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# Social inequalities in postdoctoral dropout from academia by gender, parental academic background, and migration background, and their intersections****

**Abstract:** Academic careers should be independent of social characteristics. However, empirical evidence on social inequalities in German academia is ambiguous, and research explicitly on intersectional inequalities in academic careers is scarce. To provide new insights into the empirically contested question of whether there are inequalities in academic careers, we examine whether postdoctoral dropout from academia is associated with any of gender, social origin, migration background, or the intersections of these social categories. Building on the intersectionality approach complemented by theories on minority and majority effects in the workplace, we assume that several minority groups have a higher risk of dropout from academia. We use panel data that are representative of the 2014 doctoral graduation cohort in Germany and their career trajectories up to five years after graduation and apply event history techniques. We find that many graduates drop out from academia in the initial years following graduation, but we find—against our hypotheses—no inequalities in dropout by any of the social categories under study.

**Keywords:** intersectionality; social inequalities; dropout; academia; doctoral graduates; Germany

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**Zusammenfassung:** Akademische Laufbahnen sollten unabhängig von sozialen Merkmalen sein, allerdings sind die empirischen Befunde zu sozialen Ungleichheiten in der Wissenschaft in Deutschland nicht eindeutig und es gibt bisher wenig Forschung explizit zu intersektionalen Ungleichheiten. Um neue Einblicke in die empirisch umstrittene Frage zu gewinnen, ob es Ungleichheiten in akademischen Laufbahnen gibt, untersucht dieser Beitrag, ob der Dropout aus der Wissenschaft nach Promotionsabschluss mit dem Geschlecht, der sozialen Herkunft, Migrationserfahrung oder ihren Intersektionen zusammenhängt. Auf dem Intersektionalitätsansatz aufbauend, ergänzt durch Theorien zu Minder- und Mehrheitseffekten am Arbeitsplatz, nehmen wir an, dass mehrere Minderheitsgruppen ein höheres Risiko haben, aus der Wissenschaft auszuscheiden. Wir nutzen Längsschnittdaten, die repräsentativ für die 2014er Promotionsabschlusskohorte in Deutschland und ihre Erwerbsverläufe bis fünf Jahre nach dem Abschluss sind und wenden ereignisdatenanalytische Verfahren an. Es zeigt sich, dass viele Promovierte in den ersten Jahren nach ihrem Abschluss aus der Wissenschaft ausscheiden, aber – entgegen den aufgestellten Hypothesen – entlang keiner der untersuchten sozialen Merkmale Ungleichheiten beim Dropout aus der Wissenschaft bestehen.

**Stichwörter:** Intersektionalität, soziale Ungleichheiten, Dropout, Wissenschaft, Promovierte, Deutschland

## 1 Introduction

Academic careers and career advancement should be based solely on scientific achievements in the production of knowledge and should be independent of researchers' social characteristics. This orientation towards meritocratic principles has already been described by Merton (1973) as a central imperative of scientific research and is incorporated in his concept of the ethos of science.

However, for German academia, there is some empirical evidence of inequality. On the one hand, a large body of research has shown that there are social inequalities by gender and parental academic background—which is one of the main dimensions of an individual's social origin—in the participation *in* and the completion *of* higher education (e.g., Becker 2009; Jaksztat 2014; Jaksztat et al. 2021; Lörz 2019; Lörz/Mühleck 2019; Lörz/Schindler 2016; Müller/Pollak 2016; Müller et al. 2011; Vogel 2017; Watermann et al. 2014); some studies also found inequalities by migration background (Lörz 2019, 2020). Yet individuals who have earned an advanced higher education degree seem to be such a preselected group (Mare 1980) that these inequalities no longer persist (Bornmann/Enders 2004; König et al. 2021; Lörz/Mühleck 2019; Lörz/Schindler 2016; Zimmer 2021). More precisely, from completion of the doctorate onward, academic careers seem to follow meritocratic principles.

On the other hand, some studies nevertheless find indications of social inequalities in academic careers in Germany by at least one of the above-mentioned social categories (Buche/Gottburgsen 2012; Flöther 2017; Goldan et al. 2023; Jungbauer-Gans/Gross 2013), while a few studies even detect intersectional inequalities (Löther 2012; Möller 2017; Shinozaki 2017). However, research explicitly on intersectional inequalities in academic careers is scarce. The term 'intersectional inequalities' stems from the intersectionality approach, which assumes that an individual's different social categories may be intertwined and cause specific and additional inequalities in certain contexts.

In this paper, we study inequalities in academic careers in terms of postdoctoral dropout from academia. Doctoral graduates fulfill the general requirements for an academic career but have not yet put them into practice and therefore could still opt for a career outside academia. The doctoral degree qualifies them for taking further steps toward an academic career, but it is also highly valued in the non-academic labor market so that a substantial number of doctoral graduates in fact leave academia with good career prospects outside academia. Please note that our research interest does not imply any evaluation of whether dropout is positive or negative. Quite the contrary, we do justice to the fact that doctoral graduates' dropout from academia is a structural necessity because the number of doctoral graduates largely exceeds the number of permanent positions inside academia. Yet outside academia doctoral graduates can be professionally as successful as if they had realized the ideal-typical academic career. Therefore, dropout itself is not an issue, but that chances to stay within academia depend on social characteristics, is. We investigate the main and intersectional "effects"[1] of gender, parental academic background, and migration background in dropout from academia. These categories reflect widespread inequality dimensions in both society and academia whose influence on academic careers has already been studied, and they refer to ascriptive social categories and not to those acquired in the life course. Our overall research question is: *are there inequalities by gender, parental academic background, and migration background, and their intersections in postdoctoral dropout from academia?*

Our contribution to the literature is threefold. *First*, we explicitly consider intersectional inequalities in academic careers, something which has hardly been done in previous research (exceptions: Buche/Gottburgsen 2012; Shinozaki 2017) but does justice to potential intersectional entanglements of social categories with specific advantages or disadvantages for an academic career. Thus, taking intersectional inequalities into account is more accurate than confining research to the main effects only. *Second*, we provide new insights into the empirically contested question of whether there are social inequalities in academic careers. Knowledge of such

1 We put the word in inverted commas to emphasize that we cannot guarantee causal relationships. See section 4.3 for a brief discussion on causality in our analyses. For the purpose of better readability, we do not use inverted commas for effects in the remainder of the paper.

inequalities is important to identify measures to redress them, which is required by law and in the interest of science itself, in order not to let the potentials of certain groups go untapped. *Third*, in contrast to previous research, we use a rich panel data set on the employment trajectories of doctoral graduates in Germany up to five years after their graduation, which enables us to use event history techniques on postdoctoral dropout from academia while controlling for discipline and academic performance. By considering both *if* and *when* the graduates experience such a dropout, we are able to account for the dynamics of postdoctoral careers.

## 2 Literature review

### *2.1 Previous research on social inequalities in academic careers*

In the following, we present previous research on inequalities in different aspects related to academic careers by gender, parental academic background, migration background, and their intersections. For better comparability, we confine ourselves to studies from German-speaking countries in the following.

Regarding *inequalities in doctoral students' academic career intentions*, previous research is scarce. The few existing studies find no differences by gender (Briedis et al. 2014; Dubach 2014; Hauss et al. 2015) and parental academic background (Briedis et al. 2014). By contrast, with regard to migration background, Hauss et al. (2015) and Dubach (2014) suggest that doctoral students with a migration background have a higher academic career intention than doctoral students with no migration background. Differences in academic career intentions by intersections of these potential inequality dimensions have not yet been studied.

Regarding *inequalities in postdoctoral chances of realizing an academic career*, previous research has provided some insights for different postdoctoral groups inside academia. Among researchers with a 'habilitation' in economics, business administration, and related fields, Schulze et al. (2008) find no gender differences in the chances of being appointed to a chair. Among researchers with a 'habilitation' in mathematics or law (Jungbauer-Gans/Gross 2013) and among junior professors (Zimmer 2018), the chances of being appointed seem to differ by gender and by parental academic background with women and those from a lower educational background having lower chances of being appointed. By contrast, analyzing procedural data on actual appointment procedures from one German university, Auspurg et al. (2017) find that women and men have the same chances at all stages of the appointment procedure. However, given their academic qualifications, women tend to less often apply for a professorship than might be expected. Other studies even find that women have higher chances of being appointed in sociology (Jungbauer-Gans/Gross 2013; Lutter/Schröder 2016) and in political sciences (Schröder et al. 2021). There is also some evidence that men have slightly better chances of obtaining research funding (Allmendinger/Hinz 2002; Findeisen 2011), but that the frequency of application for research funding does not vary by parental

academic background among doctoral graduates in Switzerland (Leemann et al. 2010).

With regard to migration background, Löther (2012) indicates that scientists with a migration background less often habilitate, less often hold permanent positions, and are less often professors than are scientists without a migration background. However, the findings rely on survey data that was collected in German language only, therefore people without German language skills are underrepresented in the data, which likely affects the generalizability of the findings. Nevertheless, the share of people without a German nationality is, for example, with seven percent indeed quite low among professors in Germany in 2020 (Federal Statistical Office 2021: 18, 24). Further studies suggest that professors with a migration background experience discrimination inside German academia (Neusel et al. 2014; Pichler/Prontera 2012). According to Leemann et al. (2010), educational migrants and locals differ in application frequency for some types of research funding but not for other types.

Intersectional inequalities in postdoctoral chances of realizing an academic career have hardly been studied to date. However, there are some descriptive findings that point in the direction of intersectional inequalities. *First*, gender and social origin seem to be intertwined insofar as female professors come on average from a higher social class than male professors (Möller 2017, 2018). *Second*, social origin and migration background seem to be intertwined insofar as scientists with a migration background more often come from a higher social class than scientists without a migration background, which holds in particular for professors (Löther 2012; Möller 2017, 2018). *Third*, migration background and gender seem to be intertwined insofar as the share of women is higher among scientists with a migration background than among scientists without a migration background (Bakshi-Hamm/Lind 2008; Löther 2012). However, female scientists with a migration background feel less integrated into academia, perceive their academic career prospects to be poorer, more frequently think about dropping out from academia, and less often hold a professorship than do male scientists with a migration background (Löther 2012). In addition, female international professors more often report having experienced discrimination due to their gender than do male international professors (Neusel et al. 2014).

Only two studies explicitly examine academic careers within the framework of intersectionality. The first study is from Shinozaki (2017). Shinozaki describes academic career advancement from doctoral training to professorship by gender, nationality, and their intersections at two German universities based on triangulated data. The author finds that most professors are male and German (68 percent) and least professors are female and non-German (3 percent). However, within their respective nationality group, the share of women is higher among non-German professors (32 percent) than among German professors (25 percent). These findings emphasize the importance of examining social inequalities through an intersectional

lens. The second study is from Buche and Gottburgsen (2012) and is the most extensive study on intersectional inequalities in academic careers so far. Buche and Gottburgsen study the chances of holding a full-time position in the faculty of a German university by gender, parental academic background, the country where the university entrance qualification was gained, and the individuals' or their parents' birth country. They find main effects of all social categories under study with women, individuals from non-academic families, individuals who gained their university entrance qualification in Germany, and individuals who themselves or whose parents were born outside Germany less often holding full-time positions, whereas none of the interactions between the categories is statistically significant. However, their findings are not meant to show intersectional inequalities in dropout from academia as they examine faculty staff within a cross-sectional design.

