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Parenthood and the Gender Gap in Academic Careers

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Parenthood and the Gender Gap in Academic Careers*

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Abstract

Using population-wide data on Swedish university researchers and teachers, we identify the effects of parenthood on academic careers. Leveraging staggered event-study models that compare mothers and fathers around first birth, we document widening gender gaps in publication output, wage income, promotion, and PhD completion. These gaps arise across all scientific fields. We further document substantial gender differences prior to first birth and among never-parents, indicating that child-related penalties explain only part of the overall academic gender gap.

Keywords: academic careers, child penalty, parenthood, gender gap, Sweden, staggered event study, research productivity

JEL Codes: J16, J24, I23, J13, J31, C23

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1 Introduction

Gender gaps in high-skill labor markets persist despite decades of policy efforts aimed at promoting equality. A large and growing literature documents that these gaps widen sharply at the transition to parenthood, with motherhood playing a central role in explaining persistent gender inequality in earnings and career progression (Angelov et al., 2016; Kleven et al., 2019a). These studies show that child penalties are substantial and long-lasting, and that they account for a large share of the gender pay gap in the broader labor market. Yet our understanding of how parenthood shapes careers in knowledge-intensive occupations remains limited. Academic careers are a particularly consequential and informative setting: research productivity is directly observable through publications, cumulative in nature, and central to hiring, promotion, and long-run career outcomes. Because early productivity plays a critical role in establishing a research profile and securing stable academic employment, even temporary disruptions around family formation may have persistent consequences that extend well beyond the immediate post-birth period.

A related literature documents gender gaps in academic careers, including differences in publication output, hiring, promotion, and retention (Xie and Shauman, 2003; Ginther and Kahn, 2006; Larivière et al., 2013). Early evidence by Cole and Zuckerman (1984) shows that gender differences in scientific productivity have long historical roots, and more recent work confirms that men continue to publish more than women across disciplines (West et al., 2013). Several studies highlight the role of family formation in shaping these patterns, linking motherhood to declines in research productivity, slower promotion, and higher attrition from academia relative to fathers (Mason et al., 2009; Wolfinger et al., 2008, 2009; Cech and Blair-Loy, 2019). These findings point to the presence of substantial *academic child penalties*. Recent contributions using administrative and longitudinal data have begun to study publication dynamics around childbirth using event-study designs. Cairo et al. (2023) and Kim and Moser (2025) document sizable declines in publication output for mothers relative to fathers following childbirth. Using Danish register data, Lassen and Ivandić (2024) show that childbirth delays PhD completion and affects progression into research careers. Taken together, this literature provides strong evidence of substantial academic child penalties, but existing studies differ in terms of data sources, institutional settings, and outcome coverage, and often rely on selected samples or specific disciplines.

This paper advances the literature along several dimensions. Using Swedish population register data covering nearly the full population of university researchers and teachers, linked to individual-level bibliometric records, we provide the most comprehensive evidence to date on how parenthood affects academic career trajectories. Three features of our study distinguish it from existing work. First, we observe complete career trajectories for an essentially complete population of academics across all disciplines and career stages, rather than relying on selected samples or single fields. This allows us to assess the generalizability of academic child penalties in a way that prior work has not been able to do. Second, we jointly analyze multiple career dimensions–publication output, academic exit, PhD graduation, promotion transitions, and earnings–within a unified empirical framework, allowing us to trace how disruptions in research productivity translate into broader and persistent career penalties. Third, we provide the first comprehensive cross-field evidence on academic child penalties, including humanities and social sciences, a setting largely absent from the existing literature that has focused predominantly on STEM (Science, Technology, Engineering and Mathematics) and medicine.

Our empirical strategy builds on the staggered event-study framework of Sun and Abraham (2021), comparing mothers and fathers around the birth of their first child. A key feature of the analysis is that we estimate models separately by gender and focus on the evolution of the gender gap following childbirth. This approach is motivated by the observed pre-birth dynamics in the data: publication output trends upward among soon-to-be parents relative to the control group in the years preceding childbirth, a pattern that may reflect selection into parenthood among productive researchers or other career dynamics specific to the pre-birth period. Importantly, however, this pre-birth trend evolves similarly across genders, and the gender gap in publication output is stable before childbirth and widens sharply after. Following the approach of Kleven et al. (2019b), our primary estimand is therefore the gender gap in the child penalty–how much more does childbirth affect mothers relative to fathers–with the stable pre-birth gender difference supporting a causal interpretation of the post-birth divergence. We complement the main analysis with a matched sample of non-parents as an alternative control group, and show that the gender gap estimates are robust to this change.

Sweden provides an informative and in many ways demanding test case for studying these questions. The country has among the most generous family policies in the world: parents are entitled to 480 days of paid parental leave, publicly subsidized childcare is universally available, and several policy reforms have actively encouraged greater paternal leave-taking. If institutional support can mitigate the academic child penalty, Sweden is where we would expect to see it. The persistence of substantial gender gaps in our results therefore carries a broader message: family policies of the Swedish type, while valuable, are insufficient to close the gender gap in academic careers.

Our results show that the transition to parenthood is associated with substantial, persistent, and broad-based gender gaps in academic careers. Following childbirth, fathers increase their publication output relative to the pre-birth period while mothers' output remains essentially unchanged, producing a widening gender gap that emerges immediately at the birth event and persists throughout the six-year follow-up window. The average post-birth gender gap in publications amounts to approximately 0.27 publications per year over the first five years following childbirth, corresponding to nearly a doubling of the pre-existing gap. Beyond publications, mothers experience slower PhD completion, lower promotion rates into postdoctoral and faculty positions, and persistent wage losses relative to fathers, with the estimated gender gap in wage income averaging approximately 9,700 USD per year in the six years following childbirth.

Three dimensions of heterogeneity sharpen the interpretation of these findings. First, the gender gap is present and statistically significant across all four broad scientific areas we study–humanities and social sciences, medicine, natural sciences, and technical sciences–indicating that the academic child penalty appears broadly across all fields. The gap is largest in natural sciences and smallest in humanities and social sciences, a pattern that partly reflects differences in baseline publication rates across fields rather than fundamentally different responses to childbirth. Second, the gap is most pronounced among postdoctoral researchers, the career stage characterized by the greatest publication pressure and the least institutional security, and attenuates at more senior career stages. Third, the gap increases monotonically with pre-birth publication experience, a pattern consistent with a scaling effect whereby a given divergence between fathers and mothers in publication output translates into larger absolute differences among more productive researchers.

An important finding that contextualizes these results is that gender gaps in academic careers are not solely a consequence of childbirth. We document substantial gender differences in publication output and career stage already prior to first birth, and a clear gap between academics who never become parents. Child-related penalties therefore explain only part of the overall gender gap in academia, and pre-existing differences in career trajectories and selection into parenthood account for a meaningful share of the observed inequality. This finding echoes the broader point made by Kleven et al. (2019b) that child penalties, while large, do not fully account for gender gaps in labor market outcomes.

Our paper contributes to three strands of literature. It contributes to the child penalty literature by providing evidence from a high-skill occupation where productivity is cumulative, directly observable, and central to career advancement (Angelov et al., 2016; Kleven et al., 2019a; Goldin et al., 2024). It contributes to the literature on gender gaps in academic careers by linking childbirth, research productivity, and career progression in population-wide administrative data (Xie and Shauman, 2003; Ginther and Kahn, 2006; Larivière et al., 2013). And it contributes to the growing literature on academic child penalties specifically (Cairo et al., 2023; Kim and Moser, 2025; Lassen and Ivandić, 2024) by offering the most comprehensive evidence to date in terms of population coverage, outcome breadth, and disciplinary scope. While prior work documents child penalties in selected samples and specific institutional contexts, our study follows nearly the complete academic workforce across all disciplines and career stages, allowing us to separately identify pre-existing gender gaps from post-birth dynamics and to speak to the generalizability of academic child penalties across fields and career stages.

The remainder of the paper is structured as follows. Section 2 describes the institutional context and section 3 the data. Section 4 outlines the empirical strategy. Section 5 presents descriptive evidence and section 6 the main results. Section 7 reports robustness checks and additional results. Section 8 concludes.

2 Institutional Background

2.1 Academic career structure

Academic careers are characterized by a hierarchical structure in which advancement depends strongly on research productivity. In Sweden, the typical academic trajectory begins with PhD training, followed by a sequence of postdoctoral or other fixed-term research positions before the possibility of obtaining a permanent faculty position.

During the early career stage, many researchers are employed on temporary contracts such as postdoctoral or researcher positions. However, tenure track positions are very rare among Swedish universities. Promotion to more senior academic ranks–such as associate professor and professor–depends heavily on publication output, research visibility, and success in obtaining external funding. As in many other countries, publications in peer-reviewed journals are a central metric in hiring and promotion decisions.

This structure implies that research productivity early in the career can have long-lasting consequences for academic trajectories. The period of studying for a PhD and that immediately following the PhD is therefore particularly important for establishing a research profile and securing stable academic employment.

2.2 Family policies in Sweden

Sweden provides a useful institutional setting for studying the interaction between family formation and academic careers. The country has extensive family policies aimed at facilitating the combination of work and family life. Parents are entitled to paid parental leave following childbirth, and publicly subsidized childcare is widely available. Parental leave can be shared between mothers and fathers, and several policy reforms have aimed to encourage greater paternal participation in childcare. Within academia, PhD students today enjoy the same parental leave rights as other employees. Moreover, academics employed on temporary contracts typically have their contracts extended by the length of parental leave.[1]

Despite these policies, mothers continue to take a substantially larger share of parental leave than fathers. Previous research shows that gender differences in labor market outcomes widen substantially after the arrival of the first child even in countries with generous family policies. These patterns suggest that childbirth may continue to affect men and women differently even in institutional contexts designed to support gender equality.

[1] Appendix A provides further details on parental leave rights and related family policies in Sweden.

2.3 Implications for academic careers

These institutional features make Sweden an informative context for studying the effects of parenthood on academic careers. On the one hand, generous family policies and extensive childcare provision may mitigate potential career disruptions associated with childbirth. On the other hand, the structure of academic careers–with strong pressure to publish and temporary contracts early in the career–may make this period particularly sensitive to interruptions in research activity. Because early research productivity plays a central role in promotion and long-term career prospects, even temporary reductions in publication output may have persistent effects on academic career trajectories (Mincer and Ofek, 1982). Studying how research productivity and career progression evolve around the birth of the first child can therefore provide important insights into the sources of gender gaps in academic careers. In the next section, we describe the data used to measure academic employment, career progression, and publication outcomes.

3 Data

3.1 Data sources

The analysis uses Swedish population register data covering nearly the full population of individuals employed in academia. The data combines several administrative sources that provide information on demographic characteristics, childbirth, employment histories, and scientific publications.

Information on births and family characteristics is obtained from population registers maintained by Statistics Sweden. These registers contain complete records of childbirths and allow us to identify the timing of individuals' first child.

3.2 Academic positions

Academic career progression is measured using information on employment positions in Swedish universities standardized by Statistics Sweden. These registers allow us to classify individuals into different stages of the academic career.

For the purpose of the analysis, several early-career research positions are grouped under the category *postdoc*, which includes postdoctoral and related fixed-term research positions typically held after the PhD.

We also identify individuals employed as senior lecturers (*lektor*). In the analysis, we refer to these positions as *associate professors*. This terminology reflects that the Swedish title *docent*-a research qualification typically required for becoming professor-is conceptually closest to the associate professor rank in many international systems. Because the *docent* qualification is not directly observable in the register data, we use senior lecturer positions as the closest observable proxy. Online appendix OA1 provides further details on the construction of the academic position categories.

