RESEARCH ARTICLE

A matter of time? Gender and ethnic inequality in the academic publishing careers of Dutch Ph.D.s

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ABSTRACT

Women and ethnic minorities underpopulate influential academic positions, even though these groups are increasingly represented at the doctorate level. Does this imply that gender and ethnic gaps in academic careers are closing? Prior studies on gender inequality in academia predominantly focus on single academic fields or restricted time periods. Longitudinal descriptions of ethnic inequality are even more rare. Using a novel data set of a nearly complete population of doctorates (N = 95,130) from Dutch universities across all academic fields between 1990 and 2021, and their publications, we extend descriptions on gender and ethnic inequality in academic publication careers in the Netherlands. Furthermore, we assess trends in inequality over approximately 30 years without focusing on established academics. We find that while women are as likely as men to start an academic publishing career after obtaining a doctorate, their careers are shorter. Ethnic minority scholars are less likely to start an academic career after their doctorate, and when they do, they stop sooner than ethnic majority researchers. We do not observe a trend towards more equality in academic publishing careers. In conclusion, efforts to increase diversity in Dutch academia have not yet paid off, and gender and ethnic parity are likely not just a matter of time.

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1. INTRODUCTION

In spite of prolonged efforts to increase gender representation in science, women remain underrepresented in permanent research positions in European universities (European Commission, 2021). Women also publish less, are less likely to hold prominent author positions, and their contributions are overlooked compared to men (Hofstra, Kulkarni et al., 2020; Huang, Gates et al., 2020; Leahey, 2006; West, Jacquet et al., 2013). Although women's employment rates are high in the Netherlands (Eurostat, 2021), they are underrepresented in the professoriate (European Commission, 2021). In 2021, only 26.7% of full professors at Dutch universities were women (Poorthuis, Vergouwen, & Scheer, 2022). While there are numerous reports drawing attention to the precarious position of women in Dutch and European academia, data on *ethnic minorities'* representation is more fragmented (European Commission, 2021; Poorthuis & Verdonk, 2021).

In the Netherlands, 14% of the population is foreign born, and an additional 11% are second-generation immigrants (CBS, 2022). Members of the latter group were educated in the Netherlands and are predominantly made up of children from guest workers recruited

in the 1960s and 1970s from Morocco and Turkey and children of migrants from Suriname or the Dutch Caribbean. These four groups are also among the largest second-generation immigrant groups in the Netherlands[1]. Moroccan, Turkish, Surinamese, and Caribbean Dutch are more likely than native Dutch to attend university if they completed higher general education (i.e., VWO). Yet when they do, they graduate more slowly, and are more likely to drop out (CBS, 2020; Tolsma, Need, & de Jong, 2010; Zorlu, 2013). This limits the recruitment of ethnic minorities into Ph.D. programs, because a master's degree is a requirement to enter Dutch Ph.D. programs. Furthermore, anecdotal evidence suggests that academics with a minority background seem unlikely to progress beyond the level of assistant professor in the Netherlands (NWO, 2020).

The underrepresentation of women and ethnic minorities in academia poses a problem for scholars, academia, and society. Structural barriers like motherhood penalties, hostile academic climates, and a lack of recognition hinder capable and motivated scholars to fulfil their aspirations (Dion, Sumner, & Mitchell, 2018; Hofstra et al., 2020; Maranto & Griffin, 2011; van der Lee & Ellemers, 2015). A lack of diversity also limits institutions' scientific progress, as diversity in research teams is associated with increased innovation and creativity (Hofstra et al., 2020; Nielsen, Alegria et al., 2017; Phillips, Northcraft, & Neale, 2006; Risi, Nielsen et al., 2022). Scientists from underrepresented groups are likely to study more diverse and more generalizable research samples, thereby revealing group disparities (Henrich, Heine, & Norenzayan, 2010; Nielsen, Andersen et al., 2017; Sugimoto, Ahn et al., 2019). The inclusion of underrepresented groups inspires new research fields and ultimately transcends science to inspire policy decisions and practical applications in government and industry (Perkmann, Tartari et al., 2013; Tannenbaum, Ellis et al., 2019). Given the negative consequences of underrepresentation of women and ethnic minorities, it is important to describe how underrepresentation comes about, and how it has developed over time.

Here, we extend prior studies investigating the underrepresentation of women and ethnic minorities in academia (European Commission, 2021; NWO, 2020; Wapman, Zhang et al., 2022). Earlier studies often focused on successful academics. However, this introduces survivor bias into our knowledge pool on inequality in academic careers, because with a sample of successful academics, it is difficult to establish which mechanisms contribute to disparities in career outcomes. Studies that do follow a population from the start of the career are often limited to a single discipline or university (Box-Steffensmeier, Cunha et al., 2015; Groeneveld, Tijdens, & van Kleef, 2012; Heiberger, Munoz-Najar Galvez, & McFarland, 2021; Kaminski & Geisler, 2012; Munoz-Najar Galvez, Heiberger, & McFarland, 2020) or are U.S. focused (Hofstra et al., 2020; Kim, Smith et al., 2022). In contrast, our site of study is the Netherlands, and we will trace the publication careers of a nearly complete population of doctoral recipients from all research universities and all scientific fields for the period 1990 to 2021. The Netherlands is a relevant context to study gender inequality in academic careers, because while the percentage of women Ph.D.s in the Netherlands is similar to the EU average, women's representation among professors is lagging behind the EU average (European Commission, 2021). Furthermore, the Dutch context lends itself well to an investigation of ethnic career inequalities, due to its history of labor migration in the 1960s. So, whereas prior research in different countries has mostly focused on career inequalities by race or nationality

[1] Only second-generation immigrant groups (i.e., the children of immigrants) from Indonesia and Germany are larger than some of these groups.

(Heiberger et al., 2021; Hofstra, McFarland et al., 2022; Shinozaki, 2017), we provide insight in the role of scholars' ethnic background. We ask the following research questions:

1. How do gender and ethnicity affect research careers from the start (i.e., entering academia as a publishing scholar) to the end (i.e., leaving academia as a nonpublishing scholar)?
2. How have gender- and ethnicity-based inequalities in research careers developed over the last three decades?

We conceptualize research careers as individual publication trajectories, starting from the first publication after having obtained doctorate until a scientist's last published work. This implies that we cannot capture salary or position differences among publishing scholars; rather, we analyze how inequalities arise in who becomes and remains an actively publishing scholar. There are advantages to using publications to study academic careers as well: By considering publishing onset and "publication survival," we study the complete publishing careers of Ph.D. recipients regardless of career start and length, hence avoiding survivor bias. It also allows us to assess when inequalities occur and whether inequalities are persistent over the career. With question 2, we assess how representation developed to illuminate whether group parity is a matter of time, or whether more is needed to close gender and ethnic gaps in academia—a question that, so far, has remained unanswered.

We introduce a unique data set that contains a nearly complete population of doctorates awarded at all Dutch research universities. These data allow us to reconstruct the publication careers of Ph.D.s (N = 95,130) in the Netherlands (1990–2021) by universities, fields, and Ph.D. cohorts. We curate and enrich this corpus with information on gender and ethnic background by drawing on openly available registers (CBG, n.d.; Meertens Instituut, n.d.). Note that although we include almost the entire population of doctoral recipients over a 30-year period, the number of ethnic minorities in our empirical setting is rather small, causing limited statistical power in our analyses focusing on ethnic differences in research careers, especially so in earlier cohorts. Our data set also allows us to consider career stage, and prior academic productivity when analyzing publication survival. To our knowledge, we are among the first to provide such a rigorous account of gender and ethnic inequality at both the start and end of Dutch academic publication careers.

2. THEORETICAL FRAMEWORK

2.1. The Dutch Academic Setting

Fourteen universities in the Netherlands can confer doctoral degrees. We expect that Dutch universities are equally attractive as employers for the most part, as salaries are determined at the national level and research-teaching distributions are comparable. Dutch universities rank high in international prestige, and prestige variation is located mostly on the department level rather than between universities (Vennekens & van den Broek-Honingh, 2022). Furthermore, the universities are comparable in terms of employee diversity, with the exception of the technical universities, which employ relatively more international employees and fewer women (Poorthuis et al., 2022; Rathenau Instituut, 2023b). While universities do not differ greatly in student body size and amount of government financing, some universities may be more attractive because they receive more external funding (Rathenau Instituut, 2020, 2023a). Compared to other European countries, the Dutch academic labor market is dynamic in terms of mobility between universities and other sectors (Frølich, Wendt et al., 2018). Ph.D. and postdoctoral

positions are inherently temporary in the Netherlands, and associate and full professorships tend to be permanent, while assistant professorships fall somewhere in between (VSNU, 2021). For full professors currently in Dutch academia, the path from a Ph.D. to full professor took 19 years on average (de Goede, Belder, & de Jonge, 2013). Doing research is a central part of nearly all academic positions in Dutch academia: 40–80% of time is spent on research (Rathenau Instituut, 2021). Because publishing is an integral part of academic research, no publication output is a strong indication that a scholar may have left academia.

2.2. Starting and Stopping a Research Career

Individual differences in publishing careers relate to labor supply and demand factors. On the supply side, the availability of academic and nonacademic vacancies determines which of these options is viable. The number of applicants willing to apply for or continue a specific job constitutes the demand factor.