Regarding *inequalities in doctoral graduates' occupational destinations* more general, female doctoral graduates seem to stay as frequently inside academia as male doctoral graduates (Bornmann/Enders 2004; Briedis et al. 2014; Enders/Bornmann 2001; Franken 2020; König et al. 2021: 64, 72; Leemann et al. 2010; Lörz/Mühleck 2019; Lörz/Schindler 2016) but to be less frequently employed in the private sector (BuWiN 2013: 256; Flöther 2017; Goldan et al. 2023; König et al. 2021: 99; Schubert/Engelage 2011). With respect to parental academic background, there seem to be no differences in postdoctoral occupational destinations (Bornmann/Enders 2004; Briedis et al. 2014; Enders/Bornmann 2001; Franken 2020; König et al. 2021; Leemann et al. 2010; Lörz/Mühleck 2019; Lörz/Schindler 2016). Only few studies consider doctoral graduates' migration background. Among doctoral graduates in Switzerland, Leemann et al. (2010) find that graduates who had migrated to Switzerland for taking up doctoral training are more likely to be employed inside academia than those graduates who had already completed their studies in Switzerland prior to doctoral training. For doctoral graduates in Germany, Flöther (2017) finds no differences in employment sectors between educational migrants and locals one to two years after their graduation. Intersectional inequalities in postdoctoral occupational destinations have not yet been studied.

### *2.2 Research gap and purpose of the paper*

Overall, a large body of research in Germany has investigated social inequalities in academic careers, mostly by one single social category and sometimes only incidentally. However, few studies have examined inequalities by migration background in academic careers due to insufficient data bases, too few cases with a migration background in the data, and challenges in defining a migration background (Bakshi-Hamm et al. 2008; Baur 2016; Buche/Gottburgsen 2012; BuWiN 2013: 352f.; Löther 2012).

Research specifically on intersectional inequalities in academic careers is even more scarce. Shinozaki (2017) has only considered two social categories, conducted descriptive analyses, and used data from only two universities. Buche and Gottburgsen's (2012) study is the most extensive study so far but due to their survey design and research interest, the authors provide insights into other academic employment outcomes than dropout from academia.

Our paper contributes to the literature by studying intersectional inequalities in postdoctoral dropout from academia by means of event history techniques. Using panel data on the career trajectories of a recent doctoral graduation cohort from Germany, we are able to test the main effects of gender, parental academic background, and migration background, and their intersections while controlling for discipline and academic performance. By adopting an intersectional perspective, we are able to accurately depict the complex social situatedness of individuals striving for an academic career. Thereby we provide new insights into the question of whether there are social inequalities in academic careers.

## 3 Theoretical background & hypotheses

We use the intersectionality approach (section 3.1) as theoretical framework and combine it with theories that assume minority and majority effects in the workplace in order to derive hypotheses on social inequalities in dropout from academia (section 3.2).

### *3.1 Intersectionality approach*

The intersectionality approach focuses on the intersections of different axes of inequality and on how these are intertwined and cause specific advantages and disadvantages for the individuals (Collins/Chepp 2013; Crenshaw 1989; Davis 2011; McCall 2005). From an intersectional perspective, single social categories are insufficient to explain inequalities. Instead of assuming that locations in different socially constructed groups are separate axes of inequality with independent effects on the respective group members' life chances, the intersectionality approach assumes that these axes of inequality are social systems of power that are intertwined and therefore simultaneously and mutually constitutively cause inequalities. The intersectionality approach claims that inequalities and discrimination cannot be understood in isolation from one another because they are always multidimensional along different axes of inequality. Intersectionality helps to detect how power works as it assumes that overlapping social categories and identities "are the ossified outcomes of the dynamic intersection of multiple hierarchies, not the dynamic that creates them. They are there, but they are not the reason they are there." (MacKinnon 2013: 1023). However, inequalities only emerge in certain social contexts, and they vary according to these. Not all social categories lead to inequality in every context; the activation of some categories requires a specific context, which in turn

can affect the direction and strength of the influence of a particular social category. Individuals and groups can be privileged in one context and at the same time disadvantaged in another.

The general idea of intersectionality arose from debates within black feminism and gender studies in the 1970s and 1980s, but only in 1989 did the US legal scholar Crenshaw (1989) introduce "intersectionality" as a heuristic term. Crenshaw used the analogy of traffic at an intersection. The directions of that intersection represent axes of inequality, and discrimination or rather "accident[s] […] can be caused by cars traveling from any number of directions and, sometimes, from all of them" (1989: 149). Crenshaw's intersection analogy can be generalized into multidimensional or rather intersectional inequalities being greater than the sum of their underlying single discriminations.

McCall (2005) differentiates inter-, anti- and intra-categorical intersectionality research depending on their use of categories. We follow the inter-categorical approach, which systematically compares inequality between multiple intersectional groups: "Unlike single-group studies, which analyze the intersection of a subset of dimensions of multiple categories, however, multigroup studies analyze the intersection of the full set of dimensions of multiple categories and thus examine both advantage and disadvantage explicitly and simultaneously." (McCall 2005: 1787). The categorial approach is thus more holistic but necessarily also more complex than single-group approaches. While most of the empirical studies within the intersectional framework use qualitative methods, we use quantitative methods (see Gross et al. 2016 for a discussion of the strengths and weaknesses of the different methodological approaches regarding intersectionality).

The intersectionality approach is a rather vague and ambiguous theoretical concept as it does not specify which social categories cause which inequalities in which social context and how they affect these inequalities. However, this vagueness is often acknowledged as its particular strength. The approach is theoretically and empirically so open-ended that it "allows endless constellations of intersecting lines of difference to be explored" (Davis 2011: 51) in various contexts. Because of its openness, the intersectionality approach alone does not allow the deductive derivation of concrete hypotheses regarding what dimensions (and what constellation of them) lead to disadvantages in what social context. Therefore, in the following section, we combine the intersectionality approach with other theories that assume minority and majority effects in the workplace in order to fill this gap and to derive hypotheses on social inequalities in dropout from academia.

### *3.2 Minority & majority groups in the (academic) workplace*

To derive testable hypotheses, we draw on theories that argue based on minority and majority effects in the workplace both from employers' and employees' perspectives and apply them to doctoral graduates inside academia. For the employers'

perspective, we refer to discrimination approaches: tastes for discrimination (Becker 1957) and statistical discrimination (Arrow 1973; Phelps 1972). For the employees' perspective, we refer to Kanter's (1977) tokenism.

Becker (1957) suggests that employers tend to have a "*taste for discrimination*", i.e., they discriminate against particular social groups and are willing to pay a price for cooperating with people who are similar to themselves in terms of social characteristics. Against the background of their taste for discrimination, employers try to maximize their utility, usually in hiring and remuneration decisions. For example, a male employer would act as if associating with women entails non-pecuniary costs. As a result, this employer will hire a woman only for a lower wage than a man with the same qualification, to compensate for the higher non-pecuniary costs of employing the woman.

Following the *theory of statistical discrimination* (Arrow 1973; Phelps 1972), employers also try to maximize their utility and discriminate against minority groups, not because of tastes but because of estimations about the average productivity of the members of social groups. In hiring decisions, employers face incomplete information on the productivity of each applicant, so they use further information such as social characteristics to improve their estimation. If they have a priori beliefs about the available social characteristics (e.g., women taking on average more parental leave than men) an employer may estimate the costs of employing a woman as higher even if the female applicant under consideration never actually takes any parental leave at all. In addition, the productivity estimation for the minority group is by definition based on a smaller sample and therefore has a higher variance and is less reliable. An employer benefits from an exact estimation of the employee's productivity, since over- and underestimation of productivity are associated with higher costs (salary too high or too low and the employee quits). As a result, employers are more likely to hire members of the majority group than those of the minority group even if the average productivity does not vary by social category.

At their core, both rational choice-based discrimination theories are blind for gender or any other social category. However, people who have social attributes similar to the decision-makers or those in power (for taste-based discrimination) and/or are members of the statistical majority (for statistical discrimination) benefit from their attributes at least in this social context.

From an employee's perspective, Kanter's (1977) *theory of tokenism* provides insights into interaction dynamics between minority and majority groups in the workplace. According to Kanter (1977: 965), the "relative numbers of socially and culturally different people in a group" largely affect interaction dynamics within that group. Kanter refers to minorities in largely skewed groups as "tokens". These tokens only differ from the respective majority in terms of ascribed characteristics but not in terms of productivity or ability. The skewed numerical proportions of different

social subgroups within a given group may cause dynamics in everyday interaction in the workplace that have many negative effects on the tokens. One such interaction dynamic is that tokens are particularly visible, which places them under high performance pressure while at the same time evoking efforts to limit both their visibility and their achievements. The presence of tokens also causes majority members to exaggerate their intragroup commonalities and the tokens' otherness, which reinforces the polarization and the isolation of tokens. Another interaction dynamic is role entrapment of the tokens, which occurs if they assimilate into their ascribed stereotypic roles for the sake of convenience or resignation because constantly 'fighting' their stereotypic role requires time and much self-assertion. Taken together, these dynamics diminish both career and promotion opportunities of minority groups in the workplace.

We assume that minority and majority or rather group-size effects also exist in the academic workplace and that the presented theories, together with intersectionality help to explain social inequalities in postdoctoral dropout from academia. Inside academia, there is no one employer, but rather many actors involved in hiring and appointment decisions: appointment committees, professors, but also universities and their managements. Both historically and empirically, the majority groups inside academia include men, people with academic parents, and those without a migration background, whereas women, people with non-academic parents, and those with a migration background are the respective minority groups. In addition, the intersections of these minority groups are even smaller minorities and therefore prone to face multiple disadvantages.

Following the presented theories, members of the minority groups may be discriminated against for different reasons. Doctoral graduates who are members of one (or several) minority groups could be disadvantaged in hiring decisions and contract extensions, which increases their risk of dropout from academia. Or they could be disadvantaged by group-size effects because they have no—or only a small number of—role models and face a particularly high performance pressure due to their high visibility inside academia, which could in turn lead to reduced well-being and a higher likelihood of opting out. We assume that the described mechanisms hold for all minority groups and increase their risk of dropout from academia.

To sum up, we assume that the social categories are directly associated with dropout from academia. We expect that female doctoral graduates, those with a non-academic background, and those with a migration background have a higher risk of dropout from academia than their respective majority groups; and as a result, also drop out from academia more quickly after graduation. Furthermore, we assume that these disadvantages reinforce each other and that the social categories are intersectionally intertwined, which gives specific and additional risks of dropout. The following Table 1 summarizes all expectations.

**Table 1: Hypotheses on the main and intersectional effects on postdoctoral dropout from academia**

| Inequality dimensions – minority groups | Effect on risk of dropout |
|---|---|
| *Main effects* | |
| H1a: female gender | + |
| H1b: parental non-academic background | + |
| H1c: migration background | + |
| *Intersectional effects* | |
| H2a: female gender # parental non-academic background | + |
| H2b: parental non-academic background # migration background | + |
| H2c: migration background # female gender | + |

## 4 Data & methods

### *4.1 Data & sample*

We use data from the DZHW PhD Panel 2014 (Brandt/Briedis et al. 2020; Brandt/Vogel et al. 2020), which was conducted by the German Centre for Higher Education Research and Science Studies (DZHW). The target population of the survey were people who had earned doctoral degrees at a German university in the winter semester of 2013/14 or the summer semester of 2014. The data was collected in five annual waves from 2015 to 2019, i.e., approximately one to five years after the respondents' doctoral graduation, and includes information on their employment trajectories. The first wave was realized as a standardized postal survey, and the subsequent waves were realized as standardized online surveys. The full sample in wave 1 consists of 5,408 graduates.

We confine ourselves to those graduates who have completed their doctoral training inside academia and are thus at risk of dropping out from academia after graduation. Therefore, we exclude graduates with no or a non-academic institutional integration during doctoral training (–1,868 cases) and instead use a subsample of graduates who have completed their doctoral training as employees of a university or non-university research institution or within the framework of a structured doctoral program or doctoral scholarship (3,540 cases). Due to incomplete data, some cases needed to be excluded from the analysis sample: graduates who had not indicated their date of graduation (–3 cases), who had not given any information on their employment trajectories after graduation (–986 cases), and whose last job episode was academic, had no ending date, but was also no longer running at the last time of observation (–2 cases). Thus, the final analysis sample consists of 2,549 cases.