3.3 Publication measures

Research productivity is measured using information on scientific publications linked to individual researchers. These data allow us to construct annual measures of publication output over the course of academic careers.

Our main measure of research productivity is the number of scientific publications produced by an individual in a given year. The publication data include journal articles as well as other types of scholarly outputs. Publications from Scopus are linked to researchers using author identifiers and affiliation information, which allows us to construct longitudinal publication histories for individuals working in Swedish academia. Online appendix OA2 provides further details on the bibliometric data and the construction of the publication measures.

3.4 Sample construction

The main analysis focuses on individuals who have their first child during an academic career. We identify first-time mothers and fathers working in Swedish academia and construct a panel centered around the year of the first birth. The sample is restricted to individuals employed in a research or teaching position in the year prior to the birth of their first child and were working at a university sampled through our publication data collection.

For each individual we observe outcomes over a window of years before and after the first childbirth. This allows us to compare career trajectories for mothers and fathers around the same life event.

Our main estimation sample therefore consists of academics who become parents at some point during the observation period. The empirical analysis compares the evolution of outcomes for mothers and fathers relative to the year before first childbirth and contrast this against the last cohort (2013) of to-be-parents in our data.

3.5 Alternative control group: matched non-parents

In addition to the main analysis, we construct an alternative control group consisting of individuals who do not have children during the observation period. These individuals are matched to parents based on observable characteristics in order to provide a comparison group with similar pre-birth career trajectories.

The matching procedure and the construction of this control group are described in detail, and all empirical results based on this alternative control group are reported in Appendix B. The main text compares the findings using the matched sample with those of the main (last cohort) control group.

4 Empirical strategy

Our starting point for the regression analysis is the event-study framework commonly used to study the economic consequences of childbirth (e.g., Kleven et al., 2019b). Recently, similar approaches have been applied to academic careers and research productivity (Cairo et al., 2023; Lassen and Ivandić, 2024). The event-study design allows us to trace the evolution of outcomes before and after the first birth and to examine whether gender gaps emerge or widen following the transition to parenthood.

The event analyses are built on regressions of the following type:

$$Y_{it}^{g} = \sum_{j \neq -1} \alpha_j^g \mathbf{1}\{t - T_i = j\} + \sum_{k} \beta_k^g \mathbf{1}\{A_{it} = k\} + \gamma_t + X_i' \delta + \nu_{it}^{g}. \tag{1}$$

The coefficients α_j^g trace the evolution of outcomes relative to the year immediately preceding childbirth and therefore capture the dynamic effects of childbirth on academic careers. The model is estimated using the interaction-weighted estimator proposed by Sun and Abraham (2021), which accounts for staggered treatment timing. All regressions are estimated separately for men and women, allowing the dynamic effects of childbirth to differ by gender, where Y_{it}^{g} is an outcome for individual i of gender $g \in \{m, f\}$. j denotes event time, that is, years before or after the birth of the first child. T_i denotes the calendar year of the first childbirth for individual i. The indicators $\mathbf{1}\{t - T_i = j\}$ capture event time relative to childbirth, with event year $j = -1$ set as the reference year. The model also includes age, denoted A, age group dummies (15–19, 20–24, 25–29, 30–34, 35–39, 40–44, 45–49, 50–54, 55–59) to control for life-cycle effects fixed at the year before birth, and year dummies to control for aggregate trends and business-cycle variation.

The vector X_i contains pre-birth observables measured one year before the birth of the first child. In most specifications, these include position-by-years-in-position fixed effects to control for career stage effects (for example, second-year PhD students), as well as science-by-university fixed effects. Science fields are grouped into humanities and social sciences, medicine, natural sciences, and technical sciences. The identifying assumption is therefore that, conditional on these controls, age, and calendar year effects, the timing of the first child is as good as random.

Equation (1) places no restrictions on the number of leads and lags relative to childbirth. In practice, however, the number of observations declines as cohorts approach the endpoints of the sample period. Following Schmidheiny and Siegloch (2023), we address this by grouping extreme leads and lags into bins rather than discarding observations in the tails, binning event time at -4 for leads and at $+6$ for lags. The estimated model is therefore modified to

$$\begin{aligned} Y_{it}^{g} =& \alpha_{-4}^{g}\mathbf{1}\{t - T_i \leq -4\} + \sum_{\substack{j=-3 \\ j \neq -1}}^{5} \alpha_j^{g}\mathbf{1}\{t - T_i = j\} + \alpha_6^{g}\mathbf{1}\{t - T_i \geq 6\} \\ &+ \sum_k \beta_k^{g}\mathbf{1}\{A_{it} = k\} + \gamma_t + X_i'\delta + \nu_{it}^{g}, \end{aligned} \tag{2}$$

where leads from $-\infty$ to -4 share the coefficient α_{-4}^{g}, leads and lags from -3 to 5 are estimated individually (with -1 as the reference year), and all lags from 6 onward share coefficient α_6^{g}. In the main specification, we include individuals from all fields and career positions. The grouping of academic positions follows the classification presented in Table OA1.1. Because the administrative data do not allow us to distinguish precisely between several early-career research positions after the PhD, we group postdoctoral researchers, assistant professors, and associate senior lecturers into a single category labeled "postdoc", and as earlier noted, we label *lektors* as associate professors. Note that "Other researchers & teachers" is a broad category, but are usually positions of a temporary nature with varying degrees of research time. The event-study specification also allows us to assess the plausibility of the identifying assumptions by examining outcome dynamics prior to childbirth. If the timing of childbirth is unrelated to underlying outcome trends, the estimated lead coefficients should be close to zero. In practice, we observe trends in outcomes already prior to the first birth, which is consistent with positive selection into parenthood among highly productive researchers. Our empirical analysis therefore focuses on the change in gender differences following childbirth rather than interpreting the post-birth coefficients in isolation. An important feature of the empirical design is that the event-study framework allows us to distinguish between gender differences that arise prior to childbirth and changes that occur following the transition to parenthood. This distinction is important in the context of academic careers, where gender gaps in research productivity may emerge already before family formation. Our analysis therefore focuses on how childbirth changes the trajectory of these gender differences over time.

4.1 Staggered difference-in-differences

In our data, individuals have their first child in different calendar years. In such settings with staggered treatment timing, standard two-way fixed effects estimators may produce biased estimates of treatment effects (de Chaisemartin and D'Haultfœuille, 2020; Callaway and Sant'Anna, 2021). The conventional difference-in-differences estimator combines several types of comparisons: treated units versus never-treated units, late-treated units versus early-treated units after the latter have already been treated, and early-treated units versus late-treated units before the latter receive treatment. When treatment effects evolve over time, these comparisons can lead to biased estimates because already-treated units serve as controls for newly treated units (Goodman-Bacon, 2021).

To address this issue, we follow Sun and Abraham (2021) and estimate dynamic treatment effects using the interaction-weighted estimator. This approach estimates cohort-specific treatment effects for each lead and lag relative to the event and then aggregates these effects across cohorts using appropriate weights. In the first step, cohort-specific average treatment effects on the treated (CATTs) are estimated for each event time. In the second step, these estimates are averaged across cohorts using sample shares as weights. The first treated cohort in the data is always treated and is therefore excluded from the analysis, while the last treated cohort (individuals whose first child is born in 2013) serves as the comparison group in the main text. This implies that all estimates are always relative to the last treated group. For example, for a cohort treated in year 2000, the lead estimate two years before childbirth compares the outcome in 1998 (-2) with that of 1999 (-1). The same year-pair observations, 1998 and 1999 is also used from the observations of the last cohort to control for the underlying trend. This may have downsides, as trend developments may differ for the control group if observed too far away from treatment. Alternatively, estimates were derived using a matched sample of individuals who are non-treated in the sample period.[2] Estimated coefficients then show absolute treatment effects relative to untreated units. Overall, our results are robust to this change of control group.

4.2 Estimation and outcomes

Our outcome variables capture several dimensions of academic careers. These include exit from academia, publication output, time to PhD degree, promotion to different academic positions, annual wage income, and total labor-market income. Annual wage income is defined as total gross wage payments received during the calendar year according to administrative register data. Total labor-market income is defined as the sum of wage and salary income, self-employment income, and earnings-related social insurance benefits reported in the registers.

For exit from academia and promotion outcomes, we estimate linear probability models. This choice facilitates interpretation, as the coefficients represent changes in the probability of the outcome associated with childbirth.

Publication output is measured as the number of publications recorded for an individual in a given year. The publication measure includes journal articles as well as other scholarly publications recorded in the bibliometric database. Because publication counts are highly skewed and include many zero observations at the annual level, a count-data model could in principle be appropriate. However, the implementation of the interaction-weighted estimator using the `eventstudyinteract` command in Stata does not allow for count models. Our main specification therefore relies on linear models. As a robustness check, we estimate alterna-

[2]We prefer to label them non-treated as they may have children later. Note that the term "never-treated" are used in the descriptive analysis to denote those that have not had children by the age of 55.

tive specifications that ignore the staggered treatment structure and instead estimate Poisson regressions and standard fixed effects models for publication outcomes reported in Appendix C.

4.3 Robustness and alternative control groups

We conduct several robustness checks to assess the sensitivity of the results to alternative specifications and control groups.

Online appendix OA3 presents graphical comparisons of estimates obtained from two-way fixed effects models and the interaction-weighted estimator for a range of specifications with publication output as the outcome. Overall, the results are qualitatively similar across estimators, although the standard two-way fixed effects model tends to attenuate the estimated lead and lag coefficients for both mothers and fathers.

Appendix B reports additional estimates using a matched sample of individuals who do not have children during the sample period as an alternative control group. These individuals are matched to parents based on pre-birth characteristics, and a pseudo-birth year is assigned to construct comparable event-time trajectories. Details of the matching procedure are provided in the Appendix. Overall, the gender gap is quite similar regardless of outcome using this control group.

5 Descriptive evidence

Before turning to the econometric analysis, we present descriptive evidence on gender differences in academic careers and research productivity. We first illustrate how publication activity evolves over the life cycle for men and women and how these patterns differ between individuals with and without children. We then describe the characteristics of the sample of future parents used in the econometric analysis, focusing on differences between mothers and fathers in career stage, publication activity, and other observable characteristics prior to childbirth.

Additional descriptive evidence on the gender composition of academic positions, career transitions across positions, and family formation patterns among academics is reported in Online appendix OA4.

5.1 The publication life cycle and parenting

Figure 1 shows average publication rates by age for researchers and teachers in Swedish academia during the period 1996–2013, according to the database. Individuals are included only if they are observed as researchers or teachers at a university sampled by our publication data collection and can be classified as either ever-parents or never-parents based on their fertility histories. To allow this classification, individuals must be observed at age 55 in at least one year of the data. Because our data for observing fertility ends in 2020 and publication data start in 1996, Figure 1 is restricted to individuals born in 1965 or earlier. Panel A shows unadjusted publication rates, whereas panel B shows residuals from a regression including fixed effects for science, year, and university. Note that these patterns are purely descriptive and should not be interpreted causally, as publication productivity and family formation may be jointly determined.