On the supply side of the academic labor market, the number of available positions decreases with each subsequent rank in the academic hierarchy, with the exception of the step from associate to full professor (de Goede et al., 2013). This automatically implies that some Ph.D.s will not progress through the ranks. Academic contracts are additional prohibitive factors in academic labor supply. Scarcity in permanent appointments below or sometimes at the rank of associate professor cause high mobility between universities among postdocs and assistant professors (de Goede et al., 2013; van der Weijden, Teelken et al., 2016). During each of these transitions, researchers face competition. This may push scholars out of academia in pursuit of employment elsewhere, while those who have attained a permanent position in academia tend to remain in these positions until promotion or retirement (Balsmeier & Pellens, 2014; de Goede et al., 2013).

On the demand side, individuals should be willing to apply for specific jobs. Following the Effort-Reward imbalance model, academics decide to leave or change professions if they perceive that the effort they exert at work is not properly compensated by financial rewards, esteem, and job security (Dorenkamp & Weiß, 2018; Siegrist, 1996). Academics often work under time pressure, have to secure external funding for research, carry responsibilities towards students and mentees, and work overtime to meet workloads (Jongsma, Sanders, & Weeda, 2020; Kinman, 2001). As a consequence, university staff report disproportionate levels of work stress compared to the general labor population (Watts & Robertson, 2011). The strain that academics experience, however, is not always on par with the rewarding job elements. Academic jobs are characterized by low levels of job security, and depending on the field, salaries for research positions in universities below the rank of professor are mostly not competitive with those offered in industry (Koier & de Jonge, 2018; Nicholls, Nicholls et al., 2022). This may lead some scholars to opt for a nonacademic career (European Science Foundation, 2017; Roach & Sauermann, 2010; Waaijer, Teelken et al., 2018).

2.3. Gender and Ethnic Background *vis-à-vis* Publishing Start and End

The decreasing share of women as one moves up the academic career ladder implies they either leave academia sooner or remain in lower positions until the end of their career. The number of Moroccan-Dutch, Turkish-Dutch, Surinamese-Dutch, and Caribbean-Dutch starting an academic career is low, mainly because of their lower likelihood to hold master's degrees (CBS, 2020). So far, objective numbers on their representation at different career stages are simply not present. However, previous research has established that scholars from these minority groups experience their sociocultural background to be a barrier to career

advancement (Koens, Vogelezang, & Vennekens, 2022). Women and scholars with an ethnic minority background are thus still a distinct minority in Dutch academia. Being a numerical minority may negatively impact the availability of role models and social support at the workplace. It also activates stereotypes among colleagues and can lead to a "chilly climate" (Richman, Vandellen, & Wood, 2011). Although our data does not allow us to test exactly which mechanisms contribute to the reported inequalities, we outline several potential explanations as to why we expect to find gender and ethnic inequalities in academic careers in the Netherlands.

First, negative incidents that are predominantly experienced by women and ethnic minorities may push these scholars out of academia at higher rates. As a result, the demand for academic positions may be lower among scholars of these groups, and so these groups may start and continue research careers at lower rates. The phrase *chilly climate* is often used to describe systematic exclusion and devaluation of individuals from underrepresented groups, such as women and ethnic minorities, in academia (Maranto & Griffin, 2011; Williams, 2019). As a consequence, women and ethnic minority scholars feel socially excluded from informal networks in academia (Gardner, 2012; Howe-Walsh & Turnbull, 2016; Settles, Buchanan, & Dotson, 2019). There is also evidence that the academic contributions of women and ethnic minorities are underrecognized (Cheng & Weinberg, 2021; Hofstra et al., 2020; Kim et al., 2022; Sarsons, Gërxhani et al., 2021). Women report sexual harassment, threatening behavior from colleagues, and humiliation in front of other colleagues (Naezer, van den Brink, & Benschop, 2019). The circumstances listed above often cause stress and lower job satisfaction among scholars from numerical minority groups, leading them to opt out of academia at higher rates (Spoon, LaBerge et al., 2023). Women and ethnic minorities who remain in academia develop strategies to cope with identity threats and negative aspects of the chilly climate (Griffin, Pifer et al., 2011; Verkuyten, Thijs, & Gharaei, 2019). Yet, being a numerical minority and experiencing a hostile work environment is likely to negatively affect productivity (Eagan & Garvey, 2015) and, consecutively, hampers climbing the academic ladder.

On the supply side of the academic labor market, hiring biases can negatively affect the chances of underrepresented groups obtaining academic positions, and hence lower their chances to start or continue their career as a researcher. Studies on gender discrimination in academic hiring find that women applicants are judged as less competent and hirable, receive less positive and shorter recommendation letters, and their unrelated personal situations are more often taken into account (Correll, Benard, & Paik, 2007; Moss-Racusin, Dovidio et al., 2012; Rivera, 2017; Trix & Psenka, 2003; van den Brink & Benschop, 2012). The few studies on ethnic discrimination in academic hiring report similar findings. Faculty at U.S. universities are less likely to respond to fictional requests to discuss pursuing a Ph.D. when the request is submitted by a racial minority (Milkman, Akinola, & Chugh, 2015). In sum, both supply and demand side factors disproportionately prevent women and ethnic minorities from starting and continuing academic careers.

Furthermore, publishing career trajectories may be influenced by differences in publication practices by gender and ethnicity. Given that researchers are primarily evaluated on their publication track record, having fewer or less high-status publications could decrease scholars' chances when applying for external funding and academic positions (van den Brink & Benschop, 2012). Although some studies show that women tend to publish less and have less research time than men, other studies find that gender gaps in publication productivity diminish when controlling for gender differences in career age and career breaks (Cameron, White, & Gray, 2016; Link, Swann, & Bozeman, 2008; Misra, Lundquist, & Templer, 2012). Mixed

findings also appear when further zooming in on publication practices by gender: While some find that women are less likely to occupy prominent first-, last- and solo-author positions, others find no gender differences in publishing solo-authored work (Kwiek & Roszka, 2022; West et al., 2013). Literature on productivity by ethnicity is scarce, but a few studies on racial differences in publishing productivity in the United States find that racial minority academics tend to have fewer publications compared to White academics of similar career ages, which has been attributed to higher levels of stress due to (subtle) discrimination (Carr, Raj et al., 2018; Eagan & Garvey, 2015). Potential gender and ethnic differences in publication track record could further help to explain why scholars from these groups have shorter research careers.

Based on the theoretical arguments and empirical findings discussed above, we hypothesize that:

Hypothesis 1: Women are less likely to start publishing than men

Hypothesis 2: Ethnic minority scholars are less likely to start publishing than ethnic majority scholars

Hypothesis 3: Women stop publishing earlier than men

Hypothesis 4: Ethnic minority scholars stop publishing earlier than ethnic majority scholars

2.4. Cohort Trends and Gender Inequality

The opportunity to continue in research positions after a Ph.D. varies by cohort. Doctoral degrees steadily increased between 1990 and 2019 (see Figure 1), yet the number of academic positions has not grown as much (de Goede et al., 2013). Consequently, competition for research positions is higher for more recent than for older cohorts of doctoral recipients, and recent cohorts increasingly have to find employment outside of Dutch universities after

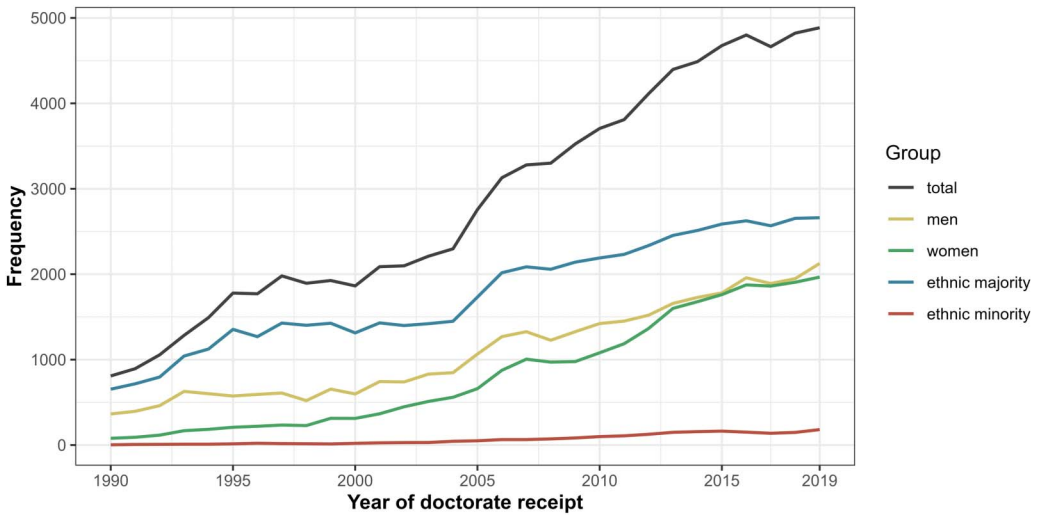

Figure 1. Yearly number of doctorates awarded.

obtaining their doctorate. Another consequence of the increased competition at early career stages could be that younger Ph.D. cohorts, especially, increasingly work in temporary positions and terminate their publishing career sooner, because they fail to obtain a permanent position. But how do these general cohort trends impact gender inequality over time? Below, we will outline several mechanisms that could have impacted gender inequality over time.

