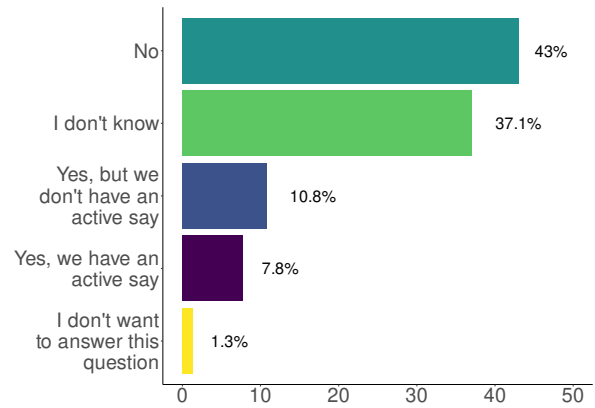


**Figure 5.6:** How often do you meet with your supervisor?

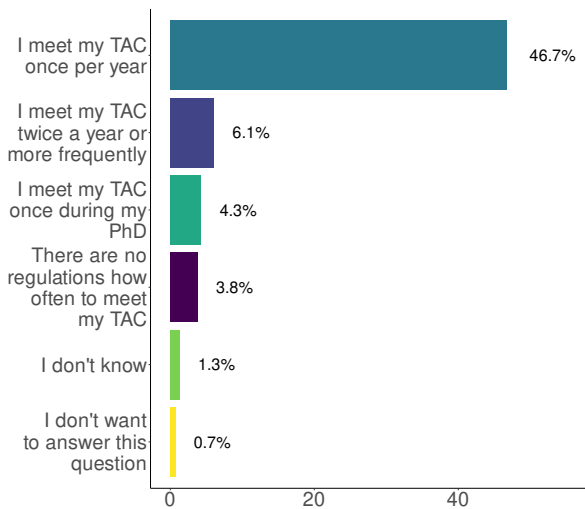
The possibility to discuss the project with other scientists is equally helpful and/or useful. TAC meetings help with both scientific and personal advice, prevent situations of power abuse and monitor the progress of the research project. Of the 62.8% of DRs that have a TAC, only 46.7% meet with them at least once per year, with 6.1% meeting them more often than that, and 4.3% only once during their PhD (Figure 5.8).



**Figure 5.7:** How often do you meet with your direct supervisor and satisfaction levels



**Figure 5.9:** Are doctoral researchers involved in the process of director/professor/group leader hiring at your institution?



**Figure 5.8:** How often do you meet with your TAC members?

## 5.4 Hiring Opinion

When it comes to new hirings at their institute only 7.8% of the DRs are involved in the process with an active say. When looking at the percentage of DRs who are actively involved in the hiring process according to their section, then HS has the highest active say (at 8.8%), followed by BM section (8.5%) and finally the CPT section (6.9%)(Supplemental Figure C.6).

## Chapter 6

# Satisfaction

### Key Points:

- The majority of DRs are satisfied with access to laboratory and office equipment, technical support, as well as vacation days.
- More than 1 in 4 DRs are dissatisfied with psychological support in their current positions.
- Approximately 1 in 3 DRs have considered occasionally (22.3%) if not often (11.6%) quitting their doctorate tracks. The most common reason for wanting to quit (22%) was due to feeling unqualified.
- Approximately 1 in 3 DRs expressed a strong desire for a higher salary as well as further career development opportunities.

### 6.1 High satisfaction leads to high productivity

A key indicator of a successful work environment is the satisfaction of its workers. Maintaining high satisfaction is not only an ethical obligation, but has been shown to correlate to higher work productivity and workplace camaraderie, from which innovative ideas can emerge [13] [3]. Doctoral research settings, however, have historically fostered highly stressful environments due to high work loads, relatively low salaries, time pressures and resulting poor work-life balance. Consequently this causes doctoral re-

searchers (DRs) to undergo high rates of poor mental health. In 2017, DRs in Belgium were reported to have higher rates of mental health problems than any other highly educated general population [7] , and in 2018, graduate students at Harvard were three times more likely than the average American to experience poor mental health [11]. Within the Max Planck Society (MPS), gathering information on overall satisfaction of DRs helps to investigate issues within the institute culture (as past surveys have succeeded in discovering [12]) as well as other areas that could be improved for insuring a thriving workplace.

We assessed satisfaction of DRs by assessing the following:

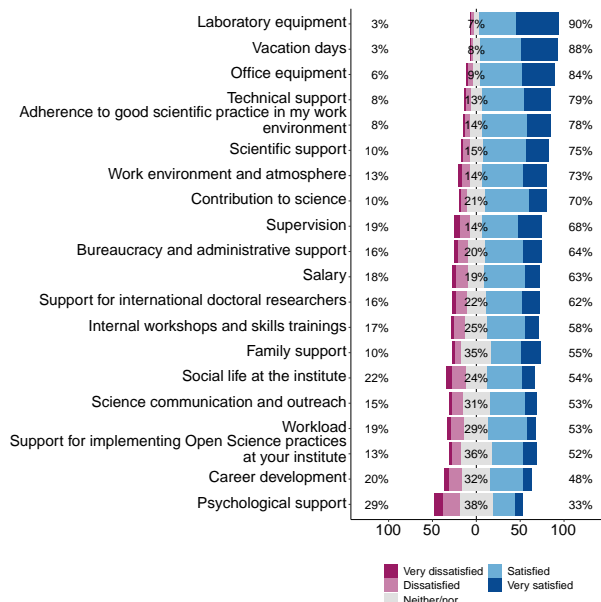
- Areas of general satisfaction within the workplace
- Suggestions for improvements within the workplace
- Reasons for considering discontinuing a PhD
- Awareness of EMAP

### 6.2 General Areas of Satisfaction with PhD

General satisfaction of various aspects were evaluated, spanning research accessibility, working environment, and time off. Satisfaction range spanned from "very satisfied", "satisfied", "Neither/nor", "dissatisfied" to "very dissatisfied". Generally, satisfaction far outweighed dissatisfaction in all areas,



listed in Figure 6.1, with the sole exception of mental health support, which returned comparable numbers of satisfied and dissatisfied individuals (21–26%). This latter result could indicate a need to bolster mental health resources for DRs.