Little's (1988) test indicated that the (remaining) missing values were not missing completely at random ($x^2$: 4,057.79; 3,147 degrees of freedom; p: 0.00), which is a violation of the complete case analysis assumption. Therefore, we applied multiple imputation by chained equations with $m$ = 25 imputations and 70 iterations and used various auxiliary variables to replace missing values in all relevant variables (see Table A1 in the appendix for details on the imputation model). Following the recommendation of White and Royston (2009), we additionally included the event indicator (i.e., dropout from academia) and the Nelson-Aalen estimate of the baseline cumulative hazard as auxiliary variables in the imputation model. Note that both variables did not have any missing values and therefore were not imputed but only used for estimating missing values in the other variables.

### *4.2 Variables*

The dependent variable is duration in months from doctoral graduation until either a dropout from academia or the date of the last participation in the survey. The data includes information on the beginning, ending, and academic setting of graduates' job episodes after doctoral graduation. This information was used to identify whether and when graduates have dropped out from academia. Postdoctoral dropout from academia is defined as first indication of a non-academic job episode after doctoral graduation. Of the 2,549 graduates in the analysis sample, 1,710 dropped out from academia during the observation period and 839 stayed inside academia until their last participation in the survey and are thus right-censored. Thus, we do not know whether these graduates will ultimately drop out from academia or be able to obtain a permanent position inside academia.

The main predictors of interest are gender, parental academic background, and migration background. Because this paper focuses also on their intersectional effects, they are measured dichotomously with 1 indicating the respective minority groups. Thus, gender is coded 1 for female graduates and 0 for male graduates. The parental academic background is coded 1 if none of the graduates' parents has a university degree and 0 if at least one parent has a university degree. Following Buche and Gottburgsen (2012), we assume that graduates have a migration background if they were born outside Germany or if at least one parent has migrated to Germany. If both aspects do not apply, they have no migration background. To test the intersections of the three social categories, we generate pairwise interaction terms between them, which is the recommended analytical strategy for applying quantitative methods to an intersectionality framework (Gross et al. 2016). See Table A2 in the appendix for a description of all predictor variables.

To disentangle inequalities in dropout from academia, we control for discipline and for several academic performance indicators. Previous research has shown that these variables are associated with academic careers (Briedis et al. 2014; Enders/Bornmann, 2001; Flöther 2017; Franken 2020; Goldan et al. 2023; Jungbauer-

Gans/Gross 2013; König et al. 2021; Leemann et al. 2010; Schulze et al. 2008; Vogel 2020: 312f.). More precisely, we control for the doctoral subject group in six categories, the final grade of the doctorate (summa cum laude vs. other), research productivity given by the numbers of publications and conference contributions during doctoral training, both standardized by subject group, and for age at graduation.

### *4.3 Event history analysis*

We use event history techniques that allow for analysis of the time until event occurrence and of the influence that covariates have on the risk of experiencing that event, while accounting for right-censored data structure. The event is dropout from academia, the onset of risk is the month of doctoral graduation ($t = 0$), and analysis time ($t$) is the time in months between doctoral graduation and event occurrence or last participation in the survey, i.e., right-censoring.

We estimate semiparametric Cox proportional hazards models (Cox 1972), which model the occurrence of an event as linear function of covariates (Allison 2014: 33ff.; Cleves et al. 2016: 131ff.). The dependent variable is a hazard rate, which is the conditional probability that a particular graduate drops out from academia at a particular time, given that the graduate is still inside academia at that time. The Cox model assumes that the covariates multiplicatively vary the baseline hazard function. It defines the hazard rate for the j$^{th}$ individual as

$$h\left(t \middle| x_j\right) = h_0(t) exp\left(x_j \beta_x\right)$$

where $h_0(t)$ refers to the baseline hazard rate, $x_j$ is a vector of covariates, and $\beta_x$ is the corresponding vector of regression coefficients to be estimated from the data. Semiparametric means that Cox models are parametric insofar as the effects of the covariates are assumed to be constant over time—i.e., "for any two individuals at any point in time, the ratio of their hazards is a constant" (Allison 2014: 33) (*proportional hazards assumption*)—but that Cox models are nonparametric as far as time is concerned because they do not require any assumption about the distribution of events over time. The estimation method of Cox regression is partial likelihood and depends exclusively on the ordering of events rather than the exact times at which the events occur.

Regression diagnostics (Cleves et al. 2016: 205ff.) indicated no problems[2] except for a violation of the proportional hazards assumptions for the final grade of the

2 We have also tested whether our analyses are sensitive to violations of the additional *non-informative assumption*, which means that the censoring times of randomly censored subjects are not associated with the subject's hazard of dropout at that time (Allison 2014: 15ff.). To test how sensitive our analyses are to violations of that assumption, we have re-estimated an illustrative full model in two extreme ways with different alterations of the randomly censored graduates in the data. First, we have altered them so that they experience a dropout from

doctorate, i.e., that its effect on dropout varies over analysis time. Therefore, in the Cox models the grade is interacted with analysis time, which allows for its non-proportionality. As a result, its regression coefficient still indicates the effect on dropout, but the respective interaction term with analysis time indicates how the effect on dropout develops over time.

A limitation of our analytical strategy is that event history techniques on survey data do not allow us to identify causal effects but only correlative associations. Yet our research interest is on inter-individual differences by gender, parental academic background, and migration background, each of which cannot be experimentally manipulated. In addition, (a) these social categories are clearly exogenous and we do not have any endogeneity issues with them; (b) we are able to model the dynamics of dropout by using event history techniques (in contrast to cross-sectional analyses); and (c) our analyses have a high external validity as we use survey data with real behavior/dropout (compared to, e.g., measures of attitudes or preferences within a factorial survey approach). Thus, we consider our analytical strategy most suitable for our research interest.

## 5 Results

In the following, we *first* nonparametrically describe survival inside academia (section 5.1). Nonparametric estimation means that there is no assumption about the functional form of the survivor function and that the effects of covariates are not modeled. *Second*, estimating semiparametric Cox regression models, we investigate whether there are social inequalities in postdoctoral dropout from academia (section 5.2). *Third*, we discuss our findings (section 5.3).

### *5.1 Description of postdoctoral survival inside academia*

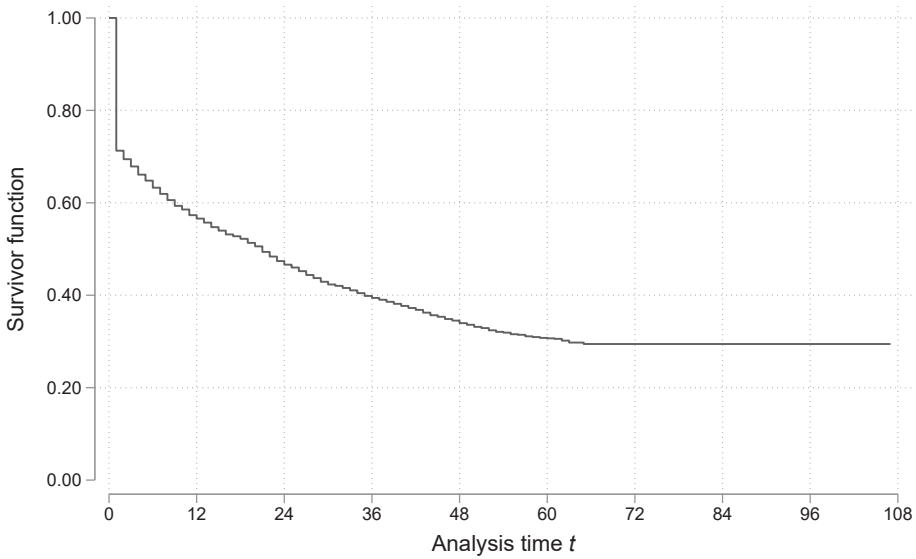
Figure 1 plots the estimator of Kaplan and Meier (1958), which is a nonparametric estimate of the survivor function. The survivor function is the conditional probability of survival beyond a certain point in analysis time, given survival up until that time, or rather the probability that there is no event prior to that time (Cleves et al. 2016: 93ff.). It is equal to 1 at $t = 0$ and decreases towards 0 as $t$ approximates infinity. The x-axis shows analysis time in months, and the y-axis shows the survivor function.[3]

academia at the time of their censoring. Second, we have altered their censoring times to the largest possible observation time in the survey, i.e., the time of wave 5. In both cases, regression coefficients and their statistical significance were very similar to those from the original model (see Figure A2 in the appendix), which indicates that the models are not sensitive to violations of the non-informative assumption.

3 See Table A3 in the appendix for more detailed statistics on survival inside academia. See Figures A1a–c for the Kaplan-Meier survival estimates by each of the social categories. We find that female doctoral graduates, those with a non-academic background, and those with a

The survivor function drastically decreases in the first month after graduation (the probability of survival beyond $t$ = 1 is 71.3 percent)[4] and continuously declines further in the subsequent months and years. However, note that the survivor function is only reliable until approximately $t$ = 60. Thereafter, estimation is unreliable because of too few cases left in the data.[5] Overall, the survivor function is already relatively low in the first month following graduation, but until five years after graduation it further and substantially decreases to 30.7 percent. Therefore, survival inside academia after graduation appears to be the exception rather than the rule.

**Figure 1: Kaplan-Meier survival estimates**




*Note:* multiply imputed data, results reported for $m$ = 1, N = 2,549.
*Source:* DZHW PhD Panel 2014 (4–0–0).

migration background drop out from academia after graduation as quickly as their respective reference groups.

4 Note that we are likely to overestimate dropout in the first month after graduation due to having defined the initial risk set based on the institutional integration during doctoral training. Thus, some of the dropouts in the first month may in fact not occur exactly at that time but rather (shortly) before the official date of doctoral graduation.

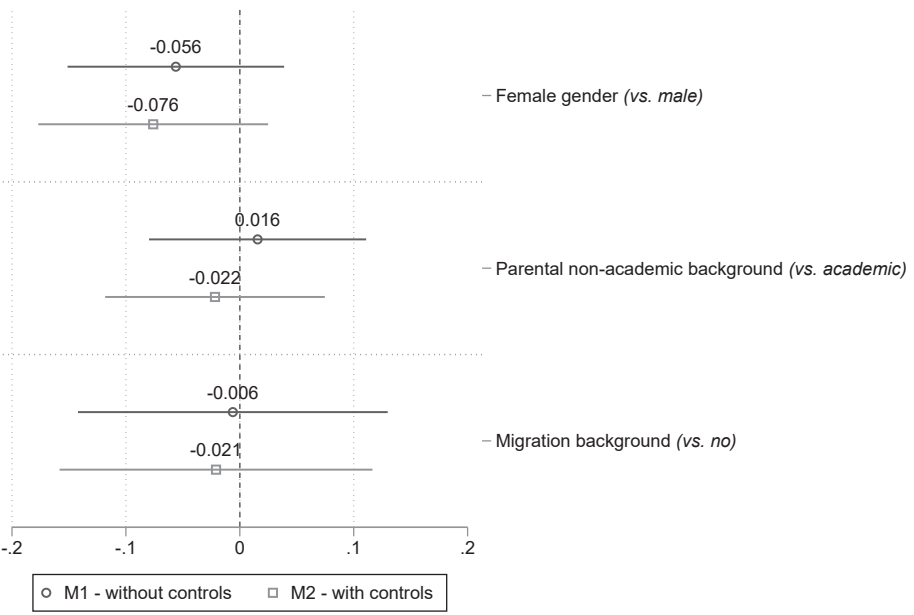
5 Note that the maximum analysis time is $t$ = 107, which indicates that data collection did not work perfectly, because then the maximum time would have been approximately 60 months. However, beyond $t$ = 60 (see Table A3 in the appendix), most graduates are censored anyway, which means that the main analysis time in this paper aligns with the overall observation period of the panel survey.