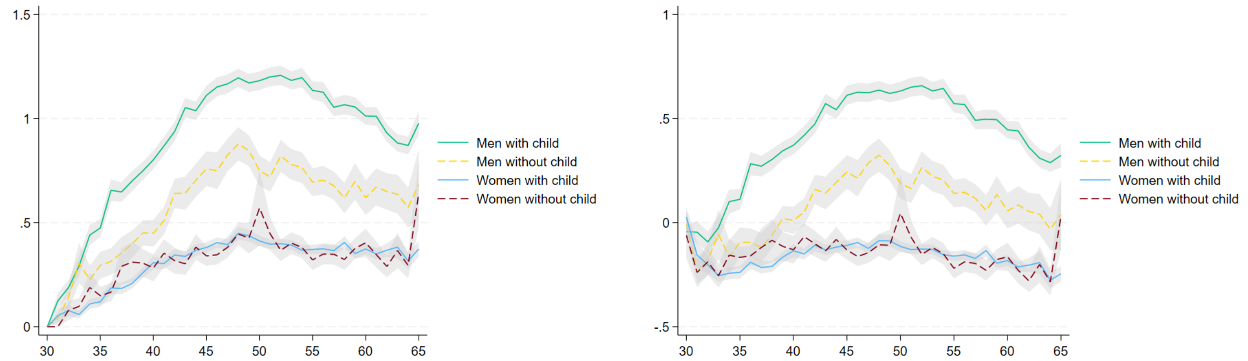
These graphs show clear evidence of how publication varies over the life cycle. Similar to Kim and Moser (2025), a clear gendered publication life cycle is evident. Male academics display a familiar inverted-U-shaped publication profile, commonly observed in patterns of invention and scientific output (Lotka, 1926; Levin and Stephan, 1991; Jones et al., 2008). Men publish at increasing rates until they reach a peak in productivity in their 40s to early 50s, after which publication rates slowly decline. In contrast, the publication life cycle for women is flatter. Women increase their rate of publication less sharply until their 40s with only mild declining tendencies after their 50s. After adjusting for field, year, and university fixed effects, the patterns remain broadly similar in panel B.

Both panels indicate that a gender gap emerges already early in the career. Much of this difference arises from a higher publication rate by men with child(ren). After accounting for field, age, and university, men *without* children do not publish much more than women until they reach their 40s. This group then publishes more than women, but less than men with child(ren). For women, the publication record differential is small between those with and without children.

This figure thus suggests a father premium relative to men without children, as well as a general male premium relative to females. Therefore, a gender gap exists even when considering the possible impact of children.

Figure 1: Publication rate by age, pooled observations 1996-2013

(a) No correction (b) Correction for field, year and university



Note: The left graph shows unadjusted numbers for rate of publication. The right graph shows the residuals from a regression which includes field, year and university fixed effects.

5.2 Descriptive data of parent sample

Table 1 presents descriptive statistics for the analytical sample of future parents one year before the birth of their first child. The sample consists of 5,440 future mothers and 6,020 future fathers observed as researchers or teachers in Swedish academia between 1996 and 2013 and linked to publication records. These represent 80 percent of first-time parents in research and teaching positions in Swedish academia 1996–2012, according to the administrative registers, while the remaining 20 percent were working at universities not sampled by our publication data. The table also reports statistics separately by broad academic field. The distribution across fields differs somewhat between men and women. Women are relatively more represented in medicine and the humanities and social sciences, while fathers are more prevalent in the natural sciences and especially in the technical sciences.

PhD students constitute the majority of first time parents in the sample, accounting for 64 percent of fathers and 71 percent of mothers. Parenthood is therefore most common at early career stages. In contrast, only a small fraction of parents hold senior academic positions at the time of first childbirth. Among fathers, around two percent are professors, while the share among mothers is close to zero. Associate professors represent about ten percent of fathers and five percent of mothers. These patterns in gender differences are broadly similar across fields.

Differences are also visible in research productivity prior to childbirth. A larger share of fathers than mothers have published before becoming parents, and men have higher publication rates in all fields in the year before birth. One contributing factor is that fathers are on average about 1.5 years older than mothers at the time of first birth. The age difference also partly explains why fathers have higher academic ranks and wage income prior to childbirth.

Finally, parental leave uptake differs substantially between mothers and fathers. During the first three years following the birth of the first child, mothers take on average 371 days of parental leave compared to 146 days among fathers. Overall, the descriptive statistics reveal noticeable gender differences in career stage and research productivity already prior to childbirth.

Table 1: Mothers and fathers, all and by science

Science area:	All		Hum-soc sci		Medicine		Nat sci		Technical sciences	
	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers
Publications	0.39	0.73	0.10	0.20	0.51	0.95	0.49	0.89	0.57	0.96
	(1.58)	(1.73)	(0.44)	(0.80)	(1.16)	(1.91)	(3.18)	(2.05)	(1.26)	(1.90)
Published (0/1)	0.26	0.38	0.11	0.19	0.35	0.48	0.28	0.42	0.35	0.47
	(0.44)	(0.49)	(0.32)	(0.39)	(0.48)	(0.50)	(0.45)	(0.49)	(0.48)	(0.50)
Wages 1,000 SEK/year	323.23	370.95	332.11	377.06	309.34	352.79	298.99	332.93	374.59	408.92
	(122.82)	(158.56)	(119.66)	(175.91)	(130.65)	(196.10)	(117.32)	(140.61)	(101.32)	(135.10)
Parental leave, child age 0-3	370.71	146.42	374.54	163.77	359.42	126.93	376.56	155.37	371.93	142.56
	(164.43)	(123.12)	(160.51)	(130.42)	(162.57)	(116.88)	(165.36)	(126.85)	(165.81)	(117.50)
Age	30.69	32.03	31.67	33.74	30.62	32.13	29.99	31.75	30.23	31.39
	(3.43)	(4.61)	(3.66)	(5.00)	(3.20)	(4.56)	(3.25)	(4.55)	(3.28)	(4.35)
Associate prof/professor	0.05	0.11	0.12	0.23	0.01	0.05	0.03	0.08	0.04	0.11
	(0.22)	(0.32)	(0.33)	(0.42)	(0.10)	(0.21)	(0.16)	(0.27)	(0.20)	(0.31)
Associate prof t=10	0.21	0.31	0.46	0.54	0.08	0.16	0.09	0.23	0.23	0.31
	(0.41)	(0.46)	(0.50)	(0.50)	(0.27)	(0.37)	(0.29)	(0.42)	(0.42)	(0.46)
Other research and teaching	0.16	0.15	0.18	0.18	0.20	0.21	0.11	0.13	0.10	0.12
staff	(0.37)	(0.36)	(0.38)	(0.39)	(0.40)	(0.41)	(0.31)	(0.34)	(0.30)	(0.32)
PhD students	0.71	0.64	0.65	0.53	0.67	0.60	0.79	0.67	0.80	0.68
	(0.45)	(0.48)	(0.48)	(0.50)	(0.47)	(0.49)	(0.41)	(0.47)	(0.40)	(0.47)
Associate professors	0.05	0.10	0.12	0.21	0.01	0.03	0.02	0.07	0.04	0.09
	(0.21)	(0.30)	(0.33)	(0.41)	(0.10)	(0.17)	(0.15)	(0.25)	(0.19)	(0.28)
Postdocs and Assistant	0.08	0.10	0.04	0.05	0.12	0.15	0.08	0.11	0.06	0.09
Professors	(0.27)	(0.30)	(0.20)	(0.22)	(0.33)	(0.35)	(0.27)	(0.32)	(0.25)	(0.29)
Professors	0.00	0.02	0.00	0.02	0.00	0.02	0.00	0.01	0.01	0.02
	(0.04)	(0.12)	(0.05)	(0.13)	(0.02)	(0.13)	(0.03)	(0.11)	(0.07)	(0.13)
Count	5,430	5,972	1,427	1,237	1,737	912	896	1,159	957	2,180

Note: Descriptive statistics are measured one year prior to the birth of the first child for individuals observed as researchers or teachers in Swedish academia between 1996 and 2013. Parental leave denotes the total number of parental leave days taken during the first three years following the birth of the first child. The indicator "Associate prof $t = 10$" is an indicator for if a person is associate or full professor ten years after childbirth. Publication measures include all recorded scholarly publications linked to individuals in the database.

While the descriptive patterns are informative, they do not isolate the causal impact of parenthood on academic careers. We therefore turn to the event-study estimates described in the empirical strategy section.

6 Regression results

The event-study framework described above allows us to examine how outcomes evolve around the birth of the first child, comparing mothers and fathers while controlling for individual and work characteristics and time fixed effects.

A key concern in studies of parenthood and academic careers is selective exit from academia. If childbirth leads some researchers to leave academic employment, observed changes in research productivity or career progression could partly reflect changes in sample composition rather than behavioral responses among those who remain.

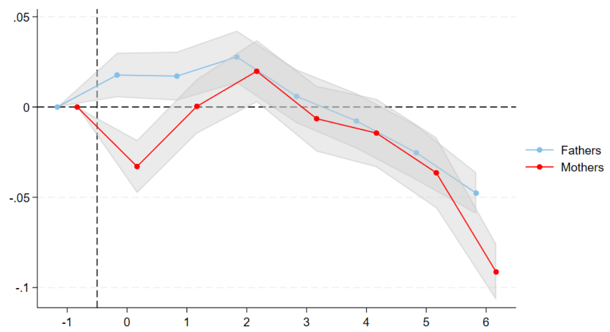
We therefore begin by examining whether parenthood affects the probability of remaining in academia. Establishing that gender gaps in exit rates do not change substantially around childbirth helps clarify whether subsequent results for research productivity and career outcomes are likely to be driven by selective attrition.

6.1 Exit from academia

The descriptive transition table in Online appendix Table OA4.1 shows that women generally have a higher probability than men of leaving academia, although these tables do not distinguish between temporary and permanent leaves. Figure 2 presents event-study estimates of the effect of childbirth on the probability of remaining in academia. The dependent variable exit is coded as one if an individual leaves academia with no indication of returning in later years, and zero otherwise, meaning that temporary leave of absence due to parental leave does not count as exit. The exit rate increases somewhat for fathers in years 0–3, while the risk of exit stays essentially unchanged or even declines for mothers. However, the confidence intervals overlap between mothers and fathers for most of the follow-up period, and the gender gap is mostly statistically insignificant. From event year four onward, the probability of exit declines for both genders, likely reflecting that parents have outlasted the most demanding early childhood years.

Overall, the estimates do not suggest a clear gender gap in the effect of childbirth on exit rates, indicating that differential attrition from academia is unlikely to drive the gender differences in publication outcomes and career progression documented in the following sections.

Figure 2: Probability of exiting academia following the birth of the first child



Note: The figure shows event-study estimates of the probability of exiting academia relative to the year before childbirth ($t = -1$). It is estimated using the Sun and Abraham (2021) staggered event specification based on equation (2), including age group dummies, year FE, position-by-years-in-position FE, and science-by-university FE. The vertical dashed line indicates the year of first childbirth ($t = 0$). The shaded areas represent 95 percent confidence intervals.

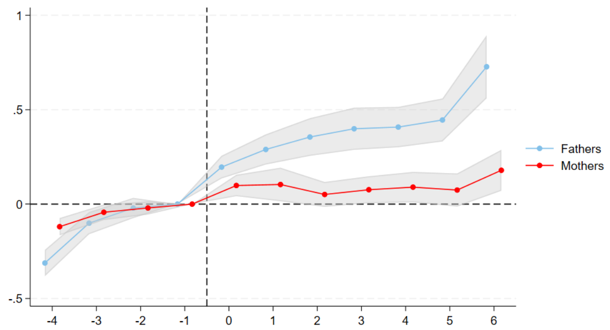
6.2 Child effects on publication productivity

We now turn to the effects of a first child on publication productivity. All estimates are conditional on individuals being employed in academia in a given year. Individuals who temporarily leave due to parental leave may therefore reappear in the estimation sample in later years. As a result, greater emphasis should be placed on longer-run effects.