The underrepresentation of women in Dutch academia has garnered growing interest. Over the last 30 years, numerous initiatives have been developed by organizations and funding bodies to improve the position of women in academia (LNVH, 2014; NWO, 2022). Universities have also increasingly committed to gender equality ideals by formulating explicit goals for gender representation in the professoriate, by creating more opportunities for women and underrepresented minorities, and by appointing diversity officers (Ministry of Education Culture and Science, 2020). These combined efforts may have contributed to the increased representation of women in academia and, as a direct or spillover effect, in senior positions. As such, women in younger cohorts might be more likely to start a publishing career after their Ph.D., and may be more likely to publish longer compared to women in older cohorts. That said, according to Täuber (2019) equal opportunity schemes could also have unintended negative consequences for women's academic careers.

The combination of reversing gender gaps in higher education (i.e., the majority of master's degrees are now obtained by women) and the growing number of Ph.D. positions has allowed women to become equally represented at the Ph.D. level. The increased competition after the Ph.D. stage, however, implies that self-promotion has become more important. Women scholars are less likely to cite their own work and promote their publications online (King, Bergstrom et al., 2017; Peng, Teplitskiy et al., 2022). When they do engage in self-promotion, women are more likely to be penalized for it than men (Krings, Manoharan, & Mendes de Oliveira, 2022). Furthermore, preferences for same-attribute candidates may lead hiring committees to select mostly men candidates (Rivera, 2020; van den Brink & Benschop, 2012).

Older Ph.D. cohorts entered academia at a time when views on women's employment were traditional (Kraaykamp, 2012). Perceptions of academic work as antithetical to femininity, may have contributed to gender bias in favor of men applicants (Bleijenbergh, van Engen, & Vinkenburg, 2013). Perhaps hiring committees actively inquired about maternity, work patterns, partners, or employment views, selecting only those who diverge minimally from traditional masculine views on the "ideal academic," yet filtering out otherwise exceptional candidates that did not fit in (Rivera, 2017; van den Brink & Benschop, 2012; Williams, 2005). As the number of women among doctorates and in junior research positions increased, the profile of women in academia has likely become diversified (Rathenau Instituut, 2022). Consequently, former differences between men and women in who entered into academic careers may have evened out. Nevertheless, gender inequality may still arise, but now at a later point in the academic career. So, while gender equality programs may have contributed to increased entry into academic careers, women may still be disproportionately pushed or pulled out of academia once they are in.

Since the 1980s, universities in the Netherlands have become more dependent on external funding (De Boer, Enders, & Leisyte, 2007). As a result, grants and publication track record have become more important metrics in performance evaluations and careers of researchers (Koens et al., 2022). Women publish less than men, are less likely to occupy prominent author positions, and experience disadvantages in grant allocation processes (Huang et al., 2020; Meho, 2021; van der Lee & Ellemers, 2015; West et al., 2013). As a consequence of a growing

focus on output as performance metrics, women's chances in academic careers may have decreased in recent cohorts compared to older cohorts.

Although we cannot yet distinguish the outlined mechanisms directly, we expect that the increased competition on the academic labor market and the growing focus on output outweigh the questionable impact of recent diversity efforts and changes in selection of candidates. This leads to following set of hypotheses:

Hypothesis 5: Women are less likely to start publishing than men, and this gender difference is greater in younger cohorts

Hypothesis 6: Women are more likely to stop publishing than men, and this gender difference is greater in younger cohorts

We do not derive hypotheses on changes in the impact of ethnic background on careers, because there is very little theoretical work to build on. Instead, we answer the research question of how ethnicity-based inequality in research careers has developed over the last three decades by taking an exploratory approach.

3. DATA AND METHODS

3.1. Data

This study introduces a database of dissertations capturing the nearly complete population of Ph.D. recipients in the Netherlands (1990–2021): the "Dutch Doctoral Database." We excluded data from before 1990 because the coverage of the database before this time is limited due to the availability of the internet and archival software. Figure S1 (Supplementary material) further summarizes the coverage from 1990 onwards, showing that the coverage of the Dutch Doctoral Database compared to the register data on doctorates is good. This data set contains 95,130 Ph.D.s and associated metadata, such as names, dissertation titles, abstracts, supervisory team, graduation year, and university, and full text dissertation URLs. Dissertation metadata was collected from the National Academic Research and Collaborations Information System (NARCIS). NARCIS was a metadata portal for researchers based in the Netherlands. NARCIS is the largest archive of research data in the Netherlands, containing information on researchers working at Dutch universities, including their publications (and dissertation), patents, grants, and data sets. As such, NARCIS provided a detailed overview of researchers in the Netherlands and their affiliations, careers, and output. NARCIS collected these metadata through a daily crawl of research repositories of Dutch universities. Essentially, each university hosted its own repository where researchers' output was collected—through end-of-year lists that researchers within a university had to fill out—and NARCIS compiled this information for all universities and researchers in the Netherlands. What we did in this study is to collect dissertation metadata from the dissertation pages of doctorates at NARCIS. Each research item (e.g., publication, dissertation, award) has its own NARCIS page with metadata information (e.g., year, title, authors). We selected all dissertations available in NARCIS from 1990 to 2021 and gathered that metadata information (abstracts, supervisors, university, and so forth). In addition, research items on NARCIS are in many cases linked to individual researchers' profiles through a unique personal identifier, essentially providing a clean author-disambiguated record for each individual researcher. Hence, if there was a personal record associated with a dissertation, we collected these doctoral recipients' personal NARCIS pages, which thus contained publication records, projects, grants, and so forth. Researchers

either construct profiles themselves or are registered by repository managers at the researcher's institution. Individual researchers with a personal profile can thus be linked to dissertations and other output. This renders this repository an advantageous database, as the data are mostly curated by researchers themselves via (yearly) lists of output and activities at university repositories. From the compiled information (i.e., from dissertation to linked publication records and associated metadata on yearly productivity, coauthors, and university affiliations) we can construct resumes from the start to the finish of academic publishing careers. In total, we consider 95,130 individual researchers (i.e., dissertations extracted from NARCIS) from the outset of their academic careers, when they have obtained a doctorate. We analyze the publishing careers of these researchers to assess publishing starts after the doctorate, and, if they do start publishing, how long it takes until they cease to publish. We outline the measures we extracted from these metadata next.

3.2. Dependent Variable I: Starting to Publish

We construct a binary variable for whether an individual has a personal NARCIS profile and at least one published book, chapter, or journal article in the 3-year period directly following the Ph.D. year. For instance, for a scholar who graduated in 2009, we consider whether this scholar has a profile with at least one publication from 2010, 2011, or 2012. Doctorates with dissertations published after 2019 were excluded from this analysis because we consider output in the 3 years following doctorate receipt, and publication data is available until 2022. Hence, we select doctoral degrees awarded 1990–2019 (N = 85,788) and of this sample, 15,826 Ph.D.s (approximately 18%) "started to publish" somewhere after their Ph.D.

3.3. Dependent Variable II: Stopping Publishing

We measure whether individuals remain active in publishing based on publication output after the doctorate. For these analyses, we start with the Ph.D.s who "started to publish" (N = 15,826). If a scholar subsequently has not published any article, book chapter, or book in the year of interest or the subsequent 2 years, the scholar is considered to have stopped their publication career. By looking forward, we consider the periods between submission and publication of manuscripts, or other dynamics where scholars shortly stop publishing (e.g., child-rearing, disciplinary differences). The last cohort of doctoral recipients included in these analyses is 2018, because we cannot determine yet whether Ph.D.s from cohort 2019 have stopped publishing. Thus, we select Ph.D.s between 1990 and 2018 (N = 15,021), and output in 1991–2022. However, robustness analyses show that the results do not change substantively by broadening the publication window to 5 years (i.e., year of interest and subsequent 4 years), with the exception of the interaction of gender by cohort. This change is discussed in the results sections under "stopping publish."

3.4. Gender

The researcher's gender is not reported in dissertations or NARCIS profiles. Therefore, we assign gender on the basis of first names, following other work (Huang et al., 2020; Madsen, Nielsen et al., 2022; Ross, Glennon et al., 2022). First names were gathered from dissertation metadata and profile metadata as recorded on NARCIS. In this way we gathered first name information for 41% of our sample. We then scraped the full-text dissertation PDFs from the university repositories, and because the first name of the Ph.D. candidate is listed on the (more or less) standardized "title page," this enabled us to increase the first name recall to 74.4%.

Subsequently, first names were matched to a Dutch public civil registry database (Meertens Instituut, n.d.) on name-by-gender frequencies. We assigned gender based on a simple majority rule. When names split equally between both genders, gender was set to missing (2% of unique first names). Unfortunately, not all names are in the used database, but we were able to assign gender to N = 61,549 (64.7%) individuals using this method. We then increased the gender recall using genderizeR (Wais, 2016). This database consists of first name and gender information for 114.5 million individuals collected from social media profiles in various countries (Demografix ApS, n.d.). We used the Dutch, Moroccan, and Turkish genderizeR databases. Overlap in gender labels of the two methods was 90.5% (our first method takes priority). Using genderizeR, the gender recall increases to N = 65,573 (68.9%).