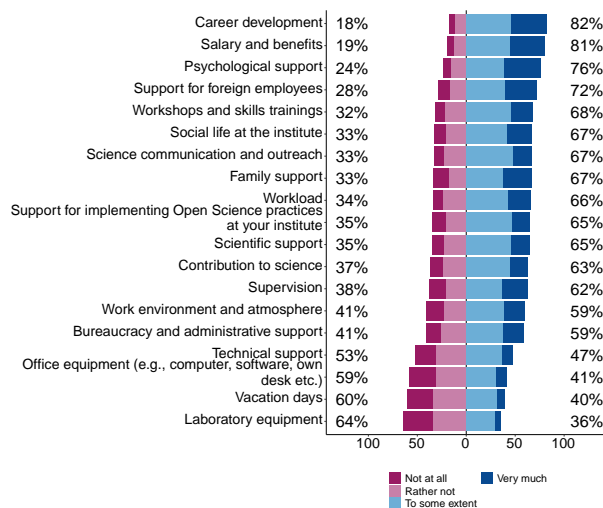
**Figure 6.1:** How satisfied are you in the following aspects?

Notably, in Figure 6.1 we see that DRs are most satisfied with laboratory equipment (with an overwhelming 90% of participants reporting satisfaction) and as well as the number of available vacation days (88%). Close behind, office equipment, technical and scientific support, as well as adherence to good scientific practices in the work environment were rated highest in satisfaction. The majority of these categories seem to indicate the positive impacts that come with a comfortable financial situation for research groups.

### 6.3 General Areas needing Improvement

In this section, we were specifically interested in hearing from DRs about what areas of their work could use improvement to increase their satisfaction. Instead of using lowest

rated responses to the prompt "If you think about your own situation as a doctoral researcher, how satisfied are you with the following aspects?", we directly inquired about what areas of work could be improved, which resulted in fairly different responses.

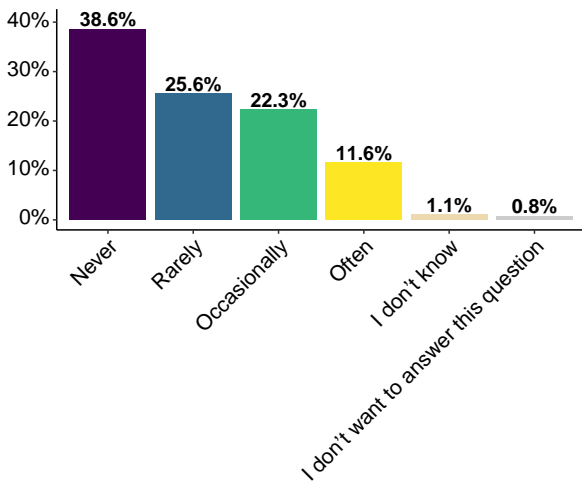


**Figure 6.2:** Which of the following aspects of your workplace would you like to see improved?

Figure 6.2 displays aspects of work that participants marked as needing improvement on a 5-point-scale spanning "very much" to "not at all". As predicted by Figure 6.1, one of the top three areas needing improvement was psychological support, with 3 out of 4 (76%) students wishing to see them improved very much to some extent. Above the need for psychological support ranked career development, well as salary and benefits, each gathering concern from about 81–82% of participants.

### 6.4 Considering Quitting the PhD Track

There are a variety of reasons why a DRs may quit in their tracks. Here we asked survey participants about their thoughts on quitting, and what were the largest factors discouraging them from their current trajectory.



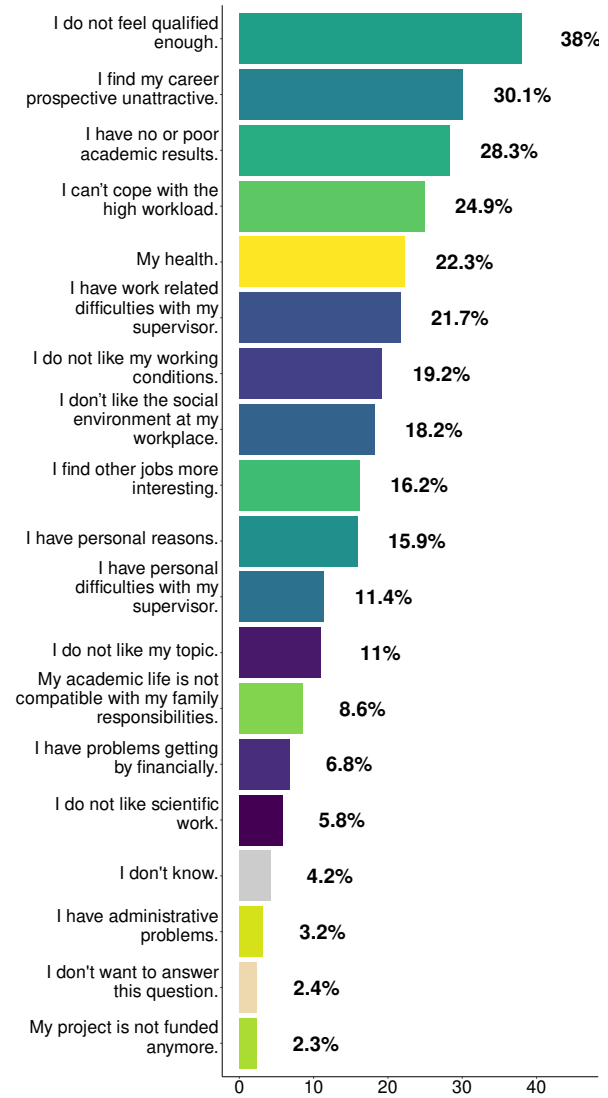
**Figure 6.3:** Have you considering quitting from your PhD track?

As shown in Figure 6.3, approximately 60% of current DRs in the MPS have at one point considered quitting their PhD track, with 22.3% occasionally considering and 11.6% frequently considering.