Online appendix Figure OA3.1 compares estimates from the standard two-way fixed effects model with the interaction-weighted estimator proposed by Sun and Abraham (2021), across a range of specifications that vary the included fixed effects. Overall, the results are qualitatively similar across estimators, although the standard model tends to attenuate both lead and lag coefficients for mothers and fathers. Because the estimates change for both genders, the implications for the gender gap are less clear.

The models reported in the main text are based on equation (2) and are estimated separately for mothers and fathers. In analyzing gender differences in the effect of the first child on publications, the sample includes birth cohorts from 1997 to 2012. Because publication output is measured annually, period $t = 0$ includes publications produced during the calendar year of childbirth. Figure 3 plots the event-study estimates for publications using the last cohort as controls. This comparison group helps account for selection into parenthood, as it consists of individuals who will have a first child later in the sample period. Publication output increases for fathers after childbirth, while it remains largely unchanged for mothers, leading to a widening gender gap in the years following the first birth.

Figure 3: Event-study estimates for publications.



Note: Event-study estimates of annual publication output for mothers and fathers in Swedish academia, using the last cohort as controls. The outcome is the number of publications per year. Period $t = 0$ corresponds to the year of childbirth. The figure is estimated using the Sun and Abraham (2021) staggered event specification based on equation (2), including age group dummies, year FE, years-in-position FE, and science-by-university FE.

Baseline results. Pre-treatment trends appear broadly parallel across genders, with the exception of the binned estimate for $t \leq -4$. Within each gender, publication output shows a positive trend prior to childbirth. However, our focus is on the evolution of the gender gap following childbirth which evolves similarly before childbirth. It is important to note that, while normalized to zero in $t = -1$, a gender gap in publication output already exists in this period as shown in Table 1. After childbirth, the gender gap in publication output clearly widens. This starts already in period 0, i.e., before the child reaches one year of age. The gap widens until year three, remains relatively stable until year five, and then increases again. The binned estimate for $t \geq 6$ shows the largest gender differences and is highly statistically significant. However, since it is based on a binned category, it suggests that the gender gap persists—and may even increase—beyond the follow-up period.

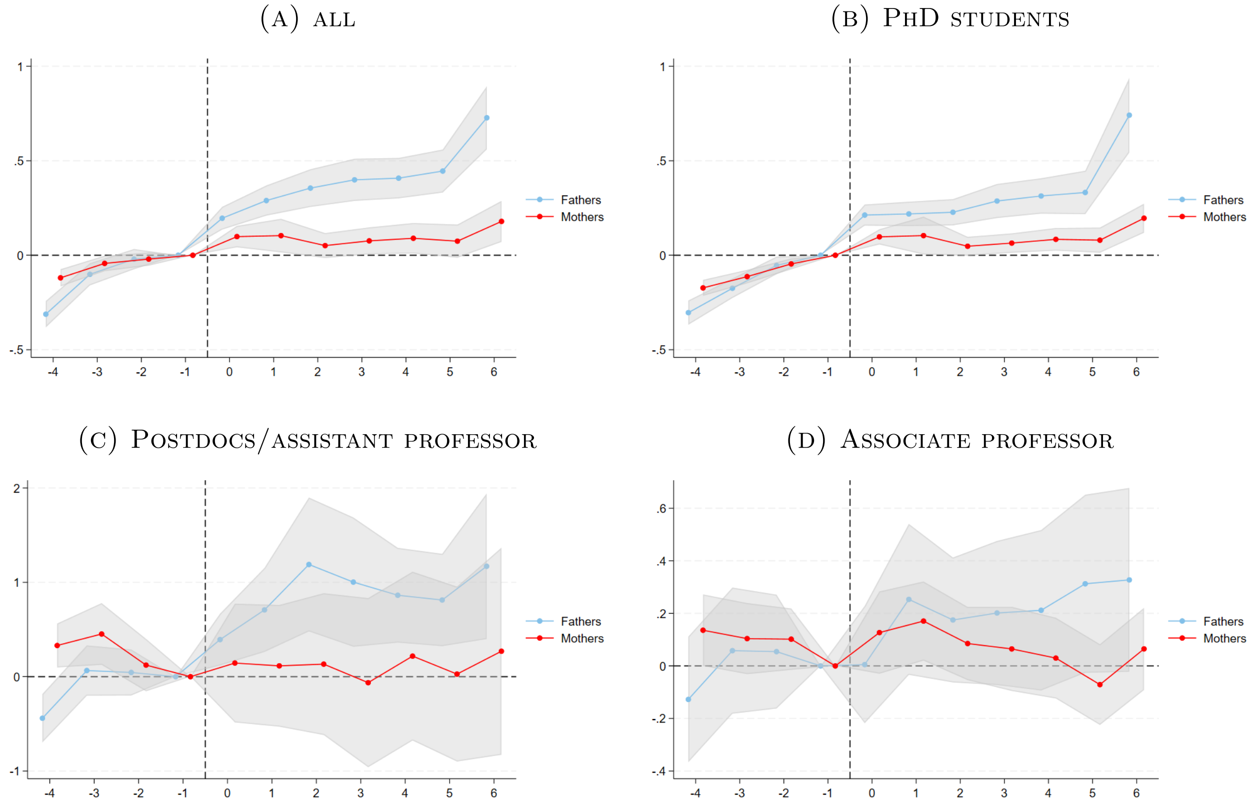
Robustness across estimators. Similar regressions were also estimated using Poisson and OLS specifications that ignore the staggered nature of treatment timing, following the approach in Kleven et al. (2021). The resulting percentage effects are reported in Figure C1 in Appendix C. These results suggest that the main findings are not driven by the choice of estimator.

Heterogeneity across fields. The Sun and Abraham (2021) estimator is next applied separately by scientific field: medicine, technical sciences, natural sciences, and not seen in many earlier studies, humanities and social sciences. These are graphically shown in Figure D1 in Appendix D. The same general pattern exists across sciences, with an increase in the publication rate for fathers but no or little increase for mothers. The gap is visually most striking for technical sciences, which is also the field with the lowest female representation, whereas for the other sciences, the confidence bands overlap and differences year-by-year tend to be insignificant. The results indicate stronger gender gaps in STEM and medicine fields than in the humanities and social sciences, which can in part be explained by a lower number of published works in humanities and social sciences.

Heterogeneity across career stages. In the next step, the same methodology is used to examine whether child penalties differ depending on the academic position held one year before birth. Figure 4 shows the child penalty for PhD students, postdocs, and associate professors.[3] These categories correspond to distinct stages of the academic career. The estimates are based on comparisons with the last to-be-parent cohort. The child penalty gender gap in terms of publications is the widest for postdocs. This stage arguably involves the greatest pressure to publish in order to secure a long-term academic position. However, the confidence bands are wide and overlap, which means that the gender gap is not statistically significant in individual years following childbirth. However, less than 10 percent of the sample are in postdoctoral positions when becoming parents for the first time (8 percent for women and 10 percent for men). Similarly, only 5 percent of women are employed as associate professors and 10 percent among men, resulting in imprecisely estimated coefficients. More precisely estimated is the gender gap for PhD students, which is mostly statistically significant and given that most observations are from PhD students (71 percent of women vs. 64 percent of men), it is no wonder that this graph closely resembles that for all academics.

[3]Because of their low numbers among parents, estimates cannot be produced for Professors.

Figure 4: Differences in publication outcomes by position before birth



Note: All figures are estimated using the Sun and Abraham (2021) staggered event specification based on equation (2), including age group dummies, year FE, and science-by-university FE. Graph (a) also includes position-by-years-in-position FE, while graphs (b)–(d) include years-in-position FE.

The results from Figures 3 and 4 together with Figure D1 in Appendix D are summarized as average effects in Table 2 for the 0-5 years after birth. Rows 1-2 reports the average post-birth effects on publication output for mothers and fathers. The evolution of publications is positive and significantly different from $t-1$, in all columns for fathers. The estimates for mothers are in most cases positive but closer to zero and statistically significant in five out of nine cases. The female estimate is not significant in natural and technical sciences in line with constant productivity. However, the coefficient is positive and significant for All, Humanities and social sciences (at the 5 percent level), Medicine and PhD students (1 percent level) and associate professors (10 percent level). More importantly, the next row reports the difference between father and mother estimates along with stars for significance levels of two-sided tests for differences. Gender differences are statistically significant in most specifications, including for the full sample and across positions, except for associate professors, and across fields, although only at the 10 percent level in the humanities and social sciences. These results are consistent with the figures with the difference that, because we pool observations over the post-birth years we gain statistical precision. The "All" model (1), shows that the gender gap widens by 0.27 publications as an average per year for the 0–5 years following childbirth, conditional on covariates. This is a very large effect as the average gender gap the year before childbirth is about 0.34 according to the descriptives in Table 1. The other models shows the development of the gap varies strongly, with the gap being smallest in Humanities and social sciences at only 0.05 publications, where the rate of publications is generally smaller, to the highest gap widening in Natural sciences where it represents more than 0.5 publications. For different positions, the gap widening ranges from just 0.1 for Associate professors (not significant) to Postdocs, where the gap rises by 0.7 publications, but is only significant on the 10 percent level. Altogether, the results suggest that fathers, on average, see a more significant increase in productivity in the years following childbirth compared to mothers, and the gender difference is mostly statistically significant.

Table 2: Effects of children on publications: all, by discipline and by position

	(1) All	(2) Hum/soc sci	(3) Medicine	(4) Natural sci	(5) Tech sci	(6) PhD stud	(7) Postdoc	(8) Other	(9) Associate
Male estimate, t=0-5	0.349***	0.078***	0.462***	0.512***	0.417***	0.265***	0.828***	0.466***	0.193
	(0.038)	(0.026)	(0.102)	(0.114)	(0.063)	(0.030)	(0.195)	(0.107)	(0.122)
Female estimate, t=0-5	0.082***	0.028**	0.165***	-0.035	0.110**	0.080***	0.096	0.087	0.068
	(0.030)	(0.013)	(0.039)	(0.147)	(0.053)	(0.017)	(0.374)	(0.058)	(0.052)
Male-female	0.266***	0.050*	0.297***	0.546***	0.307***	0.186***	0.732*	0.379***	0.125
Male observations	43,245	11,247	6,079	8,556	16,702	23,489	4,984	6,929	6,771
Female observations	34,736	11,523	10,357	5,868	6,391	23,257	2,939	6,046	2,407
Number of males	5,812	1,309	925	1,195	2,237	3,651	555	897	613
Number of females	5,256	1,502	1,709	946	948	3,733	382	887	246

Notes: The estimated effects are averages of the lead-lag effects shown in Figures 3, 4, and Figure D1 in Appendix D. All models are estimated using the Sun and Abraham (2021) staggered event study based on equation (2), including age group dummies and year FE. Model (1) also includes position-by-years-in-position FE and science-by-university FE. Models (2)-(5) include position-by-years-in-position FE and university FE. Models (6)-(10) include years-in-position FE and science-by-university FE. . The line Male-female shows the difference between the male and female estimates with stars indicating significance of a two-sided test of equality. Significance levels are indicated as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

6.3 Promotion and career outcomes

Differences in publication productivity may translate into differences in academic career advancement. We therefore examine whether the arrival of a first child affects two key early-career outcomes: PhD graduation and promotion to higher academic ranks. Using the same event-study framework as in equation (2), we estimate the effects of childbirth on the probability of graduating from a PhD program and on transitions to higher academic positions for mothers and fathers.