3.5. Ethnicity

For ethnicity, we created three categories into which researchers are classified: "ethnic majority," "ethnic minority," and "other and missing." The ethnic minority category captures the four most common Dutch ethnic minority groups (Turkey, Morocco, Suriname, and the Dutch Caribbean islands). We combine these different ethnic groups together so as to increase their cell sizes, and because our hypotheses do not require a distinction between the four origin countries. The "other" category includes ethnic minorities from all other origin countries and the Ph.D. recipients for whom we were not able to match an ethnic background. We assume—after a visual inspection of the last names—that these Ph.D.s were born outside the Netherlands as well, which is further evidenced by the fact that their last name could not be linked to name records in the register database (i.e., these last names are uncommon in the Netherlands). Our hypotheses on ethnicity are tested by contrasting the ethnic majority group with the ethnic minority group, the traditionally ethnically minoritized individuals in the Netherlands. We cannot distinguish between different generations of migrants with our ethnicity measure. Yet we expect that most scholars we classify as ethnic minority are second-generation migrants, given that their names occur frequently in Dutch register data. Note that this distinction is also not strictly necessary, given that our theoretical mechanisms are based on *perceptions* of ethnicity that are likely tied to both names and appearances (Tuppat & Gerhards, 2021; Zschirnt & Ruedin, 2016). We assigned ethnicity in three steps using scholars' last names and birth country. As a first step, we used scholars' last names as a signal of their ethnic background. Last names were present for all doctoral recipients. Last names were linked to another Dutch public civil registry database (CBG, n.d.), which provides detailed information on the geographical origins of last names (e.g., the last name "Cengiz" originates from Turkey). We classified scholars as "ethnic minority" when the database indicated that the name was Turkish, Moroccan, Surinamese, or Dutch Caribbean. For Dutch names, the database does not provide geographical origin information, but rather provides more information on the linguistic origin of the name. Hence, we classified scholars as "ethnic majority" when no origin information was present, but the database did provide other information about the last name. Using this database, we were able to determine ethnicity for the large majority of our sample (N = 68,823 or 72.3%). As a second step, we used a list of authorized Moroccan first names. This is based in Moroccan law, which, until recently, governed which first names were allowed for children (Haskouri, 2021). We then classified all scholars as "ethnic minority" whose last name matched this list, increasing the recall to 72.7%. As a third step, we considered scholars' birth countries. On dissertation title pages, some universities require doctoral recipients to note their birth place. We further classified researchers as "ethnic minority" when they were born in Turkey, Morocco, Suriname, or the Dutch Caribbean islands. This increased the recall to 77.4%.

3.6. Ph.D. Cohort

To assess trends in starting and stopping publishing, we analyze cohorts of Ph.D. recipients as the publication year of the dissertation, centered on the earliest year (i.e., 1990).

3.7. Confounding Variables

We control for the university at which the researcher obtained doctorate, research field, prior productivity, and career age. We include fixed effects for the university at which individuals obtained their doctorate to account for differences in publication cultures and/or diversity and hiring policies[2]. Additionally, we include the academic field in which an individual was active during their Ph.D., based on the field associated with their publications in journals. We assign fields to publications based on the National Research Council classification linked with Web of Science indexed journals. The field of the scholar is subsequently determined by taking the field that is assigned to the majority of a scholars' publications in the period between 4 years prior to and 2 years after the dissertation, so as to account for different supply and demand factors and publication cultures in fields. Fields may differ, for instance, in the importance attached to various types of publications (e.g., books are more important in humanities, patents are mostly used in engineering and life sciences) or the frequency at which one is expected to publish. To consider earlier productivity, we include the number of prior publications as the log-transformed mean number of publications in the 3 years preceding the year of interest (regardless of type of publication and author position). We only include publications up to 3 years prior, because the return on publications tends to drop off relatively quickly. Previous publications are not included in the set of analyses for "starting to publish," because we only have publications for scholars with a personal NARCIS profile. Given that the presence of a personal NARCIS profile tends to coincide with continued research careers, inclusion of prior productivity in the analyses of "starting to publish" would introduce selectivity. We further control for the effects of career age, measured in years since obtaining doctorate, to model that scholars are not as prolific in each career stage.

We analyze two dependent variables. For "starting to publish," we include gender, ethnicity, Ph.D. cohort, and institution of doctorate. For "stopping publish," all of the covariates are included. More detailed information on the construction of all our variables can be found on our replication website (https://ammulders.github.io/amatteroftime/). Tables 1 and 2 show descriptive statistics for the samples of our first and second dependent variables.

3.8. Analytical Strategy

We employ logistic regression models for our dichotomous variable "starting to publish." We subsequently analyze the time it takes (in years) before scholars stop publishing. We treat time until event as a continuous variable. Naturally, not all scholars experienced this event in our time window due to right-censoring. Therefore, we estimated a continuous time survival model. Preliminary analyses demonstrated that a log-normal distribution fitted our data best[3].

[2] We exclude the Open University because institutionally it operates very differently compared with the other 13 universities (distance education, part-time education (for adults), far fewer Ph.D.s, and so forth). For instance, in 2022, the Open University had only 24% as many conferred doctorates as the research university with the second-lowest number of Ph.D.s (26 versus 226).

[3] A discrete-time survival model using a complementary log-log link function led to substantially similar conclusions.

Table 1. Descriptive statistics for analyses "starting to publish" (N = 85,788). (Source: Dutch Doctoral Recipients (D-cubed) data 1990–2019)

	Min	Max	Mean	SD
Gender				
Man	0	1	0.38	
Woman	0	1	0.29	
Missing	0	1	0.33	
Ethnicity				
Ethnic majority	0	1	0.62	
Ethnic minority	0	1	0.02	
Caribbean	0	1	0.01	
Turkish	0	1	0.01	
Moroccan	0	1	0.01	
Other	0	1	0.36	
University				
Erasmus University	0	1	0.07	
Leiden University	0	1	0.06	
Radboud University	0	1	0.09	
University of Groningen	0	1	0.12	
Delft University of Technology	0	1	0.08	
Eindhoven University of Technology	0	1	0.09	
Tilburg University	0	1	0.03	
Maastricht University	0	1	0.06	
University of Twente	0	1	0.06	
Utrecht University	0	1	0.09	
University of Amsterdam	0	1	0.12	
Vrije University Amsterdam	0	1	0.08	
Wageningen University and Research Centre	0	1	0.07	
Ph.D. Cohort	0	29	18.39	7.87
Starting to publish	0	1	0.18	

We did not study multiple inactivity spells, and only consider the first inactive period. All models are estimated in R.

The model build-up is similar across dependent variables. Model 1 tests whether starting to publish and time until one stops publishing varies by gender (**H1** and **H3**); Model 2 considers differences by ethnicity (**H2** and **H4**); Model 3 includes gender, ethnicity, and the other

Table 2. Descriptive statistics for analyses "stopping publishing" (N = 15,021). (Source: Dutch Doctoral Recipients (D-cubed) data 1990–2018)

	Min	Max	Mean	SD
Gender				
Man	0	1	0.44	
Woman	0	1	0.34	
Missing	0	1	0.22	
Ethnicity				
Ethnic majority	0	1	0.67	
Ethnic minority	0	1	0.02	
Other	0	1	0.32	
University				
Erasmus University	0	1	0.04	
Leiden University	0	1	0.03	
Radboud University	0	1	0.19	
University of Groningen	0	1	0.02	
Delft University of Technology	0	1	0.01	
Eindhoven University of Technology	0	1	0.01	
Tilburg University	0	1	0.01	
Maastricht University	0	1	0.09	
University of Twente	0	1	0.12	
Utrecht University	0	1	0.13	
University of Amsterdam	0	1	0.10	
Vrije Universiteit Amsterdam	0	1	0.09	
Wageningen University and Research Centre	0	1	0.16	
Field				
Biological and health sciences	0	1	0.36	
Physical and mathematical sciences	0	1	0.15	
Social and behavioral sciences	0	1	0.13	
Engineering	0	1	0.10	
Agricultural sciences	0	1	0.09	
Humanities	0	1	0.03	
Missing	0	1	0.14	

Table 2. (*continued*)

	Min	Max	Mean	SD
Ph.D. cohort	0	28	18.46	7.04
Previous publications	0.00	2.05	0.48	0.30
Stopping publishing	0	1	0.08	

Note: Summary statistics for "previous publications" and "stopping publishing" are calculated at the level of person-periods instead of at the level of individuals.

covariates simultaneously[4]; Model 4 estimates gender and ethnicity on starting and stopping publishing by Ph.D. cohort (as a linear function, **H5** and **H6**). These analyses are found in Table 3 ("starting") and 4 ("stopping").

We present our results in different ways. We summarize table output in terms of log-odds ("starting") and log-survival times ("stopping"). Because we use nonlinear models and additionally include interaction terms, we will report the relevant estimated average marginal effects in the running text, including associated *p*-values based on bootstrap standard errors (Norton, Wang, & Ai, 2004). Finally, we visually summarize the predicted probabilities to start publishing and predicted survival times by gender and ethnic background. We calculate these predicted probabilities and survival times by assigning one specific group membership to all individuals in the sample, while leaving all other covariates unchanged, and then taking the average of the predicted probabilities or survival times for all scholars in the sample.