### *5.2 Inequalities in postdoctoral dropout from academia*

We estimate Cox regression models to test our hypotheses on social inequalities in postdoctoral dropout from academia. In the following, we illustrate the effects of interest by plots of the according point estimators. See Table A4 in the appendix for the detailed regression models these plots refer to. The presented point estimators are reported in the coefficient metric and can be transformed into the hazard-ratio metric through exponentiation with the formula $exp(\beta \Delta x)$ (Cleves et al. 2016: 132ff., 176f.).

Figure 2 shows the point estimators for the main effects of all social categories both without and with controls. Against expectations, we find that gender, parental academic background, and migration background are not statistically significantly associated with dropout from academia. Thus, none of the expected main effects can be confirmed (H1a–c).

**Figure 2: Cox regression on postdoctoral dropout from academia—main effects of all social categories**

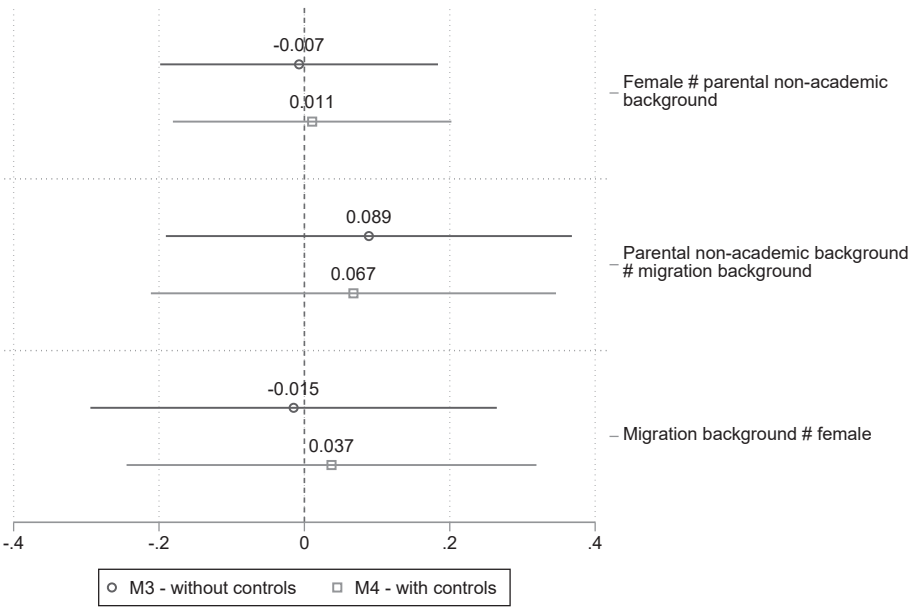



*Note:* point estimators and 95 percent confidence intervals presented, multiply imputed data, N = 2,549, M2 controls for doctoral subject group, final grade of the doctorate, numbers of publications and conference contributions, and age at graduation.
*Source:* DZHW PhD Panel 2014 (4–0–0).

We now turn to the expected interaction effects. Maybe the social categories are not associated directly with dropout from academia, but rather are associated only when

their interrelations are taken into account. Figure 3 shows the point estimators for all twofold interaction terms between the social categories both with and without controls. Here again, we find no inequalities as none of the interaction terms is statistically significantly associated with dropout from academia, which opposes H2a–c. Taken together, we find that none of the hypotheses can be confirmed because there are no main or intersectional effects of gender, parental academic background, and migration background on postdoctoral dropout from academia.[6]

**Figure 3: Cox regression on postdoctoral dropout from academia—interaction effects of all social categories**




*Note:* point estimators and 95 percent confidence intervals presented, multiply imputed data, N = 2,549, M4 controls for doctoral subject group, final grade of the doctorate, numbers of publications and conference contributions, and age at graduation.
*Source:* DZHW PhD Panel 2014 (4–0–0).

6 With regard to the control variables (see Table A4 in the appendix), we find that they are all statistically significantly associated with dropout from academia. Doctoral graduates from engineering and computer sciences as well as those from social sciences, economics, and law have a higher risk of dropout from academia than graduates from natural sciences and mathematics. Graduates who have completed their doctorate with summa cum laude have a lower risk of dropout, and the higher the number of both publications and conference contributions, the lower the risk of dropout. Age at graduation is negatively associated with the risk of dropout from academia.

### *5.3 Discussion*

The surprising finding of no inequalities in postdoctoral dropout from academia raises the question of whether there are no inequalities or whether we are simply not able to detect them. For example, in line with Mare (1980), it could be that inequalities tend to exist prior to doctoral graduation, so that doctoral graduates are such a preselected and high performing group that their chances of realizing an academic career are truly based on meritocratic factors and are independent of social categories.

To check the statistical power of our analyses, we have carried out a power analysis and found that with the available sample size, we have a statistical power of 80 percent to detect statistically significant effects with a coefficient size from ±.1203. Because the effects are very small for the social categories under study, these are not statistically significant. Yet overall, the statistical power of our analyses is sufficient, which is also reflected in the fact that we do find statistically significant effects for the controls. Therefore, the data is sufficient for event history analyses on dropout from academia.

We also carried out two robustness checks. *First*, it could be that disciplines are an important sub context and inequalities only show when differentiating between subject groups. To check whether the potential main and intersectional effects on postdoctoral dropout differ by discipline, we have rerun the presented regressions separately by doctoral subject group (see robustness check I in the appendix). However, these subject-specific analyses emphasized the finding of no inequalities in dropout from academia, with one exception. In engineering and computer sciences, female doctoral graduates, as well as those with both non-academic parents and a migration background had a statistically significantly lower risk of dropout from academia. Yet overall, the risk of postdoctoral dropout from academia does not seem to vary by subject group.

*Second,* it could be that the expected inequalities do not exist with regard to dropout from academia but rather with regard to the reasons for dropout and with regard to the transition to the non-academic labor market after dropout. For example, it could be that the members of a minority group are forced to drop out from academia because their contracts expire without renewal, while members of the respective majority group drop out from academia because of more attractive career options outside academia. In that case, transition to non-academic employment should be smooth and continuous for members of the majority group and difficult for members of the minority group. To exclude the possibility that we have only found no inequalities because they do not exist in dropout from academia but in transition to the non-academic labor market after dropout, we have repeated our regression analyses on these transitions among the subsample of graduates who have dropped out from academia (see robustness check II in the appendix). However,

we also found no differences in these transitions by the main and intersectional categories.

Taken together, the expected inequalities are reasonable from a theoretical point of view, in previous research there was some evidence for their existence, and the data and statistical power are sufficient. Nevertheless, empirically we do not find any inequalities, which suggests that there are no inequalities in postdoctoral dropout from academia. However, there are still reasons why we may not be able to detect existing inequalities.

*First*, minority groups may be more selective with regard to unobserved predictors that decrease the risk of dropout from academia (e.g., better social skills, being more ruthless) and neutralize their ascribed disadvantaged position associated with being member of a minority group. This line of argumentation is, for example, supported by Zimmer (2021) who found that the chances of being appointed to a full professorship do not differ between junior professors from privileged and underprivileged educational families because the latter lack bourgeois serenity and are therefore particularly zealous and take shorter periods of parental leave.

*Second*, in the case of gender, it could be that discrimination against women and gender mainstreaming to promote women's academic career advancement result in opposite effects that neutralize each other so that overall, there is no main effect of gender. However, with the data at hand we cannot check this presumption.

*Third*, in the case of migration background, it could be that the effects differ by home country and as long as we do not account for that, we cannot detect the possibly existing associations. Unfortunately, because there are only a few graduates with a migration background in the data, we cannot further differentiate these groups in analyses.

*Finally*, a more general reason could also be that inequalities in postdoctoral dropout from academia only show in longer-term data, i.e., data that covers more than five years after graduation, because obtaining a permanent position inside academia—which is the only way to avoid dropout from academia in the long term—usually takes more than five years.[7]

## 6 Conclusions

Building on the intersectionality approach and ambiguous empirical evidence of inequalities in academic careers, this paper aimed to provide new insights into the empirically contested question of whether there are social inequalities in academic

7 The German law on academic employment ("Wissenschaftszeitvertragsgesetz") provides that researchers can be employed on temporary contracts in academia for up to six years before doctoral graduation and up to another six years after graduation (nine for medicine), unless the positions are funded by third parties. This period can be extended for parents by two years for each child born within this period.

careers. Inequalities in access *to* and chances *of* realizing an academic career are problematic because they restrict the career opportunities of certain groups and let their scientific potentials go unused. In addition, they are forbidden by law. Knowledge of inequalities is important to identify measures to address them. Therefore, we have examined whether there are main and intersectional effects of gender, parental academic background, and migration background in postdoctoral dropout from academia. We would like to emphasize that we do not assume that dropout per se is negative and that the ideal-typical realization of an academic career is preferable. Quite the contrary, doctoral graduates can be professionally successful both inside and outside academia. The focus of the problem is not dropout from academia itself but rather when the chances of staying within academia depend on social characteristics.

We have derived our hypotheses against the background of the intersectionality approach complemented by theories on minority and majority groups in the workplace. We expected that female doctoral graduates, those with non-academic parents, and those with a migration background are more likely to dropout from academia than their respective reference groups. In addition, we expected that these social categories are intersectionally intertwined and cause specific and additional inequalities in dropout. We referred to doctoral graduates because they fulfill the general requirements for an academic career but have not yet realized one and could still opt for a non-academic career. To test our expectations, we used panel data on the employment trajectories of doctoral graduates in Germany over a period of five years following their graduation and event history techniques on postdoctoral dropout from academia.

The results indicated that survival inside academia after doctoral graduation appears to be the exception rather than the rule, but that there are no inequalities by gender, parental academic background, or migration background, or their intersections in postdoctoral dropout from academia. Our study contributes to the literature by explicitly examining intersectional inequalities in academic careers, which has hardly been done in previous research and is a more accurate depiction of reality than confining research to the main effects of the social categories only. Thereby, we were able to provide new insights into social inequalities in academic careers for which previous empirical findings were ambiguous. Having used panel data, we were also able to control for discipline and academic performance and to use time-related analysis methods.

Our study is a first step in studying inequalities in dropout from academia. Nevertheless, in the future, more research is needed to challenge our finding that there are no inequalities after doctoral graduation, which we would like to actively encourage. Future research could study postdoctoral dropout from academia over a longer period and inequalities in the chances of eventually being appointed to a chair, an undertaking which will be possible upon the publication of subsequent

survey waves of the DZHW PhD Panel 2014. In addition, future research could also examine other social categories, e.g., parenthood and health.

We would like to point out this paper's limitations. *First*, the dichotomous measurement of the social categories is a severe simplification and does not correspond to the complexity of these categories. However, a more differentiated measurement was hardly possible with the data. From a methodological point of view, the dichotomous measurement also helped us to reduce the complexity that is inherent to the categorical intersectionality approach (McCall 2005), and a more extensive measurement would have been detrimental to the generation and interpretation of the interactions. In addition, our measurements correspond to those from previous research. Nevertheless, we see our study only as a first and non-conclusive step in the investigation of intersectional inequalities in academic careers.

*Second*, the identification of dropout from academia may not be entirely accurate and comparable between graduates because of the way the data was collected. In each survey wave, the graduates were asked to indicate whether their job episodes were academic or not; however, what an academic job is, is not always straightforward and sometimes lies in the eye of the beholder. The definition may depend on criteria such as working tasks and labor market sector, and the criteria used may differ between graduates.

*Third*, we have controlled for academic performance to disentangle inequalities in dropout. However, it may be that differences in academic performance in fact result from discrimination and that they are thus rather proxies for discrimination that mediate inequalities in dropout from academia than meritocratic controls.

*Fourth*, our observation period is somewhat limited. With five years after graduation, we have only studied mid-term dropout from academia. Against the background of the German law on academic employment, a longer observation period would have been desirable. Accordingly, our analyses do not allow any statement about whether graduates who were still inside academia when last observed will eventually be able to realize an academic career and to obtain a permanent position inside academia.