Out of those that often to rarely considered quitting, Figure 6.4 indicates that the largest percentage of participants (38%) felt that they were not qualified enough for their field. Nearly equal amounts of participants of participants found their career prospects unattractive, or had poor or no academic results(30.1% and 28.3%, respectively). The next most common reason the difficulty coping with workload (25%), followed by health a consideration for quitting their PhD track (22.3%). The least common reasons for considering quitting was the lack of project funding, administration, and the lack of interest in sciences (each of which collected less than 2% of total responses).

### 6.5 The Employee and Manager Assistance Program (EMAP)

As of 2019, MPS offers all employees the Employee and Manager Assistance Program (EMAP). EMAP is an immediate, free of charge, and anonymous external counseling services via the Fürstenberg Institute

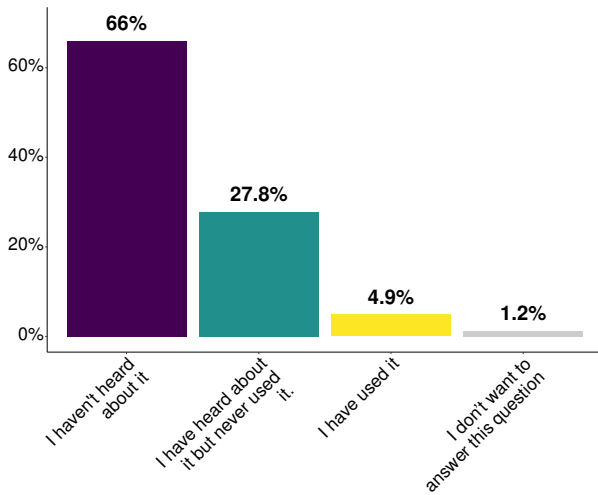


**Figure 6.4:** Reasons for considering quitting a PhD

for employees and stipend holders, which is designed to provide support to those that feel that personal and/or professional issues are negatively affecting their well-being and mental health in their workplace. These counseling services can be invaluable for helping manage the stress of DRs navigating a difficult graduate experience.

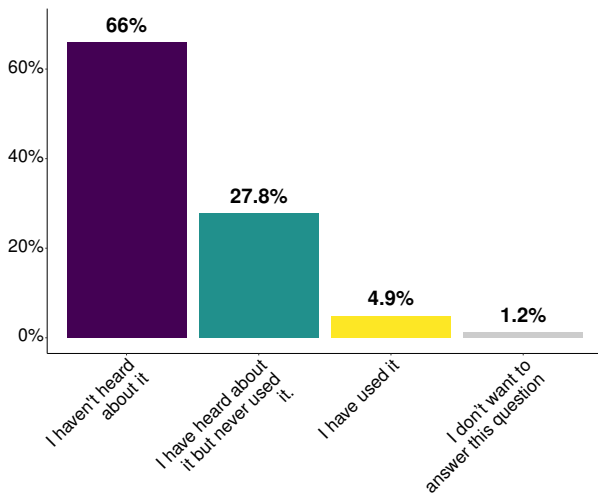
According to Figure 6.5, approximately 66% of DRs have not heard that EMAP exists as a resource for them. curiously, the same number of people report psychological support as lacking within MPS. Out of the participants, less than 5% of DRs report having used EMAP before.

Among those that have used EMAP, ap-



**Figure 6.5:** Awareness of access to EMAP

proximately 50% report having a satisfying or very satisfying experience, 23% had a neutral experience, while another 26% reported having a negative experience (Figure 6.6). With a higher number of DRs accessing EMAP, more feedback would be generated that could help service providers better meet the needs of MPS DRs.



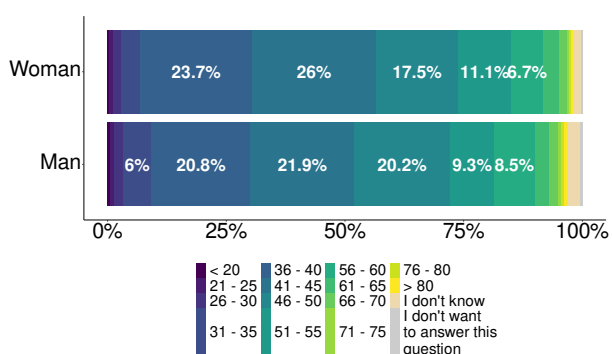
**Figure 6.6:** Experience using EMAP

# Bibliography

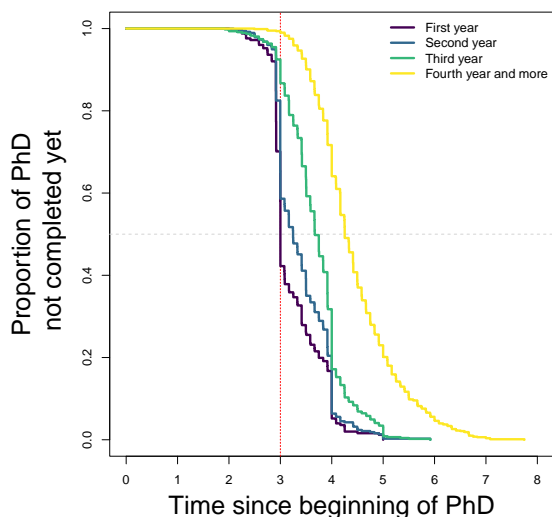
- [1] Minimum Wages. *Statistisches Bundesamt (Destatis)*, 2022.
- [2] J. Creaton. Addressing the mental health crisis. *Nature Reviews Cancer*, 2021.
- [3] George Halkos, Dimitrios Bousinakis. The effect of stress and satisfaction on productivity. *International Journal of Productivity and Performance Management*, 59(5):415–431, 2010.
- [4] M. R. F. P. Gerard Dericks, Edmund Thompson. Determinants of phd student satisfaction: the roles of supervisor, department, and peer qualities. *Assessment & Evaluation in Higher Education*, 44(7):1053–1068, 2019.
- [5] L. Y. M.–G. K. E. Z. R. M.–P. M. H. C. W. Helena L. Swanson, Catherine Pierre-Louis. Graduate student workload: Pandemic challenges and recommendations for accommodations. *Journal of Community Psychology*, 50:2225–2242, 2021.
- [6] R. Jahn. Guidelines on the Training of Doctoral Students at the Max Planck Society. <https://www.mpg.de/16990441/mpg-phd-guidelines-2021.pdf>, (access 07/2022), 2014.
- [7] Katia Levecque, Frederik Anseel, Alain De Beuckelaer, Johan Van der Heyden, Lydia Gisle. Work organization and mental health problems in PhD students. *Research Policy*, 46:868–879, 2017.
- [8] R. Larson, N. Ghaffarzadegan, and Y. Xue. Too many phd graduates or too few academic job openings: The basic reproductive number  $r_0$  in academia. *Syst. Res*, 31:745–750, 2015.
- [9] Marion Collewet, Jan Sauermann. Working hours and productivity. *Labour Economics*, 47:97–106, 2017.
- [10] E. Pain. Max Planck Society unveils €50 million support plan for young scientists. *Science*, 2015.
- [11] Paul Barreira, Matthew Basilio, Valentin Bolotnyy. Graduate Student Mental Health: Lessons from American Economics Departments. *American Economic Association*, Forthcoming article.
- [12] A. C. H. L. D. S. A. F. N. D. Paul-Georg Majeve, Renee Marie Vieira. PhDnet report 2022. [https://www.phdnet.mpg.de/180599/1\\_PhDnet\\_Survey\\_Report\\_2020.pdf](https://www.phdnet.mpg.de/180599/1_PhDnet_Survey_Report_2020.pdf), page 11.
- [13] Ruby Sangar, Santosh Rangnekar. Psychological empowerment and role satisfaction as determinants of creativity. *Asia-Pacific Journal of Management Research and Innovation*, 10(2):119–127, 2014.
- [14] S. Wanger. What makes employees satisfied with their working time? the role of working hours, time-sovereignty and working conditions for working time and job satisfaction. *IAB-Discussion Paper*, 2017.
- [15] C. Woolston. Researchers’ career insecurity needs attention and reform now, says international coalition. *Nature News*.