4. RESULTS

4.1. Starting to Publish

The results for "starting to publish" are presented in Table 3. In contrast to our first hypothesis, we find that the probability to start publishing is somewhat higher for women than for men (B = .05, $p < .05$, Model 1). Figure 2 shows predicted probabilities to start publishing for scholars from the different groups (men, women, ethnic minority, ethnic majority). The predicted probability to start publishing is around .22 for both women and men (see Figure 2, panel A). We do find evidence in line with Hypothesis 2: Ethnic minorities are less likely to start publishing than majority members ($B = -.38$, $p < .001$, Model 2). The predicted probability to start publishing is .20 for ethnic majority researchers and significantly lower at .14 for ethnic minorities (see Figure 2, panel B).

In Model 3, we assessed differences in starting to publish by gender and ethnicity and control for Ph.D. cohort and university. If women or ethnic minorities are concentrated in cohorts or universities where chances for starting to publish are lower, these two factors could provide an explanation for any differences in Models 1 and 2. When accounting for these covariates, we find no gender differences in the probability of starting to publish (B = .002, p = .94, Model 3). The AME of gender is also not significant (B = .0002, p = .94). We have to reject Hypothesis 1. However, we cannot reject Hypothesis 2. The probability to start publishing remains smaller for ethnic minorities compared to ethnic majority researchers once we control for university

[4] Preliminary analyses showed that starting to publish varied nonlinearly by Ph.D. cohort. To capture nonlinear trends we use B-splines by splitting the cohort variable into a set number of intervals (knots), and then fit piecewise polynomial functions between each of these intervals. This ensures that the polynomials join at these intervals for a smooth curve. We describe our procedure for modeling cohort trends in more detail on our replication website.

Table 3. Logistic regression on starting to publish

	Model 1		Model 2		Model 3		Model 4	
	B	SE	*B*	SE	*B*	SE	*B*	SE
Intercept	−1.31***	0.01	−1.40***	0.01	−3.03***	0.10	−2.78***	0.11
Gender: ref = man								
Woman	0.05*	0.02			0.00	0.02	−0.07	0.07
Missing	−0.67***	0.02			−1.46***	0.03	−2.55***	0.07
Ethnicity: ref = majority								
Minority			−0.38***	0.06	−0.36***	0.07	−0.44	0.27
Other			−0.22***	0.02	−0.16***	0.02	−0.26***	0.07
University: ref = Erasmus University								
Leiden University					−0.02	0.07	0.02	0.07
Radboud University					2.04***	0.05	2.02***	0.05
University of Groningen					−1.29***	0.08	−1.30***	0.08
Delft University of Technology					−1.06***	0.09	−0.99***	0.09
Eindhoven University of Technology					−1.16***	0.09	−1.15***	0.09
Tilburg University					0.06	0.09	0.07	0.09
Maastricht University					1.64***	0.06	1.67***	0.06
University of Twente					2.08***	0.05	2.11***	0.05
Utrecht University					1.44***	0.05	1.45***	0.05
University of Amsterdam					0.84***	0.05	0.89***	0.05
Vrije Universiteit Amsterdam					2.13***	0.06	2.03***	0.06
Wageningen University and Research Centre					3.01***	0.06	3.10***	0.06
Ph.D. cohort								
Knot #1					1.34***	0.17	1.44***	0.17
Knot #2					0.01	0.10	−0.12	0.10
Knot #3					1.72***	0.11	1.42***	0.12
Knot #4					0.58***	0.10	0.19	0.11
Knot #5					0.64***	0.11	0.26*	0.12
Knot #6					0.48***	0.10	0.09	0.11
Cohort interactions								
Ph.D. cohort * women							0.01	0.00
Ph.D. cohort * missing gender							0.06***	0.00

Table 3. (*continued*)

	Model 1		Model 2		Model 3		Model 4	
	B	SE	*B*	SE	*B*	SE	*B*	SE
Ph.D. cohort * ethnic minority							0.00	0.01
Ph.D. cohort * other ethnicity							0.00	0.00
AIC	80,864		81,883		65,547		65,211	
N	85,788		85,788		85,788		85,788	

* $p < .05$.

** $p < .01$.

*** $p < .001$.

and Ph.D. cohort ($B = -.36$, $p < .001$, Model 3). This is also corroborated by the AME of −0.04 ($p < .001$).

Next, we test whether gender and ethnic differences in starting to publish changed for more recent cohorts by including interaction effects with the Ph.D. cohort. The estimated interaction effect of gender by cohort is almost zero ($B = .005$, $p = .10$, Model 4), but more importantly, the AME of the interaction is also close to zero and nonsignificant (AME = .001, $p = .15$). We thus conclude that the gender gap in starting to publish remained constant for successive Ph.D. cohorts and we have to reject Hypothesis 5. In Figure 3, we plotted the predicted probabilities of men and women to start for each of the cohorts, while controlling for all other covariates in Model 4. The figure confirms that predicted probabilities to start for different cohorts of men and women are similar. While women appear to have a somewhat higher probability of starting compared to men in later cohorts, the confidence intervals do overlap, indicating that this difference is not significant.

Similarly, we find a nonsignificant interaction effect of ethnicity by cohort ($B = .005$, $p = .71$, Model 4). The absence of a cohort interaction effect is reinforced by the small, nonsignificant average marginal effects (AME = .001, $p = .54$). Figure 4 plots predicted probabilities to

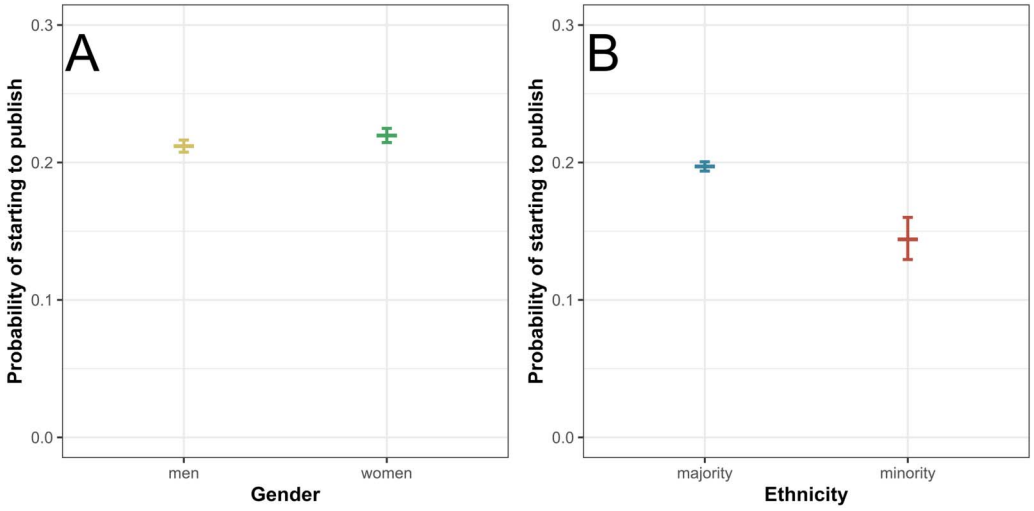

Figure 2. Predicted probabilities of starting to publish by gender (A) and ethnicity (B).

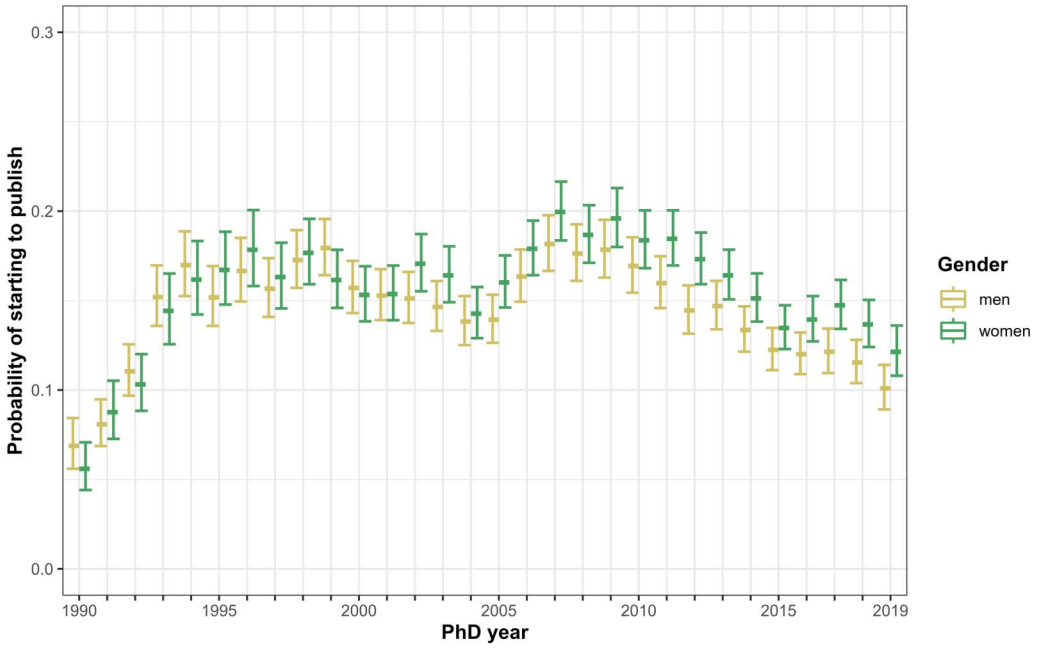

Figure 3. Predicted probabilities of starting to publish by gender and Ph.D. cohort group.