*Finally,* event history techniques do not allow us to identify causal effects but only correlative associations. Since our research interest is on inter-individual differences in postdoctoral dropout from academia between members of different ascriptive social categories, and event history techniques at least account for dynamics, our analytical strategy is the best available approximation of the causal effect.

The fact that we found no inequalities in postdoctoral dropout from academia raises the question of whether there are no such inequalities or whether we were simply not able to detect them. Especially against the background of the repeatedly confirmed phenomenon of the leaky pipeline, this finding is surprising and worthy of discussion. We have suggested several reasons for the finding—inter alia, the

opposite effects of gender mainstreaming and discrimination against women having a neutralizing effect on each other, effects of having a migration background differing by home country, inequalities in dropout from academia only showing in the long term. However, with the data at hand we were unable to check these presumptions. Yet we have carried out robustness checks and tested whether inequalities only show in some disciplines and whether our expected risk groups have more difficulties in taking up new jobs after dropout. However, we found no differences by subject group and also no social inequalities in transition to the non-academic labor market.

Further explanations could be related to the aforementioned limitations of our study but also to selections prior to doctoral graduation. Previous research has repeatedly shown that there are social inequalities in participation in, and completion of, higher education. Therefore, doctoral graduates may be such a preselected and high-performing group that characteristics other than social determine their chances of realizing an academic career. In addition, it could also be that minority groups are more selective with regard to unobserved predictors that decrease the risk of dropout from academia (e.g., better social skills, being more ruthless) and again neutralize their ascribed disadvantaged position associated with being a member of a minority group. As long as other studies do not come to different conclusions, our findings allow for cautious optimism regarding inequalities in academic careers.

## References

Allison, Paul D. (2014). *Event History and Survival Analysis.* Los Angeles, London, New Delhi, Singapore, Washington DC: Sage.

Allmendinger, Jutta & Hinz, Thomas (2002): Programmierte (Un-)Gleichheit? Geschlechtsspezifische Chancen bei der Bewilligung von Forschungsanträgen. *Zeitschrift für Soziologie* 31(4): 275–293.

Arrow, Kenneth (1973): The Theory of Discrimination, in: Orley Ashenfelter & Albert Rees (Eds.), *Discrimination in Labor Markets.* Princeton, New Jersey: Princeton University Press. pp. 3–33.

Auspurg, Katrin, Hinz, Thomas & Schneck, Andreas (2017): Berufungsverfahren als Turniere: Berufungschancen von Wissenschaftlerinnen und Wissenschaftlern. *Zeitschrift für Soziologie* 46(4): 283–302.

Bakshi-Hamm, Parminder & Lind, Inken (2008): Migrationshintergrund und Chancen an Hochschulen: Gesetzliche Grundlagen und aktuelle Statistiken, in: Inken Lind & Andrea Löther (Eds.), *Wissenschaftlerinnen mit Migrationshintergrund.* Bonn: GESIS, CEWS. pp. 11–24.

Bakshi-Hamm, Parminder, Lind, Inken & Löther, Andrea (2008): Wissenschaftlerinnen mit Migrationshintergrund aus der Sicht der Gleichstellungspolitik, in: Inken Lind & Andrea Löther (Eds.), *Wissenschaftlerinnen mit Migrationshintergrund.* Bonn: GESIS, CEWS. pp. 25–60.

Baur, Nina (2016): Migration und Wissenschaftskarrieren. Eine figurationssoziologische Perspektive auf das Wechselverhältnis von Ethnizität und Wissenschaft, in: Nina Baur, Cristina Besio, Maria Norkus & Grit Petschick (Eds.), *Wissen – Organisation – Forschungspraxis. Der Makro-Meso-Mikro-Link in der Wissenschaft.* Weinheim: Beltz Juventa. pp. 671–717.

Becker, Gary S. (1957): *The Economics of Discrimination.* Chicago: University of Chicago Press.

Becker, Rolf (2009): Wie können "bildungsferne" Gruppen für ein Hochschulstudium gewonnen werden? *Kölner Zeitschrift für Soziologie und Sozialpsychologie* 61(4): 563–593.

Bornmann, Lutz & Enders, Jürgen (2004): Social origin and gender of doctoral degree holders. Impact of particularistic attributes in access to and in later career attainment after achieving the doctoral degree in Germany. *Scientometrics* 61(1): 19–41.

Brandt, Gesche, Briedis, Kolja, Vogel, Susanne de, Jaksztat, Steffen, Kovalova, Iryna, Lapstich, Anne-Marie & Teichmann, Carola (2020): *DZHW PhD Panel 2014. Data collection: 2014–2019. Version: 4.0.0. Data Package Access Way: Remote-Desktop-SUF.* Hannover: RDC-DZHW.

Brandt, Gesche, Vogel, Susanne de, Jaksztat, Steffen, Lapstich, Anne-Marie, Teichmann, Carola, Vietgen, Sandra & Wallis, Marten (2020): *DZHW Promoviertenpanel 2014. Daten- und Methodenbericht zu den Erhebungen der Promoviertenkohorte 2014 (Befragungswelle 1–5); Version 3.0.1.* Hannover: FDZ-DZHW.

Briedis, Kolja, Jaksztat, Steffen, Preßler, Nora, Schürmann, Ramona & Schwarzer, Anke (2014): *Berufswunsch Wissenschaft? Laufbahnentscheidungen für oder gegen eine wissenschaftliche Karriere.* Hannover: DZHW.

Buche, Antje & Gottburgsen, Anja (2012): Migration, soziale Herkunft und Gender: „Intersektionalität" in der Hochschule, in: Patricia Pielage, Ludger Pries & Günther Schultze (Ed), *Soziale Ungleichheit in der Einwanderungsgesellschaft. Kategorien, Konzepte, Einflussfaktoren.* Bonn. pp. 113–126.

BuWiN (2013): *Bundesbericht Wissenschaftlicher Nachwuchs 2013. Statistische Daten und Forschungsbefunde zu Promovierenden und Promovierten in Deutschland.* Bielefeld: W. Bertelsmann Verlag.

Cleves, Mario Alberto, Gould, William & Marchenko, Yulia V. (2016). *An Introduction to Survival Analysis Using Stata.* College Station, Texas: Stata Press.

Collins, Patricia Hill & Chepp, Valerie (2013): Intersectionality, in: Georgina Waylen, Karen Celis, Johanna Kantola & S. Laurel Weldon (Eds.), *The Oxford Handbook of Gender and Politics.* Oxford: Oxford University Press. pp. 57–87.

Cox, David R. (1972): Regression Models and Life-Tables. *Journal of the Royal Statistical Society. Series B (Methodological)* 34(2): 187–220.

Crenshaw, Kimberle (1989): Demarginalizing the Intersection of Race and Sex: A Black Feminist Critique of Antidiscrimination Doctrine, Feminist Theory and Antiracist Politics. *University of Chicago Legal Forum* (1): 139–167.

Davis, Kathy (2011): Intersectionality as Buzzword: A Sociology of Science Perspective on What Makes a Feminist Theory Successful, in: Helma Lutz, María Teresa Herrera Vivar & Linda Supik (Eds.), *Framing Intersectionality. Debates on a Multi-Faceted Concept in Gender Studies.* Farnham, Burlington, VT: Ashgate. pp. 43–54.

Dubach, Philipp (2014): *Wissenschaftlicher Nachwuchs an Schweizer Universitäten: Statistische Kennzahlen zu Arbeitsbedingungen und Karriereperspektiven.* Bern: SBFI.

Enders, Jürgen & Bornmann, Lutz (2001): *Karriere mit Doktortitel? Ausbildung, Berufsverlauf und Berufserfolg von Promovierten.* Frankfurt/Main: Campus Verlag.

Federal Statistical Office (2021): *Bildung und Kultur. Personal an Hochschulen 2020.* Wiesbaden: Statistisches Bundesamt.

Findeisen, Ina (2011): *Hürdenlauf zur Exzellenz. Karrierestufen junger Wissenschaftlerinnen und Wissenschaftler.* Wiesbaden: VS Verlag für Sozialwissenschaften.

Flöther, Choni (2017): Promovierte auf dem außeruniversitären Arbeitsmarkt: mehr als ein „Plan B". *WSI-Mitteilungen* 70(5): 356–363.

Franken, Julian Pascal (2020): *Was beeinflusst den Verbleib in der Wissenschaft? Eine Analyse individueller und kontextueller Faktoren anhand des DZHW Promovierten Panels.* Hannover: Gottfried Wilhelm Leibniz Universität.

Goldan, Lea, Jaksztat, Steffen & Gross, Christiane (2023): Explaining employment sector choices of doctoral graduates in Germany. *Research Evaluation* 32(1): 185–208.

Gross, Christiane, Gottburgsen, Anja & Phoenix, Ann (2016): Education systems and intersectionality, in: Andreas Hadjar & Christiane Gross (Eds.), *Education systems and inequalities. International comparisons.* Bristol, UK, Chicago, Ill., USA: Policy Press. pp. 51–72.

Hauss, Kalle, Kaulisch, Marc & Tesch, Jakob (2015): Against all odds: determinants of doctoral candidates' intention to enter academia in Germany. *International Journal for Researcher Development* 6(2): 122–143.

Jaksztat, Steffen (2014): Bildungsherkunft und Promotionen: Wie beeinflusst das elterliche Bildungsniveau den Übergang in die Promotionsphase? *Zeitschrift für Soziologie* 43(4): 286–301.

Jaksztat, Steffen, Neugebauer, Martin & Brandt, Gesche (2021): Back out or hang on? An event history analysis of withdrawal from doctoral education in Germany. *Higher Education* 82(5): 937–958.

Jungbauer-Gans, Monika & Gross, Christiane (2013): Determinants of Success in University Careers: Findings from the German Academic Labor Market. *Zeitschrift für Soziologie* 42(1): 74–92.

Kanter, Rosabeth Moss (1977): Some Effects of Proportions on Group Life: Skewed Sex Ratios and Responses to Token Women. *American Journal of Sociology* 82(5): 965–990.

Kaplan, E. L. & Meier, Paul (1958): Nonparametric Estimation from Incomplete Observations. *Journal of the American Statistical Association,* 53: 457–481.

König, Johannes, Otto, Anne, Bünstorf, Guido, Briedis, Kolja, Cordua, Fine & Schirmer, Hendrik (2021): *Karriereentscheidungen und Karriereverläufe Promovierter – zur Multifunktionalität der Promotion*. Kassel, Saarbrücken, Hannover: INCHER, IAB, DZHW.

Leemann, Regula Julia, Keck, Andrea & Boes, Stefan (2010): Fünf Jahre nach dem Doktorat – Geschlechtereffekte bezüglich Antragsaktivität in der Forschungsförderung und Verbleib in der Wissenschaft, in: Regula Julia Leemann & Heidi Stutz (Eds.), *Forschungsförderung aus Geschlechterperspektive.* pp. 85–109.

Little, Roderick J. A. (1988): A Test of Missing Completely at Random for Multivariate Data with Missing Values. *Journal of the American Statistical Association* 83(404): 1198–1202.

Lörz, Markus (2019): Intersektionalität im Hochschulbereich: In welchen Bildungsphasen bestehen soziale Ungleichheiten nach Migrationshintergrund, Geschlecht und sozialer Herkunft – und inwieweit zeigen sich Interaktionseffekte? *Zeitschrift für Erziehungswissenschaft* 27(3): 223.

Lörz, Markus (2020): Warum nehmen Männer mit Migrationshintergrund überproportional häufig ein Studium auf, gelangen aber am Ende seltener in die weiterführenden Masterstudiengänge? *Berliner Journal für Soziologie* 30(2): 287–312.

Lörz, Markus & Mühleck, Kai (2019): Gender differences in higher education from a life course perspective: transitions and social inequality between enrolment and first post-doc position. *Higher Education* 77(3): 381–402.