Because the outcomes measure transitions—either graduation or promotion—in a given year, effects may appear relatively quickly after childbirth when such transitions become possible. At the same time, these are relatively infrequent events, implying that the estimated coefficients capture changes in the probability of transitioning in a given year.

We begin by examining the timing of PhD graduation. We then analyze promotion transitions from PhD student to postdoctoral positions, teaching adjunct positions, or directly to associate professor, as well as promotion from postdoctoral positions to associate professor.

6.3.1 PhD graduation

We first estimate OLS-regressions to examine how the time to PhD graduation differs between men and women following childbirth and whether these differences vary across scientific fields. The outcome variable in Table 3 is the number of years to PhD graduation, calculated as the difference between the year of graduation and the first year observed as PhD student, among individuals who both become parents for the first time during their PhD studies and subsequently graduate. The analysis therefore focuses on differences in time to completion conditional on eventual graduation. The coefficient of interest is the dummy variable female. The "All" model controls for age, discipline, years in position, and university by science fixed effects, while the other models replace university by science for just university fixed effects. The results indicate that it takes about 0.75 years longer for women to graduate compared with men after childbirth.[4] This difference can be compared with the parental leave take-up reported in Table 1. Mothers take out 371 days of parental leave during years 0–3 after childbirth, compared with 146 days for fathers.[5] The resulting difference of 225 days corresponds to approximately 0.61 years, which is close to our estimated delay in PhD graduation and suggests that the gender difference in graduation timing largely reflects differences in parental leave take-up. However, the time delay for women varies between fields and ranges from between approximately 0.5 years in Medicine to approximately a full year in the Humanities/Social sciences. This variation is much larger than the parental leave outtake difference by science from Table 1, which ranges from 0.58 years (Humanities/Social sciences) to 0.64 years in Medicine.

In examining graduation using Sun and Abraham's (2021) staggered event-study approach,

[4]These findings are similar to those reported in the online appendix (Table A3) of Lassen and Ivandić (2024), which indicate a delayed PhD graduation for women economists in Denmark of about 0.5 years after childbirth.

[5]Note that parental leave days are sums for all children; the contribution of individual children cannot be distinguished in the data.

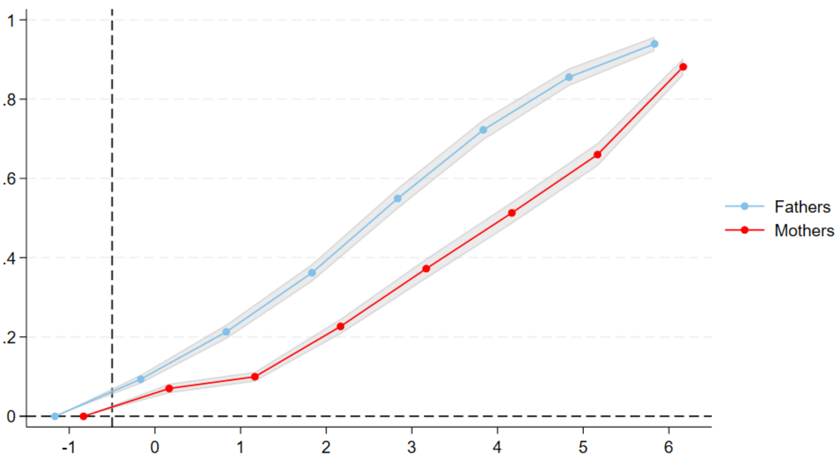
Table 3: Time to PhD for graduating students

	(1) All	(2) Hum/soc sci	(3) Medicine	(4) Natural sci	(5) Tech sci
female	0.754***	0.984***	0.531***	0.884***	0.680***
	(0.050)	(0.127)	(0.094)	(0.103)	(0.086)
Observations	5,960	1,265	1,476	1,251	1,899

Notes: All models are estimated using ordinary least squares including age group dummies, year FE, and position-by-years-in-position FE. Model (1) also includes science-by-university FE, while models (2)–(5) include university FE. Each person who has graduated is one observation with number of years to PhD graduation as outcome. The coefficient female gives the estimated difference in years for mother compared to father doctorates following childbirth. Significance levels are indicated as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

we estimate how the probability of graduating with a PhD develops over event time conditional on remaining a PhD student in the event year with the last (2013) cohort of parents as controls. We use a linear probability model restricting the outcome period to post-birth years where the probability of graduating for each event year (0-6) is compared with the baseline in -1. The model controls for age, field, years in position, and university. Figure 5 shows the estimates, revealing that in each post-birth year the graduation chance rises but is about 10-20 percentage points lower for mothers than for fathers, except in year six where the graduation rate is close to 90 percent for both genders. However, it is worth noting that, due to binning, event year six includes also later observations. These results suggest that childbirth is associated with a delay in PhD completion for mothers relative to fathers. Such delays may in turn affect the timing of subsequent career transitions, which we examine next by analyzing promotion probabilities.

Figure 5: Linear probability models on graduating as PhD



Note: The figure depicts lagged coefficients using the Sun and Abraham (2021) staggered event specification based on equation (2) for to-be-parents who were PhD students in the year before childbirth with graduation to PhD coded as a dummy as the dependent variable. The specification includes age group dummies, year FE, years-in-position FE (year as PhD student), and science-by-university FE.

6.3.2 Promotion

We next examine the effects of childbirth on promotion transitions within academia. We consider four promotion transitions corresponding to common early-career pathways in academia. Specifically, we analyze transitions from PhD student to postdoctoral positions, teaching adjunct positions, or directly to associate professor, as well as transitions from postdoctoral positions to associate professor. The analysis uses the familiar event-study framework, controlling for fixed effects observed the year prior to childbirth: university by science, years in position, and age group; and year fixed effects. Individuals are included in the estimation if they are in the relevant risk set for a given transition. For example, the analysis of promotion to postdoctoral positions includes individuals who are PhD students in the year before childbirth. The outcome variable equals one in the year in which a promotion occurs and zero otherwise. After a promotion has taken place, individuals are removed from the risk set in subsequent years.

Figure 6 shows estimated promotion transitions along typical early-career pathways in academia. Figure 6A shows that the estimated chance of becoming a postdoc ranges from less than 5 percent one year after childbirth, to close to 15 percent (males in year 4) in an individual year, conditional on remaining in the risk set. After childbirth, mothers lag in chances of being promoted to a postdoctoral position; it takes approximately one extra year for mothers to reach the same probability as fathers to be promoted. However, five years after childbirth, differences in promotion probabilities level out, consistent with that most of the sample have had time off for parental leave and finished their PhD studies.

Figure 6B examines whether there are gender differences in transiting to a 'retreat' position as teaching adjunct after their PhD. Clearly, very few make this transition, with estimated probabilities ranging from less than 1 to closer to 3 percent. Most confidence bands overlap though fathers have a significantly higher transition probability in years 0 and 1. In sum, there is no indication that women more than men fall back on teaching exclusively as a result of having children.

Figure 6C looks at the rather direct transition to associate professor from a PhD position.[6] Unsurprisingly, fewer individuals make this transition than to postdoc with estimated probabil-

[6]This may look like a premature category to examine for transition. This impression probably comes in part from the translation of the term 'lektor' (which is what we examine) to associate professor. While tenured, a lektor is mainly a teaching position though some have substantial research, especially if they have the title 'docent'.

ities ranging from just a few percent to 5–10 percent four years after childbirth, conditional on remaining in the risk set. There is a gender gap again with fathers having significantly higher chances in years 0 and 1. In years 2 and beyond, estimated differences remain but are no longer significant, clearly in part because of the lower number of observations of those staying as PhD students and in making these transitions. Finally, Figure 6D looks at the corresponding transition to associate professors from a postdoc position. This more natural transition than for PhD-students still shows substantially more variation because of the lower number of individuals having children as postdocs although the estimated lag-coefficients are fairly large, ranging from about to 10–20 percent for fathers and are substantially lower for mothers where the estimates only reach higher than 10 percent five years after childbirth (conditional on remaining in the risk set); this rate is reached already two years after for fathers.

Overall, the results indicate that becoming a parent for the first time is associated with less favorable early-career transitions for mothers than for fathers. The estimates are most precise for those coming from PhD positions, but differences are more sizable but rarely significant for postdocs transiting to associate professor positions.

Taken together, the results suggest that the arrival of a first child is associated with slower early-career progression for mothers than for fathers. Mothers experience both delayed PhD completion and slower transitions into subsequent academic positions, consistent with the gender differences in publication productivity documented above.

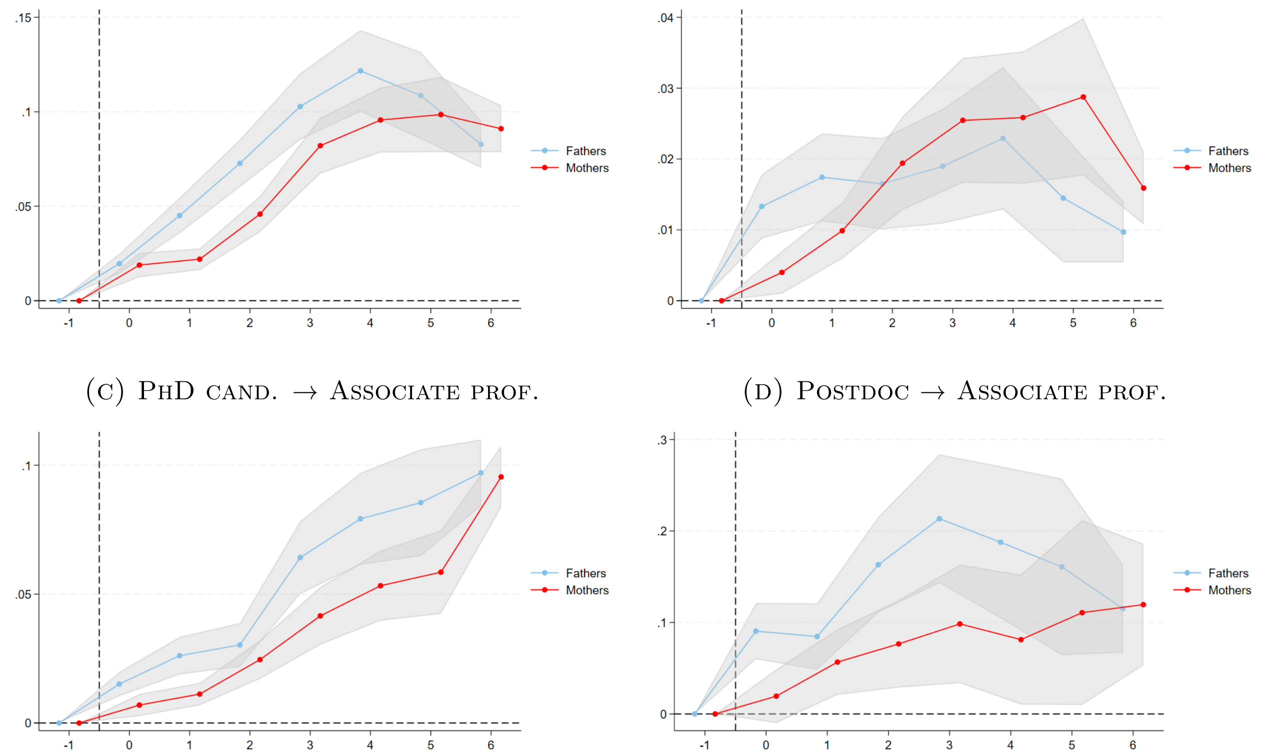
6.4 Income effects

Differences in publication productivity and career progression may ultimately translate into differences in earnings. Income provides a broader measure of career outcomes, as it reflects both academic advancement and differences in research productivity and labor supply. In this section, we therefore examine how childbirth affects two measures of income for academic parents: yearly wage income and yearly total income, as defined above. Both measures are constructed from register-based income data. Observations are included for years in which individuals are temporarily not registered as working in academia, provided that they later return to academic employment. Observations after permanent exit from academia are excluded. Figure 7 illustrates real wage income and real total income developments using staggered event-study

Figure 6: Linear probability models on promotion

(a) PhD cand. → Postdoc (b) PhD cand. → Teaching adjunct

(c) PhD cand. → Associate prof. (d) Postdoc → Associate prof.