## Appendix A

# Supplementary Figures: Working Conditions



**Figure A.1:** Hours worked per week by gender.



**Figure A.2:** Estimated time to completion of the PhD project by year of PhD.

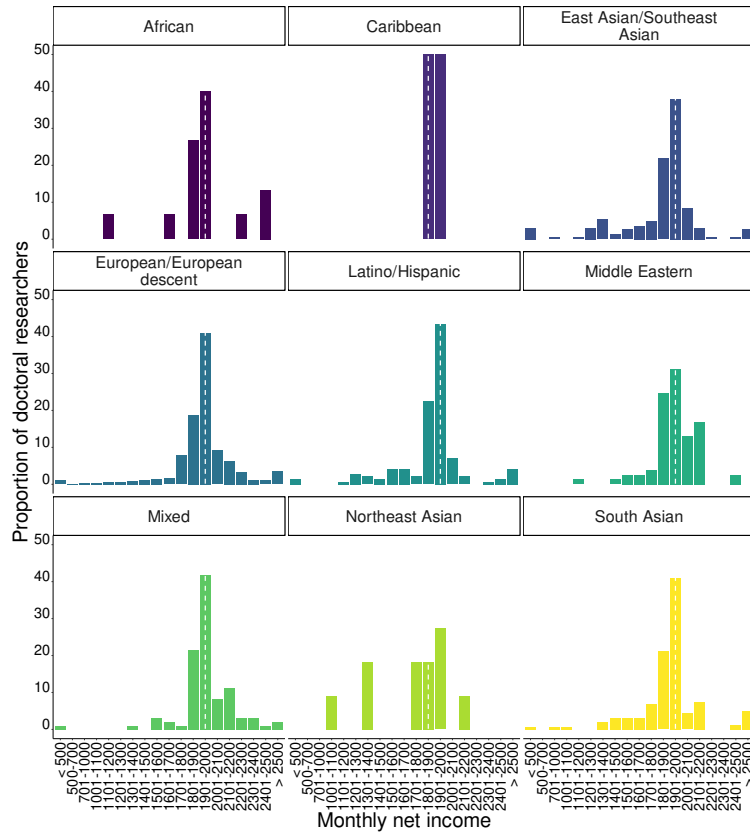


Figure A.3: Salary by ethnicity of DR.

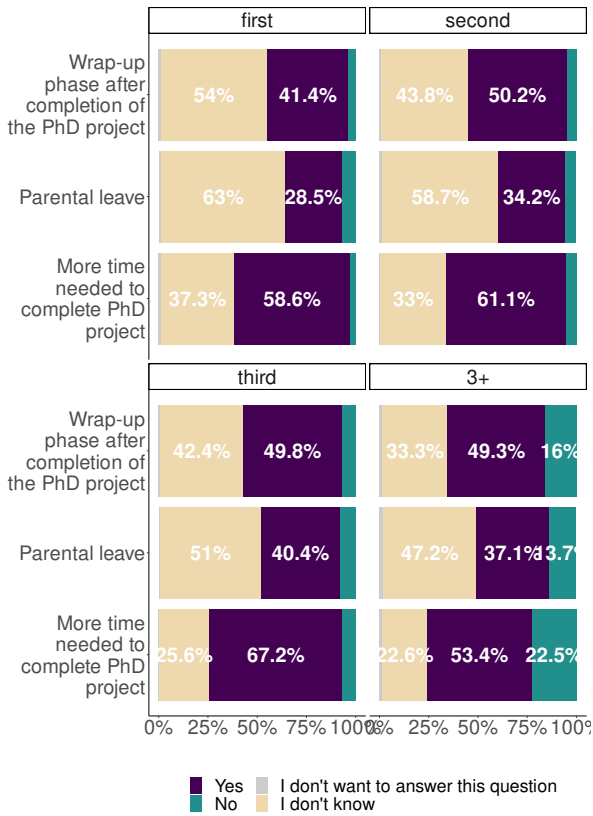


Figure A.4: Possibility of extensions by year of employment.