Lörz, Markus & Schindler, Steffen (2016): Soziale Ungleichheiten auf dem Weg in die akademische Karriere. Sensible Phasen zwischen Hochschulreife und Post-Doc-Position. *Beiträge zur Hochschulforschung* 38(4): 14–39.

Löther, Andrea (2012): Wissenschaftlerinnen und Wissenschaftler mit Migrationshintergrund. *Die Hochschule* 21(1): 36–54.

Lutter, Mark & Schröder, Martin (2016): Who becomes a tenured professor, and why? Panel data evidence from German sociology, 1980–2013. *Research Policy* 45: 999–1013.

MacKinnon, Catharine A. (2013): Intersectionality as Method: A Note. *Signs: Journal of Women in Culture and Society* 38(4): 1019–1030.

Mare, Robert D. (1980): Social Background and School Continuation Decisions. *Journal of the American Statistical Association* 75(370): 295.

McCall, Leslie (2005): The Complexity of Intersectionality. *Signs: Journal of Women in Culture and Society* 30(3): 1771–1800.

Merton, Robert K. (1973). *The Sociology of Science. Theoretical and Empirical Investigation.* Chicago, London: University of Chicago Press.

Möller, Christina (2017): Der Einfluss der sozialen Herkunft in der Professorenschaft. Entwicklungen – Differenzierungen – intersektionale Perspektiven, in: Julian Hamann, Jens Maeße, Vincent Gengnagel & Alexander Hirschfeld (Eds.), *Macht in Wissenschaft und Gesellschaft.* Wiesbaden: Springer Fachmedien Wiesbaden. pp. 113–139.

Möller, Christina (2018): Prekäre Wissenschaftskarrieren und die Illusion der Chancengleichheit, in: Mike Laufenberg, Martina Erlemann, Maria Norkus & Grit Petschick (Eds.), *Prekäre Gleichstellung. Geschlechtergerechtigkeit, soziale Ungleichheit und unsichere Arbeitsverhältnisse in der Wissenschaft.* Wiesbaden: Springer VS. pp. 257–278.

Müller, Walter, Pollak, Reinhard (2016): Weshalb gibt es so wenige Arbeiterkinder in Deutschlands Universitäten, in: Rolf Becker & Wolfgang Lauterbach (Eds.), *Bildung als Privileg*. Wiesbaden: Springer Fachmedien. pp. 345–386.

Müller, Walter, Pollak, Reinhard, Reimer, David, Schindler, Steffen (2011): Hochschulbildung und soziale Ungleichheit, in: Rolf Becker (Ed.), *Lehrbuch der Bildungssoziologie*. Wiesbaden: Springer VS. pp. 289–327.

Neusel, Aylâ, Wolter, Andrä, Engel, Ole, Kriszio, Marianne & Weichert, Doreen (2014): *Internationale Mobilität und Professur. Karriereverläufe und Karrierebedingungen von Internationalen Professorinnen und Professoren an Hochschulen in Berlin und Hessen.* Berlin: Humboldt-Universität zu Berlin.

Phelps, Edmund S. (1972): The Statistical Theory of Racism and Sexism. *American Economic Review* 62(4): 659–661.

Pichler, Edith & Prontera, Grazia (2012): Kulturelles Kapital auf dem Weg zur Professur. Unterschiedliche Ausgangslagen von Wissenschaftler/innen mit Migrationshintergrund. *Die Hochschule* 21(1): 91–101.

Schröder, Martin, Lutter, Mark & Habicht, Isabel M. (2021): Publishing, signaling, social capital, and gender: Determinants of becoming a tenured professor in German political science. *PloS one* 16(1): e0243514.

Schubert, Frank & Engelage, Sonja (2011): Wie undicht ist die Pipeline? Wissenschaftskarrieren von promovierten Frauen. *Kölner Zeitschrift für Soziologie und Sozialpsychologie* 63(3): 431–457.

Schulze, Günther G., Warning, Susanne & Wiermann, Christian (2008): What and How Long Does It Take to Get Tenure? The Case of Economics and Business Administration in Austria, Germany and Switzerland. *German Economic Review* 9(4): 473–505.

Shinozaki, Kyoko (2017): Gender and citizenship in academic career progression: an intersectional, meso-scale analysis in German higher education institutions. *Journal of Ethnic and Migration Studies* 43(8): 1325–1346.

Vogel, Susanne de (2017): Wie beeinflussen Geschlecht und Bildungsherkunft den Übergang in individuelle und strukturierte Promotionsformen? *Kölner Zeitschrift für Soziologie und Sozialpsychologie* 69(3): 437–471.

Vogel, Susanne de (2020): *Individuelle und strukturierte Formen der Promotion.* Wiesbaden: Springer Fachmedien Wiesbaden.

Watermann, Rainer, Daniel, Annabell, Maaz, Kai (2014): Primäre und sekundäre Disparitäten des Hochschulzugangs: Erklärungsmodelle, Datengrundlagen und Entwicklungen. *Zeitschrift für Erziehungswissenschaft* 17(S2): 233–261.

White, Ian R. & Royston, Patrick (2009): Imputing missing covariate values for the Cox model. *Statistics in medicine* 28(15): 1982–1998.

Zimmer, Lena M. (2018): *Das Kapital der Juniorprofessur.* Wiesbaden: Springer Fachmedien Wiesbaden.

Zimmer, Lena M. (2021): Bildungsaufstiege in der Wissenschaft. Zur Nicht-Reproduktion sozialer Ungleichheit beim Übergang von der Junior- auf die Lebenszeitprofessur. *Zeitschrift für Soziologie* 50(5): 415–433.

# Appendix

**Table A1: Imputation model**

| Variables | % missing | # complete | # imputed | Estimator |
|---|---|---|---|---|
| Dropout from academia[a] | .00 | 2,549 | 0 | Logit[b] |
| Nelson-Aalen estimate of the baseline cumulative hazard function[a] | .00 | 2,549 | 0 | Propensity mean matching[c] |
| Gender | .27 | 2,542 | 7 | Logit[b] |
| Parental academic background | .90 | 2,526 | 23 | Logit[b] |
| Migration background | 21.30 | 2,006 | 543 | Logit[b] |
| Doctoral subject group | .35 | 2,540 | 9 | Multinomial logit[b] |
| Final grade of the doctorate | .04 | 2,548 | 1 | Logit[b] |
| Number of publications | 1.29 | 2,516 | 33 | Propensity mean matching[c] |
| Number of conference contributions | 6.04 | 2,395 | 154 | Propensity mean matching[c] |
| Age at graduation | .12 | 2,546 | 3 | Propensity mean matching[c] |
| Educational trajectory[a] | 2.86 | 2,476 | 73 | Logit[b] |
| Formal type of doctoral training[a] | .00 | 2,549 | 0 | Multinomial logit[b] |
| Size of professional network[a] | 1.06 | 2,522 | 27 | Logit[b] |
| Subjective career prospects inside academia[a] | 3.33 | 2,464 | 85 | Ordered logit |
| Subjective career prospects outside academia[a] | 3.30 | 2,465 | 84 | Ordered logit |
| Life goal: having good opportunities for career advancement[a] | .59 | 2,534 | 15 | Ordered logit |
| Life goal: working in a managerial position[a] | .63 | 2,533 | 16 | Ordered logit |
| Life goal: managing and leading other people[a] | .55 | 2,535 | 14 | Ordered logit |
| Life goal: earning a lot of money[a] | .51 | 2,536 | 13 | Ordered logit |
| Life goal: expanding my mental horizon[a] | .55 | 2,535 | 14 | Ordered logit |
| Life goal: further developing my abilities[a] | .55 | 2,535 | 14 | Ordered logit |
| Life goal: developing my personality[a] | .67 | 2,532 | 17 | Ordered logit |

| Variables | % missing | # complete | # imputed | Estimator |
|---|---|---|---|---|
| Support: someone who helped with questions about the content of my doctorate[a] | 1.22 | 2,518 | 31 | Ordered logit |
| Support: someone who helped with methodological/technical questions about my doctorate[a] | 1.22 | 2,518 | 31 | Ordered logit |
| Support: someone who supported me with their expertise[a] | 1.26 | 2,517 | 32 | Ordered logit |
| Support: someone who motivated me to work on my doctorate[a] | 1.22 | 2,518 | 31 | Ordered logit |
| Support: someone who gave me joy in research[a] | 1.26 | 2,517 | 32 | Ordered logit |
| Support: someone who considered my research project as important[a] | 1.29 | 2,516 | 33 | Ordered logit |
| Support: someone who supported me emotionally[a] | 1.29 | 2,516 | 33 | Ordered logit |
| Support: someone who would listen to my worries and problems[a] | 1.29 | 2,516 | 33 | Ordered logit |
| Support: someone who encouraged me in difficult times[a] | 1.49 | 2,511 | 38 | Ordered logit |
| Support: someone who put me in touch with researchers at other universities and research institutions[a] | 1.29 | 2,516 | 33 | Ordered logit |
| Support: someone who put me in touch with people who were particularly relevant for my research topic[a] | 1.22 | 2,518 | 31 | Ordered logit |
| Support: someone who supported me in expanding my scientific contacts and networks[a] | 1.22 | 2,518 | 31 | Ordered logit |
| Self-efficacy: in difficult situations I can rely on my abilities[a] | .94 | 2,525 | 24 | Ordered logit |
| Self-efficacy: I can handle most problems well on my own[a] | .98 | 2,524 | 25 | Ordered logit |
| Self-efficacy: I can usually solve well even strenuous and complicated tasks[a] | 1.02 | 2,523 | 26 | Ordered logit |
| Academic career intention[a] | 2.20 | 2,493 | 56 | Ordered logit |

*Note:* [a] auxiliary variables, [b] augmented, [c] propensity mean matching with five nearest neighbours.
*Source:* DZHW PhD Panel 2014 (4–0–0).

**Table A2: Description of variables**

| Variables | Description | Categories | Per cent/ mean | SD |
|---|---|---|---|---|
| Gender | Graduates' gender | Female | .48 | .50 |
| | | Male | .52 | |
| Parental academic background | None of the graduates' parents has a university degree | Yes: non-academic | .49 | .50 |
| | | No: academic | .51 | |
| Migration background | Graduates were born outside Germany or at least one parent has migrated to Germany | Yes: migration background | .17 | .37 |
| | | No: no migration background | .83 | |
| Doctoral subject group | Subject group of the doctorate | Natural sciences, mathematics | .39 | 1.55 |
| | | Engineering, computer sciences | .17 | |
| | | Social sciences, economics, law | .20 | |
| | | Humanities, art | .10 | |
| | | Medicine | .07 | |
| | | Other | .06 | |
| Final grade of the doctorate | Respondents' doctoral graduation grade | Summa cum laude | .27 | .45 |
| | | Other | .73 | |
| Number of publications | Number of scientific publications that have been published during doctoral training, standardized by subject group | | .17 | 1.20 |
| Number of conference contributions | Number of presented posters and given talks at scientific conferences during doctoral training, standardized by subject group | | .17 | 1.14 |
| Age at graduation | Age in the year of doctoral graduation | | 31.73 | 3.63 |