Note: All figures are estimated using the Sun and Abraham (2021) staggered event specification based on equation (2), including age group dummies, year FE, years-in-position FE , and science-by-university FE. 'From' is the status in the year before childbirth. Promotion 'to' is an indicator that takes the value 0 before promotion, 1 in the year of promotion and missing all years after.

estimates. All income measures are expressed in real terms using CPI-adjusted Swedish kronor and are constructed from register-based income data. Before childbirth, wage income and total income follow similar trends for men and women. After childbirth, mothers' wage income declines immediately and more strongly than fathers'. In contrast, mothers' total income remains essentially flat between event years -1 and 1, reflecting that lost wage income is partly replaced by parental leave benefits.

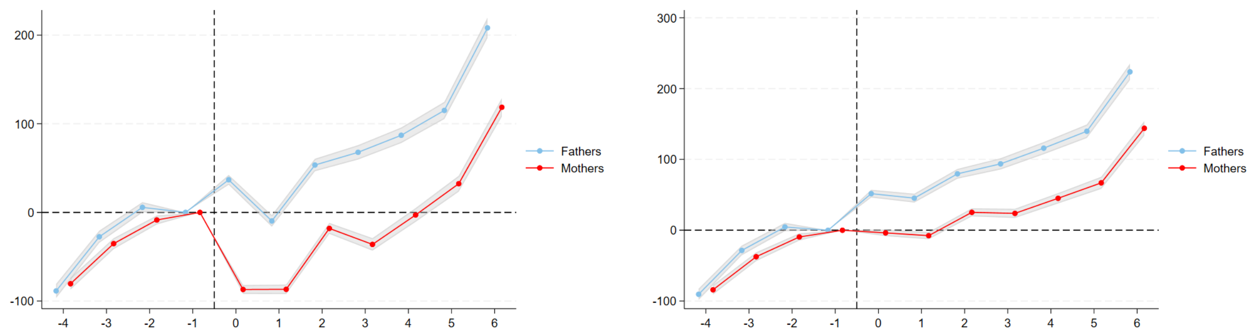
For fathers, both wage income and total income continue to increase in event year 0, followed by a dip in year 1. This pattern likely reflects differences in the timing of parental leave, as fathers often take parental leave when the child turns one year old.

From event year 2 onward, incomes for both parents recover. Fathers' wage income surpasses pre-birth levels already in year 2, whereas mothers' wage income does not return to pre-birth levels until around year 4. In contrast, mothers' total income exceeds pre-birth levels already in year 2, reflecting the role of parental leave benefits and part-time work during the early childhood years.

In the longer run, the gender gaps in both wage income and total income become more pronounced than before childbirth. These patterns are consistent with findings from the broader child-penalty literature (e.g., Angelov et al., 2016; Kleven et al., 2019a).

Figure 7: Event-study estimates for income

(a) Wage income (b) Total income



Note: Wage income and total income are expressed in deflated thousand Swedish kronor (SEK) (index cpi 2022 = 100). Both figures are estimated using the Sun and Abraham (2021) staggered event specification based on equation (2), including age group dummies, year FE, years-in-position FE, and science-by-university FE.

The lagged effects of wage income and total income in Figure 7 are presented as average effects in Table 4 which adds results by science areas. Panels A and B present results for wage income and total income, respectively. They are highly consistent, with the difference that all coefficients become more positive in panel B. Not surprisingly, the wage income effect is negative for mothers, but total income remains positive. Panel A, column (1), shows that fathers earn on average about 78,000 Swedish kronor (about 8,300 USD) more in the event year 0-5 compared with event year -1. For mothers, the effect is negative, with a reduction of about 17,000 SEK (~1,800 USD) per year. For total income, the effect for males is about 88,000 SEK (~9,350 USD) and for females about +25,000 SEK (~2,650 USD). Even-numbered columns in Table 4 add controls for publications and lagged cumulative publications.[7] Including these controls reduces the estimated coefficients in all specifications in both panels, suggesting that part of the income differences is associated with differences in publication activity.

The estimated gender gap change (row: Male-female) in wage income following childbirth is 91,000 SEK after covariate adjustment according to model 1 or about 9,700 USD. In terms of total income, the gap is estimated to 63,000 SEK or about 6,700 USD with some variation. In both panels, the largest gender gap is found in Technical sciences, where women are least represented. For both wage income and total income, the gender gap change becomes smaller when publication controls are included with the exception of a small increase in Technical sciences. This probably reflect that part of the gap in income is explained by publication differentials, which could either affect income through wage negotiations or via changes in promotion. Note, however, that controlling for publications may introduce post-treatment bias, as publication output may itself be affected by childbirth. The estimates including publication controls should therefore be interpreted cautiously. Nevertheless, the gender gap remains statistically significant across all specifications, consistent with the results earlier in the paper.

7 Additional results

In this section we present additional analyses that complement the main results. These analyses examine: a) differences when we use a matched sample of individuals who do not have children, b) heterogeneity in publication effects by pre-birth productivity, c) how the effects vary with parental leave duration, and d) investigate changes in research collaboration and publication impact.

[7] Lagged cumulative publications is the cumulative number of publications lagged one year.

Table 4: Effects of children on income: all and by discipline

(a) Wage income

	All		Hum/soc sci		Medicine		Natural sci		Tech sci	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Male estimate, t=0-5	58.425***	52.677***	38.313***	34.450***	85.863***	79.545***	44.640***	38.978***	61.392***	56.337***
	(3.261)	(3.217)	(6.888)	(6.810)	(10.500)	(10.275)	(6.148)	(6.167)	(4.447)	(4.480)
Female estimate, t=0-5	-33.052***	-35.890***	-47.869***	-50.590***	-12.912***	-16.580***	-36.576***	-37.709***	-50.405***	-56.922***
	(2.700)	(2.810)	(4.806)	(4.683)	(4.781)	(4.784)	(5.825)	(5.754)	(6.362)	(6.177)
Male-female	91.477***	88.568***	86.182***	85.040***	98.775***	96.125***	81.216***	76.688***	111.798***	113.259***
Male observations	48,742	48,742	12,859	12,859	7,063	7,063	9,728	9,728	18,132	18,132
Female observations	41,648	41,648	13,788	13,788	12,638	12,638	7,155	7,155	7,226	7,226
Number of males	5,812	5,812	1,309	1,309	925	925	1,195	1,195	2,237	2,237
Number of females	5,256	5,256	1,502	1,502	1,709	1,709	946	946	948	948

(b) Total income

	All		Hum/soc sci		Medicine		Natural sci		Tech sci	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Male estimate, t=0-5	87.671***	82.263***	69.607***	65.909***	108.237***	102.144***	73.923***	68.632***	92.218***	87.628***
	(3.233)	(3.195)	(6.893)	(6.823)	(10.473)	(10.258)	(6.037)	(6.057)	(4.382)	(4.428)
Female estimate, t=0-5	24.932***	22.003***	9.385**	6.516	44.904***	41.113***	18.532***	17.364***	12.425**	5.660
	(2.666)	(2.780)	(4.710)	(4.597)	(4.755)	(4.759)	(5.818)	(5.757)	(6.150)	(6.013)
Male-female	62.739***	60.260***	60.223***	59.393***	63.333***	61.031***	55.391***	51.268***	79.794***	81.968***
Male observations	48,742	48,742	12,859	12,859	7,063	7,063	9,728	9,728	18,132	18,132
Female observations	41,648	41,648	13,788	13,788	12,638	12,638	7,155	7,155	7,226	7,226
Number of males	5,812	5,812	1,309	1,309	925	925	1,195	1,195	2,237	2,237
Number of females	5,256	5,256	1,502	1,502	1,709	1,709	946	946	948	948

Notes: Income measures are deflated by CPI in thousands of SEK. The estimated effects for model (1) are averages of the lead-lag effects shown in Figures 7. Model (2) adds in relation to (1) controls for publications and lagged cumulative publications. All models are estimated including age group dummies, year FE, and position-by-years-in-position FE. Model (1)–(2) also includes science-by-university FE, while models (3)–(10) include university FE. The line Male-female shows the difference between the male and female estimates with stars indicating significance of a two-sided test of equality. Significance levels are indicated as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Comparison with matched sample results. Appendix B reports results using a matched sample of academic non-parents, i.e., individuals who do not have a child in the sample period. All estimates are now to be interpreted as treatment effects relative to non-treated individuals and no longer relative to the last treated group. An overall conclusion is that the qualitative results are not altered much by this change of control group when we examine the gender gap, while if we examine individual father and mother postbirth effects, the estimates are generally lower for the matched sample.

Figure B1 panel A shows estimated exit rates. Overall the estimates are substantially higher for the matched sample. However, the gender gaps are still mostly not significant. For publications in panel B, the event study figure looks very similar for the matched sample as for the to-be-parents reported in the main text. Pre-trends are even more similar between to-be-fathers and mothers. Table B2 offers more detail for publications by showing estimated averages for the period $t = 0 - 5$ by All, science field and position. The gender gap for "All" is here shown to be very similar with an estimated publication gender gap increase of 0.25 instead of 0.27, still precisely estimated. The gaps (Male-female) are of similar magnitudes and significance levels across subgroups as for the main text's last cohort as control group. The only important difference is that, in Medicine, the gender gap is no longer significant for the matched sample. Even though the gaps are similar, the estimated post-birth coefficients are generally somewhat lower for both males and females when using the matched sample.

The gender gap in the *probability to graduate as PhD* is marginally lower in the post-birth years $t = 0 - 5$ as shown in Table B3, but remains positive and highly statistically significant for all examined subgroups.

For *promotion*, Table B4 shows overall very similar male-female gaps for the matched sample. The gap for promotion from postdoc to associate professor is somewhat smaller in the case of the matched sample (0.043–0.048 in models 7 and 8 vs. 0.075–0.076).

For *wage income and total income*, Figure B2 shows similar results in terms of gender gap developments: the gap increases in the years immediately following childbirth but with no tendencies to increase further over time. The main difference is that the post-birth outcomes are more negative for both fathers and mothers for the matched sample. Results, averaged over the post-birth period 0–5 years after birth are reported in Table B5, which decomposes estimates by subgroup. These results show that the wage income gap, as well as that of total income, is estimated to be smaller but remains economically important and statistically significant for all subgroups when using the matched sample. All estimates are also smaller when using the matched sample. The changes in male and female estimates are sometimes quite substantial, highlighting that the change of control group has implications for in particular within-gender estimates.