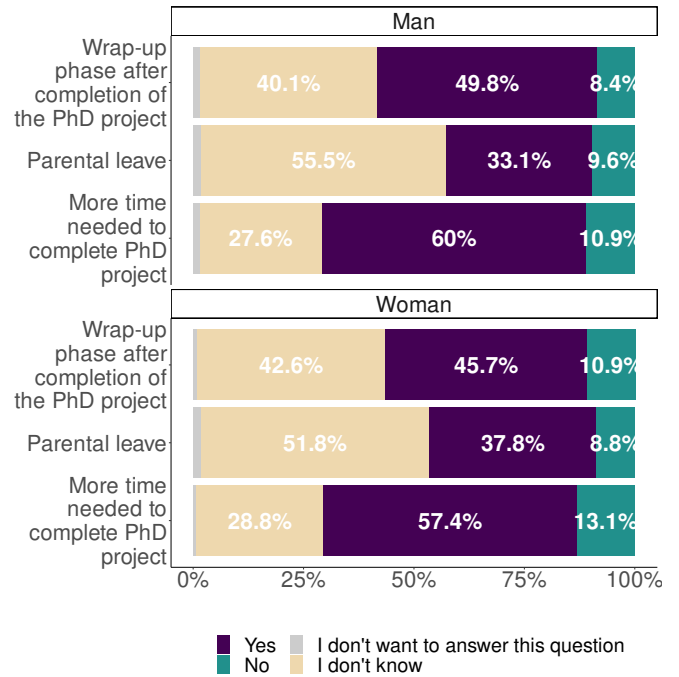
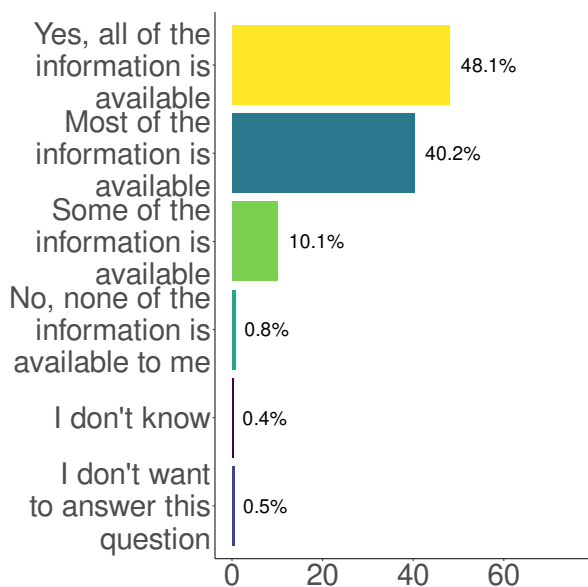


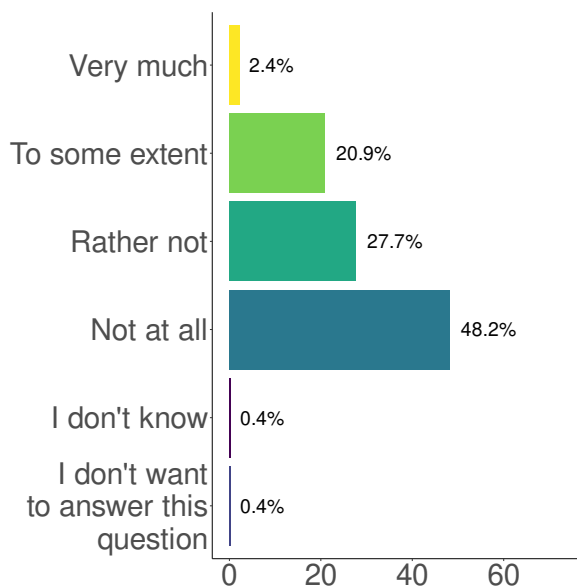
Figure A.5: Possibility of extensions by gender (gender diverse and no answers are excluded).

## Appendix B

# Supplementary Figures: Career Development



**Figure B.1:** Is all the important information (group internal, administrative, your contract/stipend) available in a language you understand?