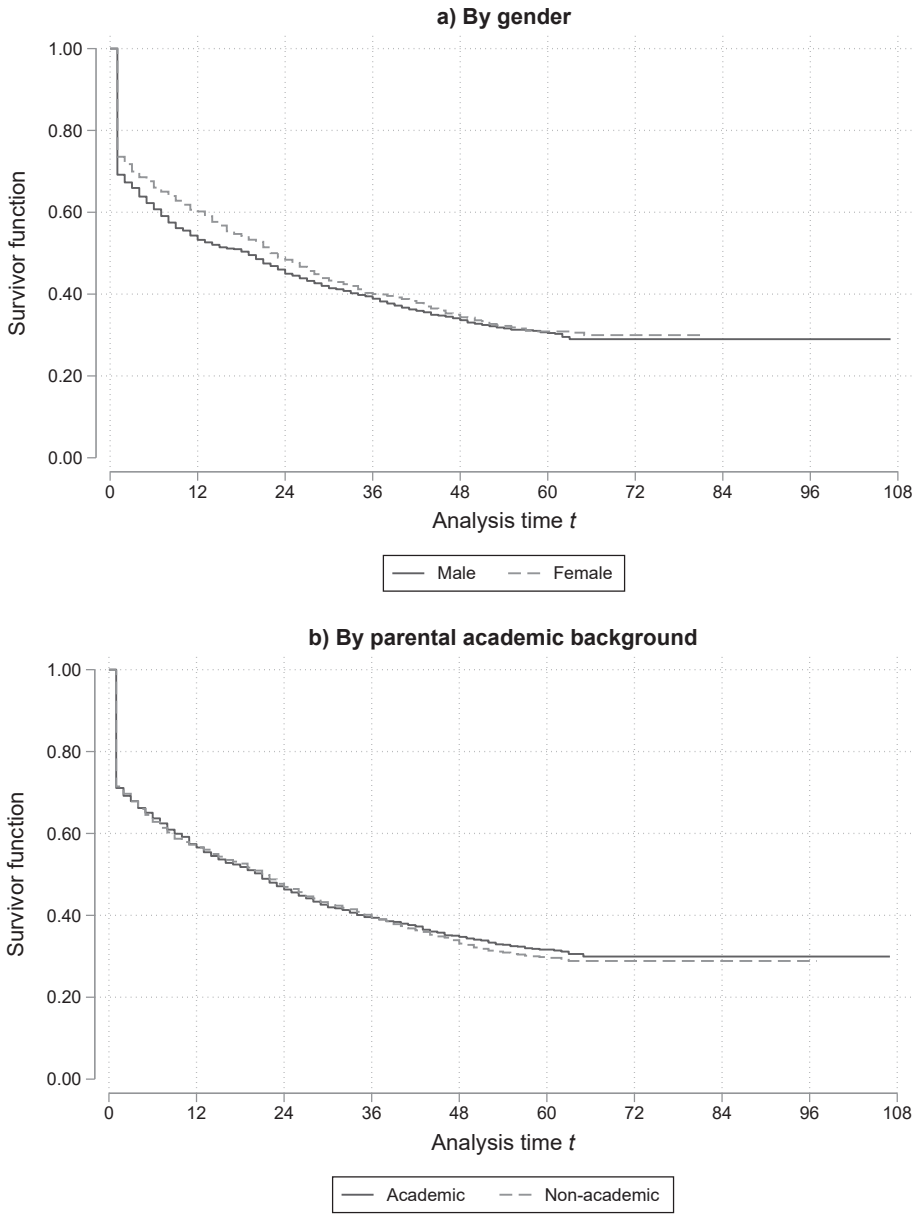
*Note:* multiply imputed data, results reported for $m = 1$, N = 2,549.
*Source:* DZHW PhD Panel 2014 (4–0–0).

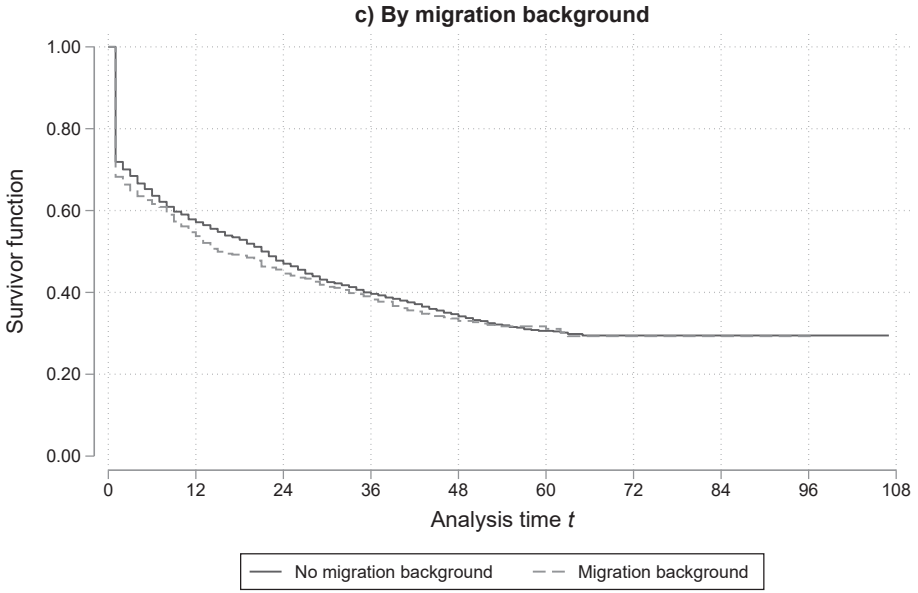
**Table A3: Survival statistics over analysis time**

| *t* | # at risk | # dropouts | # censored | Survivor function | Standard error | [95 % conf. int.] | |
|---|---|---|---|---|---|---|---|
| 1 | 2,549 | 732 | 1 | .713 | .009 | .695 | .730 |
| 2 | 1,816 | 47 | 1 | .694 | .009 | .676 | .712 |
| 3 | 1,768 | 40 | 0 | .679 | .009 | .660 | .696 |
| 4 | 1,728 | 45 | 2 | .661 | .009 | .642 | .679 |
| 5 | 1,681 | 33 | 0 | .648 | .010 | .629 | .666 |
| 6 | 1,648 | 39 | 0 | .633 | .010 | .614 | .651 |
| 7 | 1,609 | 34 | 0 | .619 | .010 | .600 | .638 |
| 8 | 1,575 | 34 | 0 | .606 | .010 | .587 | .625 |
| 9 | 1,541 | 32 | 0 | .593 | .010 | .574 | .612 |
| 10 | 1,509 | 20 | 0 | .586 | .010 | .566 | .604 |
| 11 | 1,489 | 31 | 0 | .573 | .010 | .554 | .592 |
| 12 | 1,458 | 250 | 50 | .566 | .010 | .546 | .585 |
| 24 | 1,158 | 180 | 63 | .466 | .010 | .447 | .486 |
| 36 | 915 | 117 | 104 | .394 | .010 | .375 | .413 |
| 48 | 694 | 67 | 311 | .340 | .010 | .321 | .359 |
| 60 | 316 | 9 | 297 | .307 | .010 | .288 | .326 |
| 72 | 10 | 0 | 10 | .295 | .010 | .274 | .315 |

*Note:* multiply imputed data, results reported for $m = 1$, N = 2,549.
*Source:* DZHW PhD Panel 2014 (4–0–0).

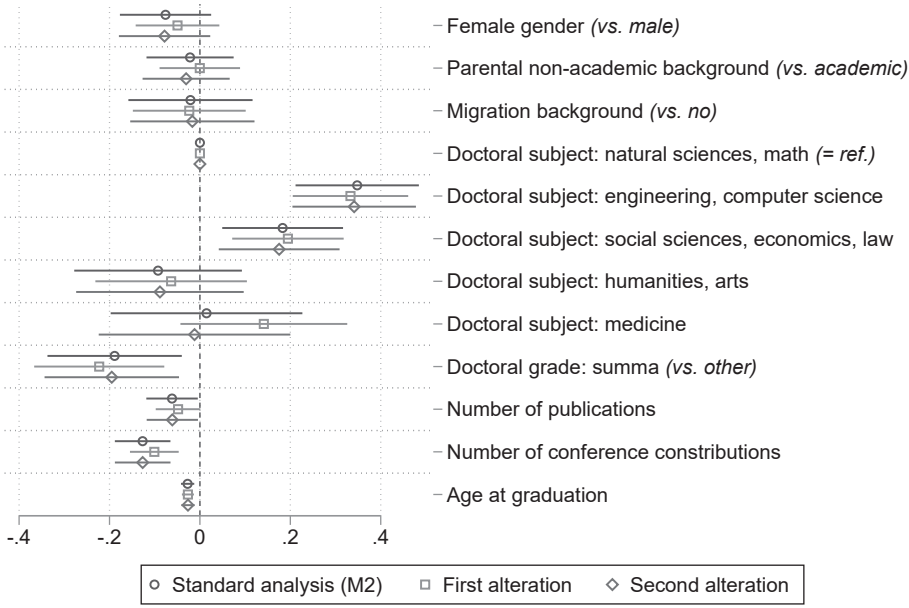
**Figure A1a–c: Kaplan-Meier survival estimates by social categories**






*Note:* multiply imputed data, results reported for $m = 1$, N = 2,549.
*Source:* DZHW PhD Panel 2014 (4–0–0).

**Figure A2: Cox proportional hazards models on dropout from academia—illustration of whether analyses are sensitive to violations of the non-informative assumption**




*Note:* point estimators and 95 percent confidence intervals presented, multiply imputed data, N = 2,549.
*Source:* DZHW PhD Panel 2014 (4–0–0).

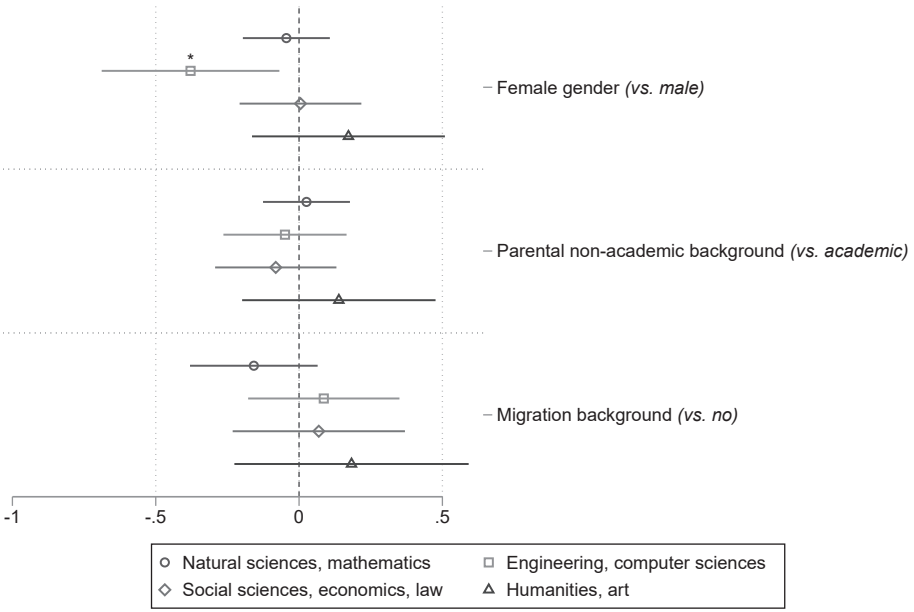
**Table A4: Cox proportional hazards models on dropout from academia**

| Variables | Bivariate | M1 | M2 | M3 | M4 |
|---|---|---|---|---|---|
| Gender: female (*ref.:* male) | –.056 | –.056 | –.076 | –.049 | –.087 |
| | (.049) | (.049) | (.051) | (.072) | (.074) |
| Parental academic background: non-academic *(ref.: academic)* | .016 | .016 | –.022 | .005 | –.037 |
| | (.049) | (.049) | (.049) | (.071) | (.072) |
| Migration background: yes *(ref.: no)* | –.005 | –.006 | –.021 | –.042 | –.069 |
| | (.069) | (.069) | (.070) | (.124) | (.124) |
| Female gender # non-academic parental background | | | | –.007 | .011 |
| | | | | (.097) | (.098) |
| Non-academic parental background # migration background | | | | .089 | .067 |
| | | | | (.142) | (.142) |
| Migration background # female gender | | | | –.015 | .037 |
| | | | | (.143) | (.144) |
| Doctoral subject group *(ref.: natural sciences, mathematics)* | | | | | |
| Engineering, comp. sciences | | | .348*** | | .346*** |
| | | | (.070) | | (.070) |
| Social sciences, economics, law | | | .183** | | .182** |
| | | | (.068) | | (.068) |
| Humanities, art | | | –.093 | | –.093 |
| | | | (.095) | | (.095) |
| Medicine | | | .015 | | .015 |
| | | | (.108) | | (.108) |
| Other | | | .210* | | .212* |
| | | | (.103) | | (.103) |
| Final grade of the doctorate: summa *(ref.: else)* | | | –.189*** | | –.189* |
| | | | (.076) | | (.076) |
| Number of publications | | | –.062* | | –.061* |
| | | | (.029) | | (.029) |
| Number of conference contributions | | | –.127*** | | –.127*** |
| | | | (.031) | | (.031) |
| Age at graduation | | | –.027*** | | –.027*** |
| | | | (.007) | | (.008) |
| Interactions with analysis time *t* | | | | | |
| # Final grade of the doctorate: summa | | | –.013** | | –.013** |
| | | | (.004) | | (.004) |
| Likelihood-ratio $x^2$ | | 1.68 | 160.32*** | 2.55 | 160.70*** |
| N | | 2,549 | 2,549 | 2,549 | 2,549 |

*Note:* point estimators in coefficient metric presented, standard errors in parentheses, multiply imputed data; significance: * p <.05, ** p <.01, *** p <.001.
*Source:* DZHW PhD Panel 2014 (4–0–0).