start publishing for ethnic majority and ethnic minority scholars from each of the different cohorts, while controlling for all covariates included in Model 4. Caution is needed when interpreting early cohort trends by ethnicity, given the small size of the ethnic minority groups in cohorts 1990–1994. Although Figure 4 shows a consistent disadvantage for ethnic minority

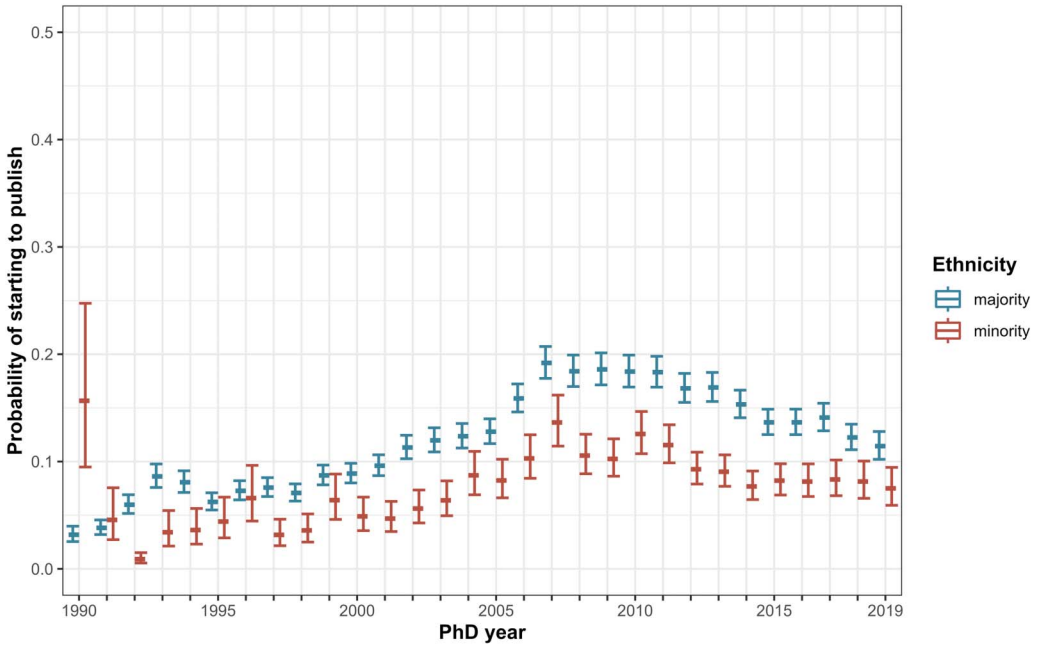

Figure 4. Predicted probabilities of starting to publish by ethnicity and Ph.D. cohort group. *Note*: Average marginal effects of ethnicity for Ph.D. years 1990–1994 should be interpreted with caution due to small sample sizes in the ethnic minority group ($n \leq 10$). The high probability of ethnic minorities to start publishing among those who obtained a doctorate in 1990 specifically is likely attributable to the small number of ethnic minorities in this cohort ($n = 3$).

scholars to start publishing, cohort trends in the size of the ethnic gaps are volatile, in line with the lack of significant average marginal effects.

4.2. Stopping Publishing

How long does it take before those who have continued publishing stop doing so? Table 4 presents the results of all survival regressions on the log-scale. Model 1 shows that women have shorter survival times compared to men by a factor of 0.83 ($B = -.19$, $p < .001$, Model 1)[5]. Figure 5, panel A, depicts predicted survival times by gender based on Model 1 and shows that men are predicted to stop publishing around 16 years and women 13 years after obtaining their doctorate. Our results thus provide support for our third hypothesis: Women stop publishing earlier than men. Consistent with Hypothesis 4, we find that ethnic minorities stop publishing earlier than ethnic majority members. Survival times are shorter for ethnic minorities by a factor of 0.63 ($B = -.45$, $p < .001$, Model 2). Where ethnic majority researchers take around 15 years to stop publishing, ethnic minority researchers do so after around 9.5 years (see Figure 5, panel B, based on Model 2).

In Model 3, we include gender, ethnicity, university of doctorate, field, Ph.D. cohort, and previous publications. Those who obtained a doctorate at the University of Groningen, or at one of the two largest technical universities (Delft University of Technology and Eindhoven University of Technology) have longer active publishing careers compared to those at other universities. Furthermore, we observe that scholars active in the humanities or social and behavioral sciences have longer publication careers on average, while those in physical and mathematical sciences have shorter publication careers. Finally, recent cohorts of doctoral recipients have shorter survival times ($B = -.03$, $p < .001$, Model 3), while those with more prior publications have longer survival times ($B = 1.50$, $p < .001$, Model 3).

Survival times are significantly shorter for women and ethnic minorities, though the coefficients decrease with the control variables in Model 3. Women's survival time is still significantly shorter than men's, by a factor of 0.92 ($B = .08$, $p < .001$, Model 3). The AME of women is −1.65 ($p < .001$). Survival times are also significantly shorter for ethnic minority researchers compared to the ethnic majority group: The survival time of ethnic minorities is now 0.89 times that of ethnic majority researchers ($B = -.12$, $p < .05$, Model 3). The AME of ethnic minority researchers is 2.19 ($p < .01$). Thus, the shorter career spans of women and ethnic minorities are partly explained by differences in survival time across universities, academic fields, Ph.D. cohorts, and differences in survival time between scholars with different publication track records.

In Model 4, Table 4, we estimated cohort trends in gender and ethnicity when stopping publishing. The results reveal that gender inequality *increased* across Ph.D. cohorts. For each 1-year increase in Ph.D. cohort, the expected survival time for women is a factor of 1% (i.e., $e^{-0.01}$) lower than for men ($B = -.01$, $p < .05$, Model 4). Although the model results indicate a small increase in gender inequality by cohort, the average marginal effect of the gender-cohort interaction is not significant (AME = −.08, $p = .25$). Furthermore, the interaction effect is also nonsignificant when estimating the model with a 5-year publication window. Figure 6 graphically summarizes the predicted survival times by gender based on the parameter estimates of Model 4 and shows that our results may have been driven by the oldest Ph.D. cohorts. Figure 6 shows a rather constant difference in predicted survival time between men and women who obtained their Ph.D. after 1995, with men having slightly longer predicted survival times than women. In the first cohorts, we see that the differences in predicted survival time between men and women are starker, but also more volatile. We therefore re-estimated

[5] Calculated as $e^{-0.19}$.

Table 4. Log-normal regression analyses on stopping publishing

	Model 1		Model 2		Model 3		Model 4	
	B	C.I.	*B*	C.I.	*B*	C.I.	*B*	C.I.
Shape	2.19	[2.16, 2.21]	2.11	[2.09, 2.13]	2.25	[2.17, 2.34]	2.24	[2.15, 2.33]
Scale	1.06	[1.05, 1.08]	1.07	[1.06, 1.09]	0.85	[0.83, 0.86]	0.85	[0.83, 0.86]
Gender: ref = man								
Woman	−0.19	[−0.23, −0.15]			−0.08	[−0.12, −0.05]	0.02	[−0.07, 0.12]
Missing	−0.62	[−0.67, −0.58]			−0.44	[−0.48, −0.40]	−0.66	[−0.76, −0.55]
Ethnicity: ref = majority								
Minority			−0.45	[−0.59, −0.32]	−0.12	[−0.22, −0.01]	−0.14	[−0.53, 0.26]
Other			−0.38	[−0.42, −0.34]	−0.10	[−0.13, −0.07]	−0.02	[−0.12, 0.08]
University: ref = Erasmus University								
Leiden University					−0.05	[−0.17, 0.06]	−0.04	[−0.16, 0.08]
Radboud University					−0.21	[−0.28, −0.13]	−0.20	[−0.27, −0.12]
University of Groningen					0.61	[0.46, 0.76]	0.61	[0.46, 0.76]
Delft University of Technology					0.37	[0.16, 0.57]	0.39	[0.19, 0.60]
Eindhoven University of Technology					0.50	[0.34, 0.66]	0.52	[0.35, 0.68]
Tilburg University					−0.44	[−0.58, −0.29]	−0.42	[−0.56, −0.27]
Maastricht University					−0.02	[−0.11, 0.06]	−0.00	[−0.09, 0.08]
University of Twente					−0.61	[−0.69, −0.52]	−0.58	[−0.67, −0.50]
Utrecht University					−0.18	[−0.27, −0.10]	−0.16	[−0.25, −0.08]
University of Amsterdam					−0.05	[−0.14, 0.04]	−0.03	[−0.12, 0.05]
Vrije Universiteit Amsterdam					−0.05	[−0.14, 0.04]	−0.03	[−0.12, 0.06]
Wageningen University and Research Centre					−0.00	[−0.09, 0.08]	0.01	[−0.07, 0.10]
Field: ref = Biological and health sciences								
Physical and mathematical sciences					−0.20	[−0.25, −0.16]	−0.20	[−0.25, −0.16]
Social and behavioral sciences					0.19	[0.15, 0.24]	0.19	[0.14, 0.24]
Engineering					−0.12	[−0.18, −0.06]	−0.12	[−0.18, −0.06]