Pre-birth publishing experience. Table 5 examines heterogeneity in the publication effects by pre-birth publishing experience. Model 1 includes individuals with zero pre-birth cumulative publications, representing 63 percent of to-be-fathers and 75 percent of to-be-mothers. Model 2 has those with one or two pre-birth cumulative publications (15 percent of males, 13 percent of females). Model 3 is based on 3-6 pre-birth cumulative publications (12 percent of males, 8 percent of females), model 4 is run on those with 7 or more pre-birth publications (10 percent of males, 3 percent of females) and model 5 on those with 13 or more (4 percent of males, 1 percent of females). The table shows some interesting patterns. Moving from models with lower to higher pre-birth publication experience, fathers increase their rate of publication more relative to -1, and the estimated coefficient remains highly statistically significant. The exception is model 5 where the most productive researchers pre-birth are found. The coefficient is both somewhat lower and not significant. For mothers, the patterns are more or less the opposite; the coefficient is positive and highly significant in models 1 and 2, while in models 3-4 the coefficient is very close to zero and not significant. But mothers' coefficient rises to above that of models 1-2 for those with 13 or more pre-publications. This is, however, very imprecisely estimated and not significant. In terms of the publication gender gap, the difference between the estimates rises monotonically with pre-birth publication from model 1–4, but shrinks in model 5. The estimates are also statistically significant in models 1–3. In sum, there is some evidence that higher pre-birth publication experience is associated with a larger post-birth gender gap in publication output.

Table 5: Publication outcomes by pre-birth publishing experience

	(1) zero pre-pub	(2) 1-2 pre-pub	(3) 3-6 pre-pub	(4) ≥ 7 pre-pub	(5) ≥ 13 pre-pub
Male estimate, t=0-5	0.360***	0.601***	0.653***	0.838***	0.519
	(0.020)	(0.067)	(0.096)	(0.281)	(0.484)
Female estimate, t=0-5	0.193***	0.186***	-0.022	-0.001	0.283
	(0.010)	(0.069)	(0.103)	(0.802)	(1.732)
Male-female	0.167***	0.415***	0.674***	0.840	0.236
Male observations	18,949	5,720	4,978	5,325	2,758
Female observations	18,214	4,130	2,793	1,331	423
Number of males	3,768	816	642	534	253
Number of females	3,988	641	406	163	50

Notes: All models are estimated using the Sun and Abraham (2021) staggered event specification based on equation (2), including age group dummies, year FE, position-by-years-in-position FE, and science-by-university FE. The estimated effects are averages of the post-birth event-time coefficients from the event-study specification. The line Male-female shows the difference between the male and female estimates with stars indicating significance of a two-sided test of equality. Significance levels are indicated as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Parental leave. Table 6 examines how the publication effects vary with the number of parental leave days taken during the first three years after childbirth. Because parents in Sweden can freely allocate parental leave days between them, with the exception of 90 days reserved for each parent, leave duration is a choice variable and therefore endogenous. The results should therefore be interpreted as descriptive heterogeneity rather than causal effects of parental leave.

Fathers typically take out parental leave at a much lower rate, but it has been increasing over time. The table reports results for six categories of parental leave: (1) fewer than 50 days, (2) 50–149 days, (3) 150–249 days, (4) 250–349 days, (5) 350–449 days, and (6) 450 days or more.[8] We should note that we cannot distinguish whether parental leave is taken out for the first or subsequent child(ren). There are most fathers found in model 2 and many are also found in models 1 and 3. It is very rare that fathers take out more than 450 days. For mothers, the opposite pattern is observed. We find very few women taking out less than 50 days. Instead, the most common is to take out parental leave in the highest category of more than 450 days.

Does the publication penalty associated with childbirth vary with the length of parental leave? Although parental leave decisions are endogenous, examining these patterns can still provide descriptive insights. Table 6 suggests that fathers' estimate is fairly stable across models with a coefficient varying from 0.265 (model 5) to 0.409 (model 3). Only in the highest category with more than 450 days taken out by only 137 men, does the estimated coefficient shrink. For mothers there is no indication that the penalty shrinks with less parental leave. Instead, the penalty is higher in models 1-3 than in particular model 4, where the post-birth coefficient is highest and significant. It is also positive and significant in model 6 where most parental leave is taken out. In terms of gender gap, the lowest difference between coefficients is shown in model 6, where in fact mothers come out slightly better at -0.03. Otherwise, the gender gap is smallest in model 4, where the difference between the point estimates is only 0.082. The estimated gaps are significant for models 2, 3 and 5 (model 5 on the 10 percent level). While descriptive, the output suggest that the publication gap does not decrease with shorter parental leave for mothers, suggesting that policies targeting parental leave are unlikely to on its own be effective in lowering gender gaps in academic careers.

Publication quality and collaboration. Table 7 examines how childbirth affects publication quality and research collaboration. The dependent variables replace the publication count used earlier with (1) total citations, (2) citations per publication, (3) total number of distinct coauthors, and (4) coauthors per publication.[9] These regressions are estimated for researchers with at least one publication prior to childbirth in order to examine whether publication quality and collaboration patterns change after the event.

The number of citations are strongly positively and significantly affected for males whereas the female coefficient is negative but not significant. For citations per publication, the male

[8]The total maximum paid parental leave length per child summed for both parents was 450 days 1989–2001 and, since 2002, is now 480 days (Försäkringskassan, 2025).

[9]Our data only allows us to count coauthors based in Sweden.

Table 6: Publication effects by extent of parental leave

	(1) D < 50	(2) $50 \geq D < 150$	(3) $150 \geq D < 250$	(4) $250 \geq D < 350$	(5) $350 \geq D < 450$	(6) $D \geq 450$
Male estimate, t=0-5	0.321***	0.350***	0.409***	0.309***	0.265**	0.072
	(0.081)	(0.078)	(0.061)	(0.072)	(0.120)	(0.121)
Female estimate, t=0-5	0.047	-0.050	0.066	0.227***	0.015	0.102***
	(0.243)	(0.087)	(0.052)	(0.052)	(0.061)	(0.028)
Male-female	0.274	0.399***	0.343***	0.082	0.250*	-0.030
Male observations	11,197	14,972	10,587	4,007	1,551	931
Female observations	392	1,509	6,489	8,696	7,491	10,159
Number of males	1,447	1,950	1,461	585	232	137
Number of females	66	228	985	1,292	1,148	1,537

Notes: D denotes number of days the parent has taken out parental leave in years 0–3 following childbirth. All models are estimated using the Sun and Abraham (2021) staggered event specification based on equation (2), including age group dummies, year FE, position-by-years-in-position FE, and science-by-university FE. The estimated effects are averages of the post-birth event-time coefficients from the event-study specification. The line Male-female shows the difference between the male and female estimates with stars indicating significance of a two-sided test of equality. Significance levels are indicated as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

coefficient is positive but not significantly different from zero. For mothers, this effect is negative and not significant. This suggests a clear gap also in impact of scientific work. The p-value testing whether the gender gap increases, shows significance on the 10 percent level for total citations. However, the increase in total citations partly reflects the publication gap documented earlier in the paper, as total citations are mechanically related to the number of publications. When considering citations per publication instead, the gender difference is not statistically significant on conventional levels ($p = 0.184$).

For total coauthors, fathers show no significant change, as the estimated coefficient is close to zero. For mothers, however, the number of coauthors declines significantly, despite earlier results indicating that their publication rate does not fall proportionally. For coauthors per publication, both fathers and mothers reduce their collaboration intensity, although the decline is larger for mothers and the gap difference is statistically significant. Thus, mothers lower their degree of collaboration more than fathers, which may contribute to the gender gap in publication output documented earlier in the paper. The larger decline in coauthors per publication suggests that mothers face greater difficulty maintaining and expanding collaborative networks after childbirth.

Taken together, these additional results suggest that the gender gap in publication associated with childbirth varies with researchers' prior publication experience and is accompanied by changes in research collaboration patterns. While parental leave duration is correlated with publication outcomes, the results indicate that differences in collaboration may also contribute to the observed gender gap in publication output.

Table 7: Quality and collaboration

	(1) citations	(2) citations per pub	(3) coauthors	(4) coauth per pub
Male estimate, t=0-5	5.421***	0.237	0.074	-0.102***
	(1.839)	(0.189)	(0.052)	(0.022)
Female estimate, t=0-5	-0.575	-0.287	-0.242***	-0.213***
	(2.533)	(0.346)	(0.077)	(0.036)
Male-female	5.996*	0.524	0.316***	0.111***
Male observations	16,023	16,023	16,023	16,023
Female observations	8,254	8,254	8,254	8,254
Number of males	1,992	1,992	1,992	1,992
Number of females	1,210	1,210	1,210	1,210

Notes: All models are estimated using the Sun and Abraham (2021) staggered event specification based on equation (2), including age group dummies, year FE, position-by-years-in-position FE, and science-by-university FE. The estimated effects are averages of the post-birth event-time coefficients from the event-study specification. The line Male-female shows the difference between the male and female estimates with stars indicating significance of a two-sided test of equality. Significance levels are indicated as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

8 Concluding discussion

This paper examines how parenthood affects academic career trajectories using Swedish population register data covering nearly the full population of university researchers and teachers, linked to individual-level bibliometric records. To account for the staggered timing of first births across cohorts, we estimate interaction-weighted event-study models following Sun and Abraham (2021), which avoids the contamination problems associated with standard two-way fixed effects estimators in settings with heterogeneous treatment effects. Following Kleven et al. (2019b), we focus on the evolution of the gender gap between mothers and fathers around childbirth as the primary estimand, motivated by the stable pre-birth gender difference in publication output and its sharp post-birth divergence. Publication output trends upward among soon-to-be parents relative to the control group prior to childbirth, a pattern that may reflect selection into parenthood or other career dynamics specific to the pre-birth period. Importantly, this pre-birth trend evolves similarly across genders, and the gender gap in publication output is stable before childbirth and widens sharply and persistently after, supporting a causal interpretation of the post-birth divergence.

Our main findings can be summarized as follows. Fathers increase their publication output following childbirth while mothers' output remains essentially unchanged, producing a gender gap that widens persistently over the six-year follow-up period. The average post-birth gender gap amounts to approximately 0.27 publications per year in the first five years after childbirth, nearly doubling the pre-existing gap. These publication differences translate into broader career penalties: mothers experience delayed PhD completion, slower transitions into postdoctoral and faculty positions, and persistent wage losses relative to fathers. The estimated gender gap in wage income averages approximately 9,700 USD per year over the first five years following childbirth. We show that these patterns hold across scientific fields, with a gender gap in humanities and social sciences, medicine, natural sciences, and technical sciences, indicating that the academic child penalty is not confined to STEM-fields. The gap in publications is largest in natural sciences and smallest in humanities and social sciences, a pattern that partly reflects differences in baseline publication rates across fields rather than fundamentally different responses to childbirth.

Heterogeneity analyses reveal that the gender gap is most pronounced among postdoctoral researchers, the career stage combining the greatest publication pressure with the least institutional security. This finding points to a particular vulnerability at the postdoctoral stage, where the combination of temporary employment and strong incentives to publish creates conditions under which the arrival of a first child disproportionately disadvantages women relative to men. Among PhD students, who constitute the majority of first-time parents in our sample, a smaller but statistically significant gender gap is nonetheless present, and mothers take approximately 0.75 years longer than fathers to complete their doctoral degrees following childbirth, a difference that closely mirrors the gap in parental leave take-up between mothers and fathers. The gap also increases with pre-birth publication experience, suggesting that the differential effect of childbirth on fathers and mothers is larger among researchers with stronger pre-birth research profiles. Part of this gradient may reflect a scaling effect according to which higher baseline productivity amplifies the absolute gender gap.