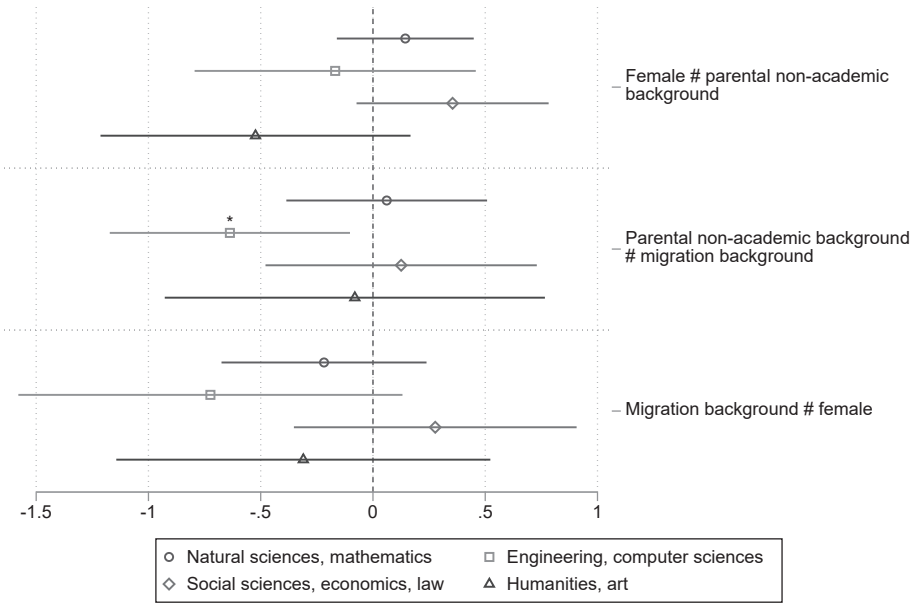
*Robustness check I: Postdoctoral dropout from academia by doctoral subject group*

**Figure A3: Cox regression on postdoctoral dropout from academia—main effects of all social categories by doctoral subject group**




*Note:* point estimators and 95 percent confidence intervals presented, multiply imputed data, N = 2,549.
*Source:* DZHW PhD Panel 2014 (4–0–0).

**Figure A4: Cox regression on postdoctoral dropout from academia—interaction effects of all social categories by doctoral subject group**



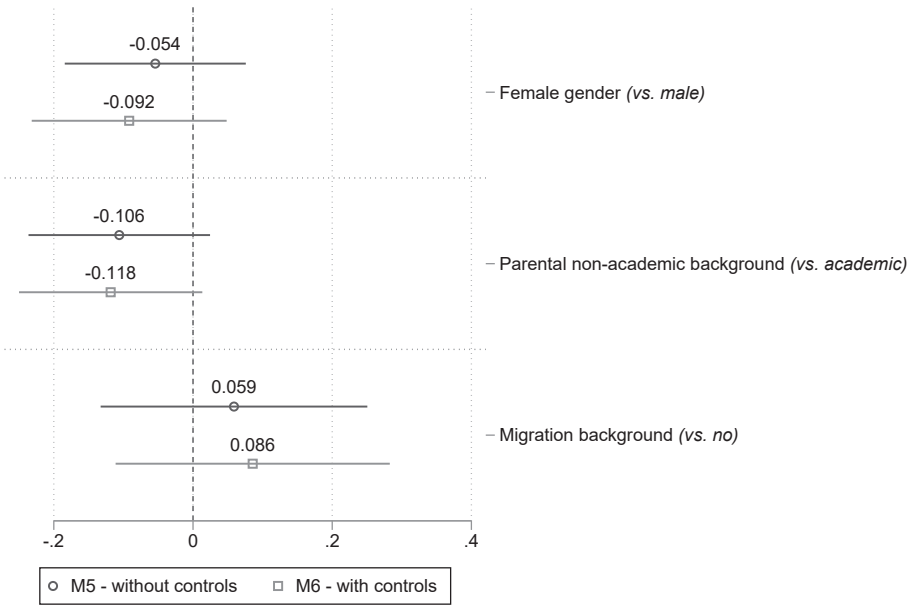

*Note:* point estimators and 95 percent confidence intervals presented, multiply imputed data, N = 2,549.
*Source:* DZHW PhD Panel 2014 (4–0–0).

*Robustness check II: Transition to the non-academic labor market*

To exclude the possibility that we have found no inequalities because they do not exist in dropout from academia but only in transition to the non-academic labor market following dropout, we have repeated our regression analyses on a different outcome variable among the subsample of graduates who had dropped out from academia and who were not self-employed in the first job episode following dropout (N = 1,500). The new outcome variable differentiates between smooth and difficult transitions with the latter being the event under study. Transition to the non-academic labor market is smooth if the next job begins no later than two months following dropout and is permanent and/or in a high position (n = 580). High positions are defined as jobs with management responsibilities and those in the upper or higher grade of the civil service. By contrast, transition to the non-academic labor market is difficult if graduates are temporarily unemployed (i.e., the next job begins three or more months following dropout), their next job is temporary, or not in a high position (n = 920).

See the following Figures A5 and A6 for the key results of Cox regression and Table A5 for the detailed regression models these plots refer to. We again find no social inequalities in transition to the non-academic labor market.[8]

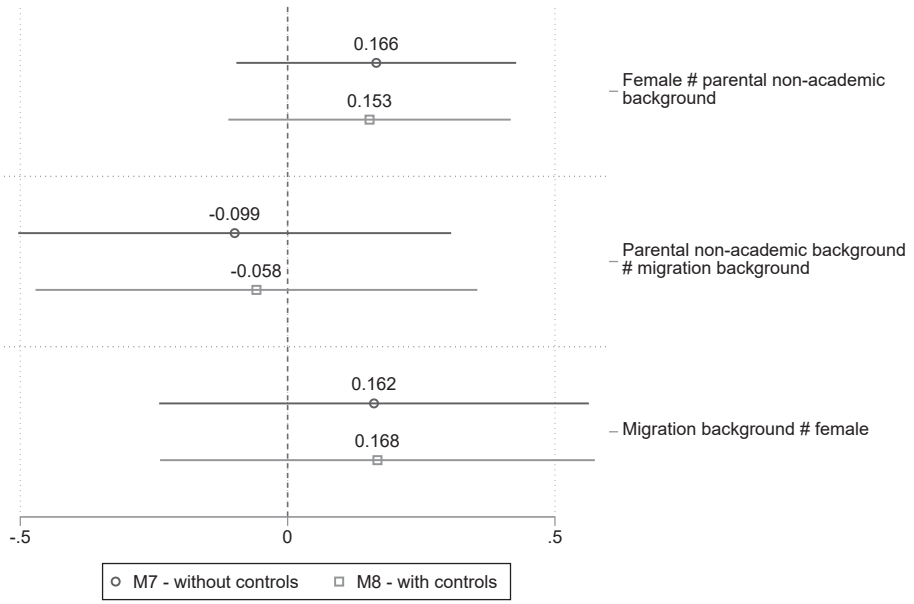
**Figure A5: Cox regression on difficult transition to the non-academic labor market—main effects of all social categories**




*Note:* point estimators and 95 percent confidence intervals presented, multiply imputed data, N = 1,500, M6 controls for doctoral subject group, final grade of the doctorate, numbers of publications and conference contributions, and age at graduation.
*Source:* DZHW PhD Panel 2014 (4–0–0).

8 To ensure that this finding is not biased due to sample restrictions, we have also repeated these analyses with the same analysis sample but additionally including graduates with no or a non-academic institutional integration during doctoral training (3,844 cases of whom 1,278 experienced a difficult transition). However, the result that there are no social inequalities in transition to the non-academic labour market was robust.

**Figure A6: Cox regression on difficult transition to the non-academic labor market—interaction effects of all social categories**




*Note:* point estimators and 95 percent confidence intervals presented, multiply imputed data, N = 1,500, M8 controls for doctoral subject group, final grade of the doctorate, numbers of publications and conference contributions, and age at graduation.
*Source:* DZHW PhD Panel 2014 (4–0–0).

**Table A5: Cox proportional hazards model on difficult transition to the non-academic labor market**

| Variables | Bivariate | M5 | M6 | M7 | M8 |
|---|---|---|---|---|---|
| Gender: female *(ref.: male)* | –.052 | –.054 | –.092 | –.162 | –.191 |
| | (.066) | (.066) | (.071) | (.099) | (.102) |
| Parental academic background: non-academic *(ref.: academic)* | –.104 | –.106 | –.118 | –.167 | –.179 |
| | (.066) | (.067) | (.067) | (.099) | (.099) |
| Migration background: yes *(ref.: no)* | .064 | .059 | .086 | .039 | .043 |
| | (.097) | (.098) | (.100) | (.173) | (.176) |
| Female gender # non-academic parental background | | | | .166 | .153 |
| | | | | (.134) | (.135) |
| Non-academic parental background # migration background | | | | –.099 | –.058 |
| | | | | (.206) | (.210) |
| Migration background # female gender | | | | .162 | .168 |
| | | | | (.205) | (.207) |
| Doctoral subject group *(ref.: natural sciences, mathematics)* | | | | | |
| Engineering, computer sciences | | | .025 | | .030 |
| | | | (.098) | | (.098) |
| Social sciences, economics, law | | | .220* | | .205* |
| | | | (.094) | | (.095) |
| Humanities, art | | | –.005 | | –.008 |
| | | | (.125) | | (.125) |
| Medicine | | | .209 | | .205 |
| | | | (.159) | | (.161) |
| Other | | | .129 | | .126 |
| | | | (.149) | | (.149) |
| Final grade of the doctorate: summa cum laude *(ref.: other)* | | | .182 | | .185 |
| | | | (.115) | | (.115) |
| Number of publications | | | –.028 | | –.028 |
| | | | (.037) | | (.037) |
| Number of conference contributions | | | –.033 | | –.033 |
| | | | (.033) | | (.033) |
| Age at graduation | | | –.035** | | –.036** |
| | | | (.011) | | (.012) |
| Interactions with analysis time *t* | | | | | |
| # Final grade of the doctorate: summa | | | .000 | | .001 |
| | | | (.005) | | (.005) |
| Likelihood-ratio $x^2$ | | 5.81 | 782.85** | 9.88 | 842.24*** |
| N | | 1,500 | 1,500 | 1,500 | 1,500 |

*Note:* point estimators in coefficient metric presented, standard errors in parentheses, multiply imputed data; significance: * p <.05, ** p <.01, *** p <.001.
*Source:* DZHW PhD Panel 2014 (4–0–0).