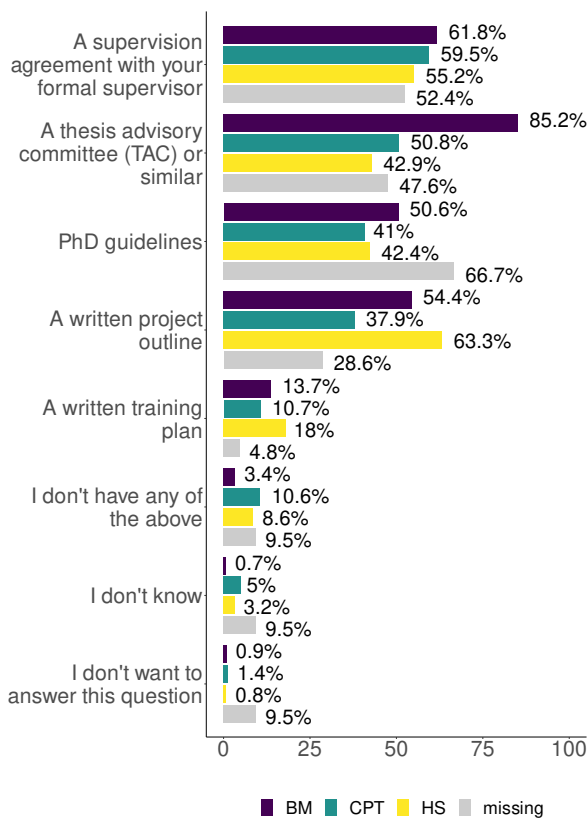


**Figure B.2:** Is language an obstacle for communication with people at your institute/center/unit?

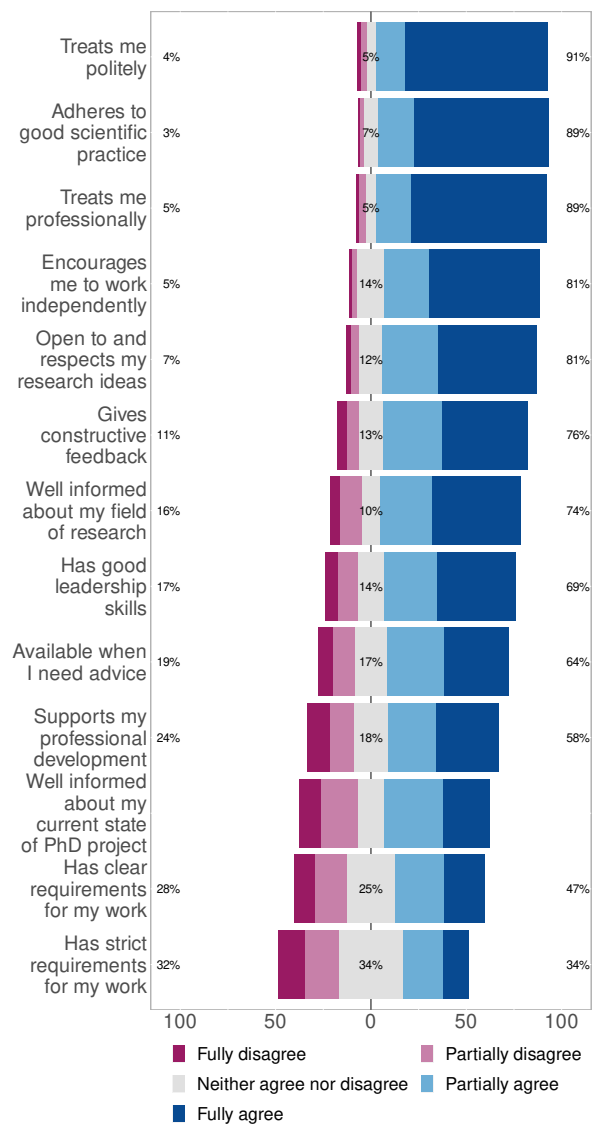


## Appendix C

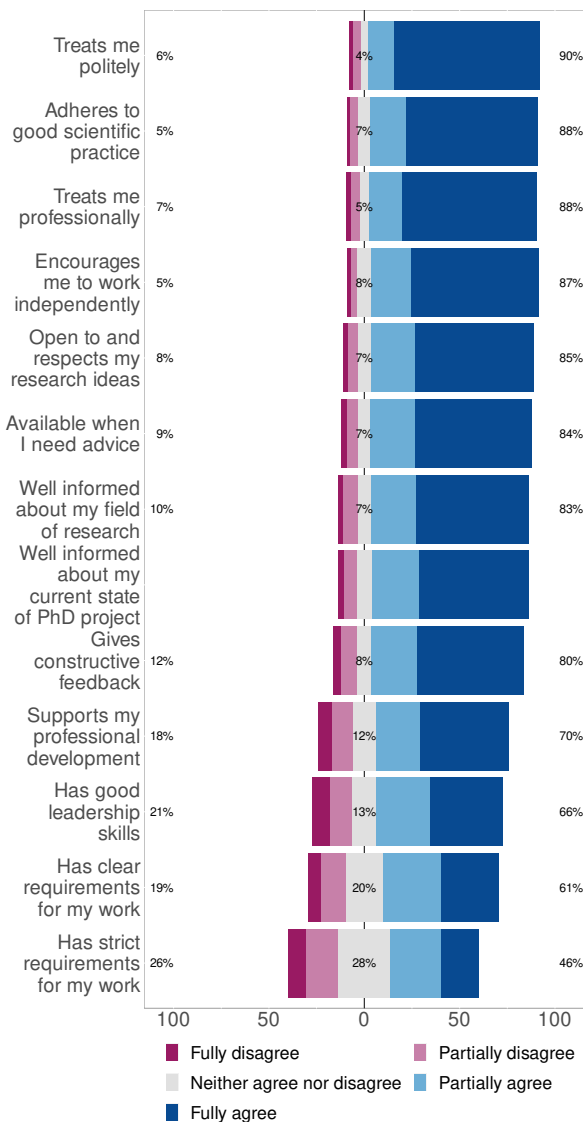
# Supplementary Figures Supervision & Support



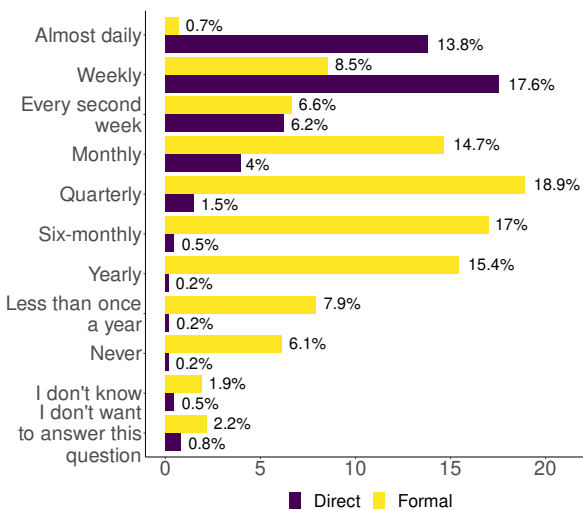
**Figure C.1:** Do you have any of the following supports?  
Answers by section



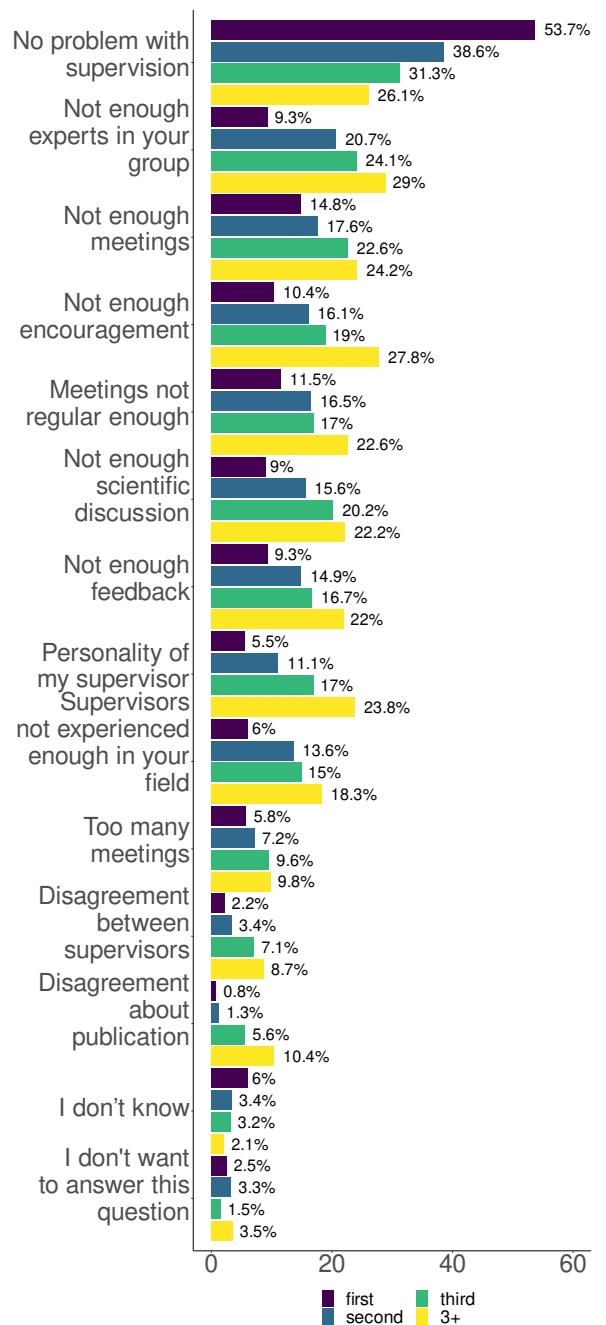
**Figure C.2:** Rate the supervision provided by your formal supervisor