Table 4. (*continued*)

	Model 1		Model 2		Model 3		Model 4	
	B	C.I.	*B*	C.I.	*B*	C.I.	*B*	C.I.
Agricultural sciences					0.05	[−0.01, 0.11]	0.04	[−0.01, 0.10]
Humanities					0.29	[0.21, 0.38]	0.29	[0.21, 0.38]
Missing field					0.29	[0.24, 0.34]	0.29	[0.24, 0.34]
Ph.D. cohort					−0.03	[−0.04, −0.03]	−0.03	[−0.04, −0.03]
Previous publications					1.50	[1.43, 1.57]	1.50	[1.43, 1.56]
Cohort interactions								
Ph.D. cohort * women							−0.01	[−0.01, −0.00]
Ph.D. cohort * missing gender							0.01	[0.01, 0.02]
Ph.D. cohort * ethnic minority							0.00	[−0.02, 0.02]
Ph.D. cohort * other ethnicity							−0.00	[−0.01, 0.00]
AIC		65,138		65,451		60,636		60,609
N		15,021		15,021		15,021		15,021

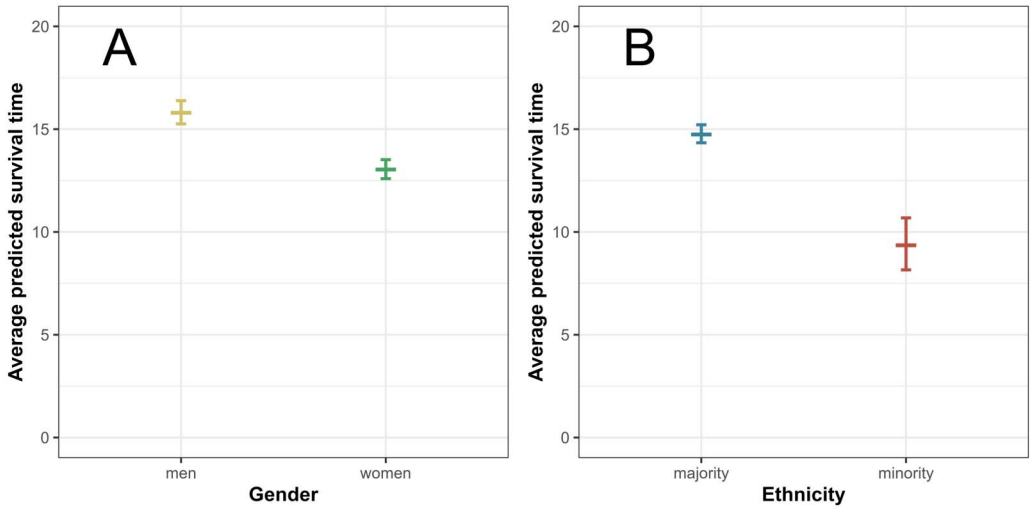

Figure 5. Average predicted survival times (in years) by gender (A) and ethnicity (B).

Model 4 without cohorts 0–2 (1990–1992). Indeed, the estimated interaction of gender by cohort is now nonsignificant ($B = -.004$, $p = .08$). As such, we find only weak support for Hypothesis 6.

We do not observe a significant estimated interaction of ethnicity by cohort ($B = .0005$, $p = .88$, Model 4). The average marginal effect of cohort for ethnic minorities is 0.09 ($p = .66$, Model 4). Figure 7 shows predicted survival times by ethnic group based on parameter estimates of Model 4. The figure confirms that ethnic minorities have shorter publication careers in almost all cohorts. Though it is difficult to discern clear cohort differences, it appears that survival times for ethnic minority and majority researchers converge in recent cohorts.

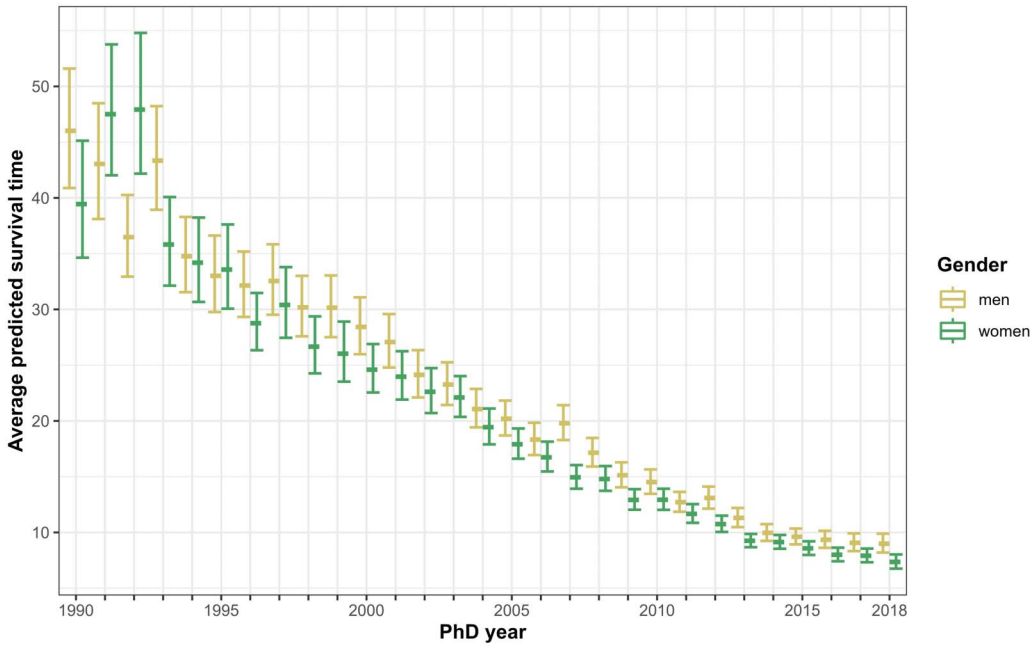

Figure 6. Average survival time (in years) by gender and Ph.D. cohort.

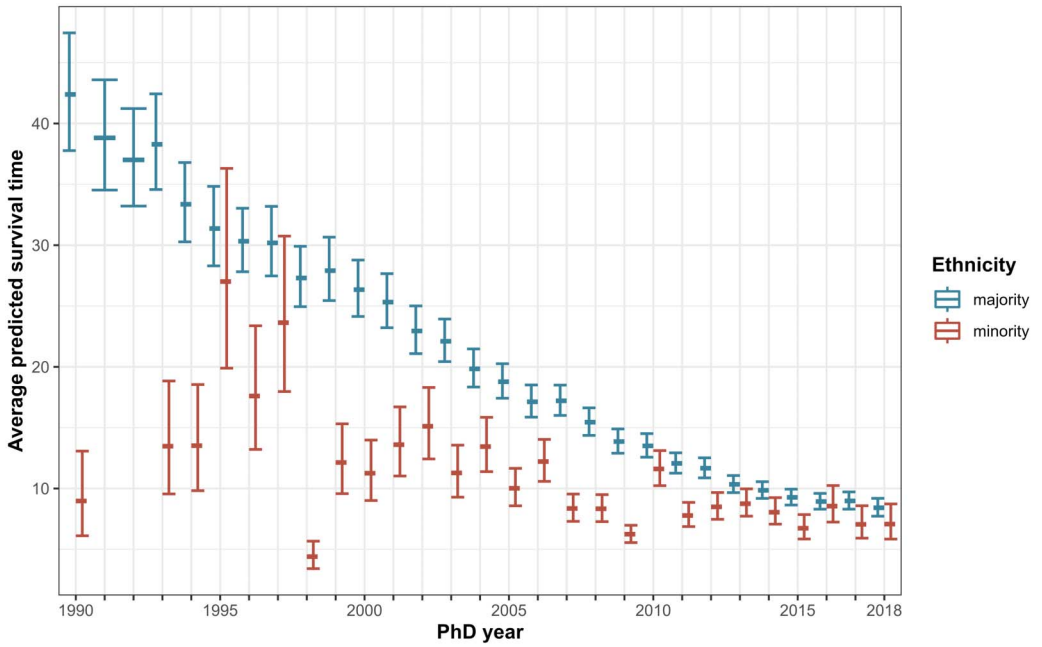

Figure 7. Average survival time (in years) by ethnicity and Ph.D. cohort.

As a robustness check, we have repeated our analyses for "stopping publish" using a wider time window of 5 years until a scholar is considered to have become inactive. These analyses reveal similar results with respect to gender and ethnic inequality in "stopping to publish."