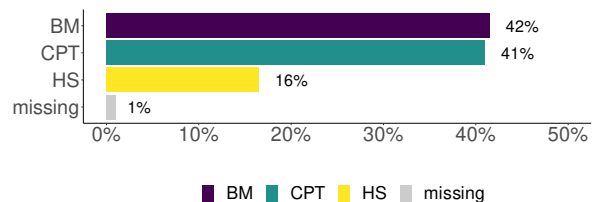
**Figure C.3:** Rate the supervision provided by your direct supervisor



**Figure C.4:** How often do you meet or would like to meet with your formal supervisor?



**Figure C.5:** Did you ever encounter problems regarding your supervision, according to the PhD year



**Figure C.6:** Do you have an active say in the process of hiring directors/professors/group leaders at your institution?

## Appendix D

# Methods

### D.1 General Analysis

This year survey was implemented and run in collaboration with the N2 network. The data analysed in this report regards DRs of the MPS only. The clean-up of the raw data was performed within the framework of the N2 analysis. Therefore, we do not present here the details of the clean-up and we refer to the N2 survey report instead.

### D.2 Variable re-categorization

Throughout the analysis, we have analysed the correlation between two or more key variables. For example, we categorized DRs according to their field of work and employment situation. In order to do so effectively, we had to re-categorize a few variables into bigger categories, in order to avoid categories with too few DRs.

1. Question A3 ("Which field (subject) are you working in?"): the answers "Agriculture, Forestry" and "Geosciences" were grouped in the category "Agriculture, Forestry and Geosciences", the answers "Health sciences" and "Medicine/Veterinary medicine" were grouped in the category "Health and Medicine".
2. Question A6 ("To which gender do you identify most?"): the answers "Gender diverse (Gender-fluid)", "Non-binary" and "Other gender representations" were grouped in the category "Gender diverse".
3. The year of PhD project was calculated as the difference in days between the date of the survey (19.10.2021) and the starting date of the PhD project: the first of the month indicated by questions A8a ("In which month did you start your PhD?") and A8b ("In which year did you start your PhD?"). This difference was then divided by 365.25 to obtain the current year of PhD project. We additionally categorize it into four categories:
  - first year if the year of PhD project was smaller or equal than 1;
  - second year if the year of PhD project was greater than 1 and smaller or equal than 2;
  - third year if the year of PhD project was greater than 2 and smaller or equal than 3;
  - fourth year or more if the year of PhD project was greater than 3.
4. The expected date of submission of the PhD thesis was calculated taking the first of the month indicated in question A9a ("In which month do you expect to submit your PhD Thesis?") of the year indicated in question A9b ("In which year do you expect to submit your PhD Thesis?").
5. Ethnicity was identified by question A10 ("To get a better picture on the diversity of your organization - I identify my

ethnicity as:") as "missing" if no answer was selected, and "mixed" if 2 or more answers were selected.

### D.3 Demographics

The percentages described in this section were obtained by calculating the number of answer for each category by the totality of participants (2555). Underrepresented categories, with a percentage of 2% or less, are not described in the plots for ease of visualization.

### D.4 Working Conditions

In this section we will briefly discuss the methods used to obtain the results presented in Chapter 3: Working Conditions. Most of the plots presented in the main report and in the corresponding appendix, are obtained from cross-tabulating the variables of interests and plotting the corresponding percentages.

Due to the fact that only 1.1% of all DRs identifies as gender-diverse, we have decided to exclude this category from all analyses which correlate gender identity with other variables.

For some specific analyses (but not all), we have excluded the categories "I don't want to answer this question" and "I don't know".

Finally, to obtain Figure 3.21 we have first obtained the average number of hours worked in a week by taking the mid-point of each answer-category from question C4 ("On average, how many hours do you typically work per week in total?"). We excluded the answers "I don't know" and "I don't want to answer this question", as they are not informative. For categories "< 20" and "> 80", we fixed 20 and 80 hours respectively. Then we considered answers to question B11 ("How many hours per week are you expected to work according to your contract?"), excluding the categories "I don't know" and "I

don't want to answer this question". Finally, for each DRs who answered both questions, we calculated the difference between the average number of hours worked in a week and the number of hours required by the contract/stipend. We plotted the result of this calculation as an histogram; a positive number indicates that the DRs works more hours than required, while a negative number indicates that the DRs works less hours than required.

### D.5 Career Development

The majority of the figures in this chapter, with the exception of 4.4, 4.5, and 4.8, are Likert Plots. Due to their representation of diverging answers, they follow an equally diverging color scheme that differs from the rest of the report. The answers range from red (negative answers) to blue (for positive answers).

For this section only valid (non-missing) answers were considered. For the likert plots answers of "I don't know" or "I don't want to answer" where not taken into account since they cannot be quantified into positive or negative. Percentages add up to 100% for each statement taken into account.

For the last figure "percentage of DRs that would have needed more support in different aspects from institutes/center/unit" the categories "Citizen within the European Union (EU)" and "Citizen outside the European Union (EU)" were merged into the category "Non-German".

### D.6 Supervision and Support

For this section only valid (non-missing) answers were considered. For the likert plots answers of "I don't know" or "I don't want to answer" where not taken into account since they cannot be quantified into positive or negative. Percentages add up to 100% for each statement taken into account.

To compare the frequency of meetings with the wished one we calculated the number of answers whose frequency of meeting was either smaller, larger or equal to that of the desired one for each of the respective supervisors.

## D.7 Satisfaction

The first two results presented in Chapter 6: Satisfaction, are Likert plots of questions C1 ("If you think about your own situation as a doctoral researcher, how satisfied are you with the following aspects?") and C11 ("Which of the following aspects of your work as a doctoral researcher would you like to be improved?") respectively. Answers range from "Very dissatisfied" to "Very satisfied", or from "Not at all" to "Very much". To highlight the diverging nature of the data, we have chosen to deviate from the color scheme used throughout the report, and to opt instead for a diverging color scale which ranges from magenta (for negative-type answers) to blue (for positive-type answers).

## Appendix E

# Acknowledgements

We especially thank Lea Heckmann, Hang Liu, Anna Kilanowski, Marco Giercke, Lisa Ziernwald, and many other colleagues coordinating, setting up the questions for the N<sup>2</sup> harmonized survey 2021. We would like to express our gratitude to the German Centre for Higher Education Research and Science Studies (DZHW) on their generous support and suggestions.

We greatly appreciate the constructive feedback from Ilka Schiessler, Sabine Ziegler, Fabian Ochsenfeld, Verena Mauch, and Stefanie Unger.

We would like to give a big thanks to Ingemar Schmidt Anderson (doctoral researcher at the MPI for Intelligent Systems in Stuttgart) for illustrating a glorious cover art for this year's report. You're a wizard, Ingemar!

Finally, thank you to all who participated in the survey, shared your comments and experiences with us and the Max Planck Society for financial support of the PhDnet.

## Appendix F

# About the authors <sup>1</sup>

### Angela Carollo



I am a doctoral researcher in Statistics at the Max Planck Institute for Demographic Research in Rostock and at the University of Leiden Medical Center (in the Netherlands). My PhD project aims at building a framework of analysis for time-to-event data recorded over multiple time scales.

In last year's survey, I introduced methods of time-to-event data analysis to study how long DRs work on their PhD project at the MPS. This year, we again used this approach to highlight that the majority of DRs at the MPS could benefit from longer contracts. Additionally, I have contributed to the analysis of the survey specifically for the Working Conditions and Satisfaction sections.

Besides being a Statistician, I am a mother of a very active toddler. In the little free time that I have left after caring for him, I like to knit, to binge a tv series, to cook or to think about food.

### Beatriz Mourato



I am a doctoral researcher at the Max Planck Institute for Evolutionary Biology in Plön. As a bioinformatician I am searching for a method to identify functionally important regions in a genome. As an internal PhD representative I joined the Survey Group because I was curious on the working conditions for DRs on other research institutes. Apart from exploring data patterns and making colorful plots I like to travel to new places, read books and to collect different varieties of tea.

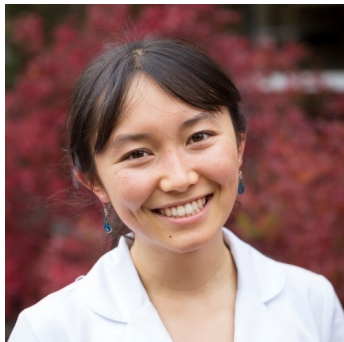
I have worked on the Supervision and support chapter this year and hope to shine a bit of light on the supervisor-student relationship at the MPS.

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<sup>1</sup>All the authors have contributed equally to this report.



### Ellen Rumley



I'm a visiting doctoral researcher from University of Colorado Boulder (USA) in the Robotic Materials department at MPI for Intelligent Systems. My work consists of studying and producing oil-filled plastic pouches that make great stress balls and double as artificial muscles for soft robots! In particular, I study how material properties and environmental factors influence their usefulness as muscles. Besides researching, I enjoy playing Irish music, climbing, and ranting at friends about my latest reads.

I joined the PhDnet survey group after hearing frustrations from institute peers regarding work conditions, and feeling like I would like to contribute towards amplifying such voices. I was involved in drafting the Working conditions and Satisfaction chapters of this report. I hope that collectively, this survey accurately represents the concerns of the larger doctorate body, and that it serves as a tool for those that need evidence of the current status quo for many doctorate experiences throughout the MPS.

### Adriana Vucetic



I am a doctoral researcher at the Max Planck Institute for Heart and Lung Research in Bad Nauheim. I am a molecular biologist and my PhD work aims to understand the role of blood cells in tumor development and metastasis.

Although I enjoy science and research, I also felt strong passion to voice the opinions of my peers. Therefore, I was a member of internal PhD Committee and External PhD representative. Last year I decided to join PhDnet survey group with objective to contribute to the improvements of PhD life of all DRs at the MPS. In this year survey report, I have been interested and contributed to chapters Introduction, Demographics, Career development and Integration. Further I am a part of the team working on questions for the next year survey.

Apart from my activities as DRs and survey group member, in my free time, I like to do sports, play board games, read books, watch series, travel and camp.



**GREAT JOB PUTTING IT TOGETHER! WELL POSED QUESTIONS.**

**THANKS A LOT FOR ALL THE EFFORT!**

**THANK YOU FOR THESE SURVEYS. I HOPE THEY CAN BE USED TO IMPROVE THE MAX PLANCK PHD EXPERIENCE.**

**I'M GLAD SOMEONE IS ASKING US THESE QUESTIONS AND WILL FOLLOW UP ON THEM.**

**THANK YOU FOR ORGANIZING THIS REPORT. I THINK THIS IS A NICE WAY TO BE AWARE OF STRUCTURAL PROBLEMS AND WORK ON THEM.**

**THANK YOU VERY MUCH FOR CARRYING OUT THIS SURVEY YEAR AFTER YEAR! IT HAS BEEN THE BASIS OF SO MANY POSITIVE DEVELOPMENTS, BOTH AT THE LOCAL- INSTITUTE AND AT THE HIGHER LEVEL.**