5. DISCUSSION

We described gender and ethnic inequality in academic publication careers of 95,130, doctoral recipients in the Netherlands (1990–2021). Three main results merit attention. First, ethnic minorities are less likely to become publishing scholars after their Ph.D. compared to ethnic majority scholars, but we find no gender gaps in starting an academic career after a Ph.D. Second, when Ph.D.s do start publishing careers, both women and ethnic minorities have shorter publishing careers compared to male and ethnic majority counterparts. Third, our study shows a small increase in gender differences in publication career length at the expense of women. Hence, the underrepresentation of ethnic minorities that starts before graduate education persists among doctoral recipients. It manifests in lower entry rates in and higher exit rates from publishing careers among ethnic minority individuals. Although ethnic inequality is found across the academic publication career, gender inequality develops later in Dutch academic careers. Men and women are equally likely to start an academic publishing career after their Ph.D., but women scholars stop publishing earlier. Optimistic extrapolations predict a growing number of women professors (Poorthuis & Verdonk, 2021). Our study suggests that increased attention to academic gender equality did not yet result in similarly long publishing careers of men and women. Thus, if more women make it to the top, it is because more women complete a Ph.D. and start the journey, not because the playing field has been levelled.

How can we explain our findings? The acute nature of ethnic inequality suggests that academia may not be a salient career choice among ethnic minorities, and implies a lack of support and barriers when they do start a research career. Being one (of the few) ethnic minority

scholar(s) in a workplace heightens the risk of negative career experiences such as tokenization, harassment, and devaluation of their scholarship (Croom, 2017; Settles, Jones et al., 2022). Building on our theoretical framework, these negative experiences can firstly explain shorter career lengths of ethnic minorities when they lower the demand for academic positions among this group by diminishing ethnic minorities' intrinsic motivations to continue working in academia. Prior research corroborates that hostile and unwelcoming work environments are a major factor in turnover among scholars (Gardner, 2012; O'Meara, Lounder, & Campbell, 2014). A second potential cause for ethnic minorities' shorter publishing careers is that they have fewer opportunities to pursue research careers, due to a lack of recognition of ethnic minorities' scholarship. Scholars from underrepresented racial groups are less likely to obtain recognition for their work in the form of research funding and citations (Hofstra et al., 2020; Hoppe, Litovitz et al., 2019; Kozlowski, Larivière et al., 2022). To some extent, these differences in funding and impact rate are due to differences in specialization (i.e., scholars from underrepresented groups are more likely to focus on topics that are funded and cited less), but ethnic biases likely also factor in the evaluation of scholarly work (Hofstra et al., 2020; Hoppe et al., 2019; Kozlowski et al., 2022). Given the importance of funding and citations for continued publishing careers, these factors can also decrease opportunities for motivated ethnic minority scholars to progress in academia.

Our study is among the first to examine academic careers in the Netherlands by ethnicity. The small number of ethnic minorities in Dutch academia rendered it difficult to study ethnic differences through surveys. Our bigger data approach, combined with principled data curation techniques to detect ethnic minority scholars, enabled us to outline stark ethnic inequalities in academia. Even though our methods have increased insight into academic publishing careers of ethnic minorities, the number of identified ethnic minority scholars is too small to permit us to conduct more fine-grained analyses (e.g., intersectional analyses, or detailed ethnic categories). At first, this seems like a study limitation, yet it is in fact a substantive finding. Ethnic minorities (Dutch scholars with Moroccan, Turkish, Surinamese, or Dutch Caribbean heritage) heavily underpopulate Ph.D. degrees and then encounter additional barriers to start and continue in academia. These results further pinpoint and problematize the study of ethnic inequality in Dutch academia and underline the necessity of looking not only at gender, but also at ethnicity as a basis for inequality in academic careers. We hope that our study firstly serves as a starting point for further investigation into the causes of the reported ethnic inequalities in academic careers in the Netherlands, for instance through the use of focus groups among this specific group of academics. The outcomes of this could then be used to inform more specific policy interventions that can stimulate these underrepresented groups to consider pursuing a career in academia, and better retain them once they do start an academic publishing career.

Women may already be well-supported at the beginning of their academic trajectories, as they start publishing at similar rates than men, but more attention may be given to obstacles they experience in their mid- and late careers. The persistent gender gap in publishing career lengths is surprising given the myriad of gender equality programs that are in place, and the gradually growing share of women professors in the Netherlands since 1990 (Poorthuis & Verdonk, 2021). A potential explanation for these (at face value) contrasting trends is that gender equality programs primarily benefit a small set of women who have remained in academia for a comparably longer period. Meanwhile, concerns about chilly climates, incompatibility of academic workloads with parenting, and perceived lack of career support from supervisors among midcareer women might remain unaddressed by recent policy programs (Cidlinská & Zilinçíková, 2024; Faniko, Ellemers, & Derks, 2022; Koens et al., 2022; Maranto & Griffin,

2011; Naezer et al., 2019; Nielsen, 2017). This explanation is in line with a study on gender equality policies in the private sector in Germany, which mostly promoted women already steadily employed, but did not decrease the outflow of women (Zimmermann & Collischon, 2023). Our results suggest that policies that seek to mitigate gender inequality in academic publishing careers should specifically focus on the retention of midcareer women and address the barriers to advancement that they indicate facing. To better understand the challenges faced by this group and contribute to an environment in which women can continue to thrive, universities may, for instance, turn to exit interviews of midcareer women who left their institution before, and take these as the starting point for fostering optimal working conditions.

At least three limitations of this study need acknowledgment. First, we were not able to control for differences between academic fields in the analyses of "starting to publish." Some of the reported ethnic inequality in this first step towards an academic career may be attributed to ethnic minorities' concentration in fields where opportunities to continue are more limited. Second, name-based gender and ethnicity assignments are simplified indicators for gender and ethnic signals, which may not accurately represent self-identification, and do not capture categories moving beyond binaries such as male/female or majority/minority. Furthermore, misclassification may be likely among names that occur infrequently. Yet studying our questions at scale seems difficult using self-reports. This is a trade-off between the depth of self-reported data and the scale of our bigger data approach. That being said, even when individuals may not identify with an ethnic or gender name-signal, their names do serve as a signal for others. As such, these individuals may experience bias by their *perceived* gender or ethnicity (Auspurg, Schneck, & Hinz, 2019; Zschirnt & Ruedin, 2016). Third, the less than perfect recall for gender is partially due to the lack of first names for around 20% of the sample. In the first 10 Ph.D. cohorts (1990–2000), missing values for the first name and hence gender are most prevalent. Because these cohorts predominantly consist of men, we expect that a large proportion of the missingness in gender stems from the omission of men from these earlier cohorts. The percentage of women in our data is slightly higher in our data compared to other statistics for almost all cohorts (2022). As a result, our estimations of gender inequality are likely conservative.

Our study shows divisions in who starts and stops publishing by gender and ethnicity. An intriguing avenue for future research is to further zoom in on these career inequalities by discipline and university. While some have argued that STEM fields may be especially challenging environments for women and ethnic minorities to thrive, others find that progression for underrepresented groups is actually more difficult in women-dominated fields, such as social and life sciences (Ceci, Ginther et al., 2014; Moss-Racusin et al., 2012). Hence, the question of disciplinary differences in gender and ethnic career inequalities remains yet unresolved. An additional avenue might involve variation by (type of) university and whether that relates to women's and ethnic minorities' academic career prospects (e.g., technical versus nontechnical universities; metropolitan versus smaller city). Our own analyses suggest some differences in publishing career length by university, although these differences were not clear-cut along the aforementioned dimensions. Further research would be needed to better understand differences in academic career by university, and how these university differences factor in gender and ethnic inequality in academic career paths.

Our large-scale analysis of the role of gender and ethnicity in academic publishing careers in the Netherlands is a starting point for research on the mechanisms explaining underrepresentation, despite the importance of research productivity. For instance, what is the role of professional networks (e.g., mentoring, coauthorship) during and after the Ph.D.? Prior studies have underlined the importance of supportive mentors during the Ph.D., and especially so for

underrepresented groups (Maton, Wimms et al., 2011; Posselt, 2018). Studies in the United States show that minorities with same-attribute mentors are more likely to remain in academia (Gaule & Piacentini, 2018; Hofstra et al., 2022). After a Ph.D., professional relations such as coauthors and departmental colleagues become important for careers (Allison & Long, 1990; Bellotti, Czerniawska et al., 2022; Li, Liao, & Yen, 2013; Macoun & Miller, 2014; Rawlings & McFarland, 2011; Stark, Rambaran, & McFarland, 2020). It is crucial to study whether and how much of the gender and ethnic career inequalities we find could be ameliorated by women and ethnic minorities' access to these relationships.

AUTHOR CONTRIBUTIONS

Anne Maaike Mulders: Conceptualization, Data curation, Formal analysis, Investigation, Visualization, Writing—original draft, Writing—review & editing. Bas Hofstra: Conceptualization, Data curation, Formal analysis, Investigation, Supervision, Visualization, Writing—review & editing. Jochem Tolsma: Conceptualization, Data curation, Formal analysis, Investigation, Supervision, Visualization, Writing—review & editing.

COMPETING INTERESTS

There authors have no competing interests.

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DATA AVAILABILITY

The data used to perform our analyses are published on https://github.com/ammulders/amatteroftime. Further specification on how our analyses are conducted and how we have constructed the data sets can be found on the replication website https://ammulders.github.io/amatteroftime/.

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