Our findings carry important implications for understanding both the sources of the academic child penalty and the scope for policy to address it. While the endogenous nature of parental leave decisions prevents causal interpretation, the descriptive analysis of parental leave heterogeneity suggests no clear gradient between leave duration and the publication penalty for mothers, pointing tentatively toward the conclusion that policies targeting leave duration alone are unlikely to fully close the gender gap in academic productivity. The structure of academic careers itself – with its cumulative returns to early productivity, strong publication norms, and reliance on temporary contracts during the period when family formation is most common – appears to be a more central driver of the penalties we document. This interpretation is further supported by the collaboration network evidence: mothers experience a larger decline in coauthors per publication than fathers after childbirth, suggesting that the penalties operate at least partly through disruptions to research collaboration that compound over time.

Taken together, these patterns suggest that the academic child penalty operates through multiple channels simultaneously – career stage vulnerability, collaboration network disruption, and cumulative productivity loss – rather than through a single mechanism. Effective interventions may therefore need to address these structural features of academic careers rather than focusing narrowly on parental leave duration alone.

An important qualification to these findings is that gender gaps in academic careers are not solely a consequence of childbirth. We document substantial gender differences in publication output and career stage already prior to first birth, and a clear gap between academics who never become parents. This pattern echoes the broader point made by Kleven et al. (2019b) that child penalties, while large, do not fully account for gender gaps in labor market outcomes. In the academic context, our findings suggest that other mechanisms – including ifferences in collaboration networks, research environments, and institutional practices – also contribute to gender inequality and may explain part of the gap that childbirth alone cannot account for. A full account of the gender gap in academic careers therefore requires attention to factors beyond parenthood, and disentangling the relative contributions of child-related and non-child-related mechanisms is an important direction for future research.

Our analysis is by design restricted to individuals employed in research and teaching positions at Swedish universities, as these are the academics for whom publications constitute a central career outcome and for whom the tension between research productivity and family formation is most directly relevant. Within this population, our publication data link researchers to Scopus author identifiers, a process that covers approximately 35 percent of all university staff. While this partly reflects the fact that many staff members in this category do not publish or publish infrequently, it implies that our bibliometric analysis is concentrated among the more active publishers within an already research-active population, which should be kept in mind when interpreting the magnitude of the publication effects.

Several limitations of the present study deserve acknowledgment. While the parallel evolution of the gender gap before childbirth supports a causal interpretation of the post-birth divergence, the positive pre-birth trends within each gender reflect selection or other mechanisms, and within-gender post-birth estimates should therefore be interpreted with appropriate caution. Finally, our data cover the period 1996 to 2013, and it is possible that the patterns we document have evolved in more recent years as gender norms, parental leave take-up, and academic career structures have continued to change. Whether the child penalty in academia has narrowed in more recent cohorts remains an open question that future research with more recent data could address.

Sweden provides an informative and in many ways demanding test case for studying academic child penalties. With among the most generous parental leave entitlements in the world, widely available subsidized childcare, and active policy efforts to encourage paternal leave-taking, Sweden represents a best-case scenario for institutional support of working parents. The persistence of substantial and broad-based gender gaps in our results suggests that family policies of the Swedish type, while valuable, are insufficient to close the gender gap in academic careers. This finding has relevance beyond Sweden: if generous family policies cannot eliminate the academic child penalty in a setting specifically designed to support the combination of work and family life, the barriers to gender equality in academic careers are likely to be at least as large in less supportive institutional contexts.

Taken together, our findings paint a consistent picture: the transition to parenthood is associated with substantial and persistent gender gaps in academic careers that extend across disciplines, career stages, and outcome dimensions. These penalties operate through multiple channels and are not fully captured by differences in parental leave take-up, pointing toward the structure of academic careers as a central driver. At the same time, the presence of gender gaps prior to childbirth and among never-parents reminds us that family formation is only one part of the story. Closing the gender gap in academic careers will likely require a broader set of interventions that address both the structural features of academic career design and the mechanisms sustaining gender inequality beyond parenthood itself.

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Appendices

A Parental leave rights in Sweden

Sweden was the first country in the world to adopt universal parental leave rights on the labor market, in 1974 (Försäkringskassan, 2025). The aim was to facilitate combining work with having children, thus aiding women's participation and entry on the labor market. Parents have the right to 480 leave days, which can be shared between the parents. 90 of those days have to be reserved to each parent. The level of parental leave compensation is based on previous income and requires an employment. This has had negative impacts for PhD students who had positions in which they were often not considered "employed". Today, PhD students are generally employees with the same rights as on the regular labor market. This implies full rights to social security benefits, including paid rights to parental leave. Such leaves, which thus are paid by government, entail an extension of the PhD program duration by the same number of days as parental leave is taken. Prolongation is also used if PhD students teach or engage in other responsibilities outside their PhD duties. For example, if a PhD student teaches 20 percent of the time in all years, the total time is extended to 5 years. Until its abolition in 2017, a small stream of PhD students were financed through an "education grant" (utbildningsbidrag), which did not qualify them for social security benefits. A minority of PhD students are still funded by scholarships which does not automatically entitle them to social security coverage. Instead, universities are required to cover such expenditures through mandatory insurance (UKÄ, 2025; Universitetsläraren, 2005; SULF, 2025).

B Matched sample results

B.1 Matching procedure for non-parent control group

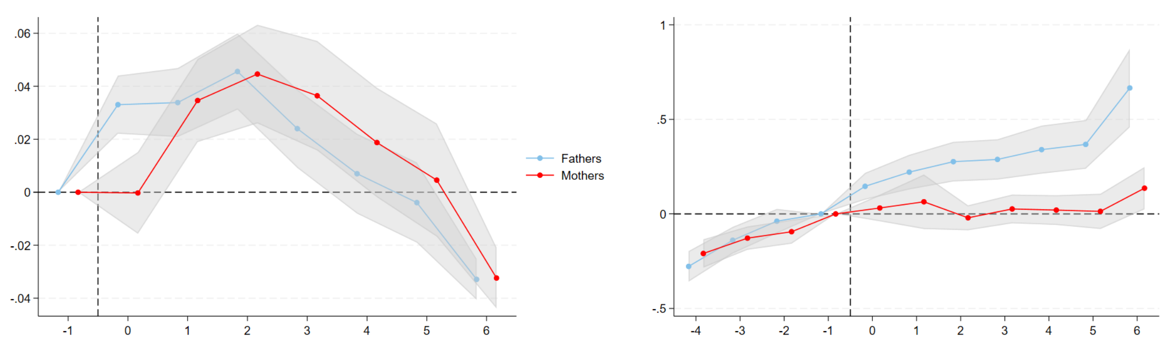
For the comparison between parents and non-parents we created a matched sample. As in the main text, parenting is observed for the 1996–2013 period. Non-parents are those with no observed children in our data. Note that this group is different from that of neverparents as presented in the main text as that definition requires individuals also to be observed without children at age 55. Here, parents to be treated were matched with non-parents using coarsened exact matching (CEM) without replacement (Iacus et al., 2012) based on individual characteristics from one year before the birth of the child. We match on age, gender, year, a dummy for foreign born, position and broad scientific field (humanities and social sciences, medicine, technical sciences and natural sciences). The matching on year implies the creation of a placebo childbirth year among non-parents. We use Sturge's rule to coarsen the data into bins for birth year and match exactly on all other variables. First, a file containing the pool of all-to-be treated individuals with their characteristics in the year before birth was put together with non-parents. An algorithm was created where first a random number was drawn for all treated individuals. They were then drawn in the order given by the random number. If a match was found, they were matched to a non-parent and the matched pair was removed from the pool. Then the next treated person given by the random number was drawn and so on.

B.2 Results

Regression results for the matched sample are presented here for survival, publications, graduation to PhD and promotion using the method of Sun and Abraham (2021) but with the non-treated matched sample as control group. Interpretations of these results are found in the main text.

Figure B1: Event-study estimates for probability to exit out of academia and for publications. Controls: matched non-parents.

(a) Exit (b) Publications



Note: The figures show event-study estimates of the probability of exiting academia (A) and of annual publication output (B) using the matched sample of non-parents relative to the year before childbirth ($t = -1$) for parents and assigned placebo-birth year for non-parents. It is estimated using the Sun and Abraham (2021) staggered event specification based on equation (2), including age group dummies, year FE, position-by-years-in-position FE, and science-by-university FE.

Table B1: Matched sample, male and female.

	(1) Male treated	(2) Male control	(3) Female treated	(4) Female control
PhD students	0.69	0.69	0.72	0.72
	(0.46)	(0.46)	(0.45)	(0.45)
Postdocs	0.07	0.07	0.06	0.06
	(0.26)	(0.26)	(0.23)	(0.23)
Associate Professors	0.07	0.07	0.03	0.03
	(0.26)	(0.26)	(0.18)	(0.18)
Professors	0.01	0.01	0.00	0.00
	(0.11)	(0.11)	(0.04)	(0.04)
Other research and	0.15	0.15	0.19	0.19
teaching staff	(0.36)	(0.36)	(0.39)	(0.39)
Common/other	0.00	0.00	0.00	0.00
	(0.04)	(0.04)	(0.07)	(0.07)
Humanities/social sciences	0.23	0.23	0.30	0.30
	(0.42)	(0.42)	(0.46)	(0.46)
Medicine	0.16	0.16	0.32	0.32
	(0.37)	(0.37)	(0.47)	(0.47)
Natural sciences	0.22	0.22	0.19	0.19
	(0.41)	(0.41)	(0.39)	(0.39)
Technical sciences	0.39	0.39	0.19	0.19
	(0.49)	(0.49)	(0.39)	(0.39)
Year of match	2,005.71	2,005.71	2,006.03	2,006.03
	(4.90)	(4.90)	(4.89)	(4.89)
Foreign born	18.12	18.07	17.72	17.57
	(5.18)	(5.18)	(5.29)	(5.29)
Age	31.64	31.50	30.59	30.51
	(4.75)	(5.24)	(3.62)	(4.73)
Publications	0.69	0.49	0.37	0.25
	(1.69)	(1.75)	(1.69)	(0.98)
Citations	11.56	10.87	13.84	11.28
	(28.74)	(25.90)	(87.88)	(24.15)
Coauthors	0.52	0.36	0.36	0.27
	(1.34)	(1.29)	(1.16)	(1.11)
Wages, 1000 SEK/year	355.92	317.09	312.12	260.08
	(151.88)	(154.71)	(118.43)	(137.55)
Observations	4,793	4,793	3,441	3,441

Note: This table shows descriptive data for male and female parents matched against non-parents. Matching is exact on position (PhD students, Postdocs, Associate professors, Professors and, Other research and teaching staff), science (Humanities/social sciences, Medicine, Natural sciences and, Technical sciences), Year of match and, Foreign born. Age is a coarsened matching variable. Publications, citations, coauthors and wages are variables not matched on.

Table B2: Effects of children on publications: all, by science and by position. Controls: matched non-parents.

	(1) All	(2) Hum/soc sci	(3) Medicine	(4) Natural sci	(5) Tech sci	(6) PhD stud	(7) Postdoc	(8) Other	(9) Associate
Male estimate, t=0-5	0.273***	0.076**	0.326**	0.359***	0.322***	0.169***	0.652**	0.532***	0.121
	(0.043)	(0.031)	(0.133)	(0.112)	(0.073)	(0.036)	(0.286)	(0.112)	(0.137)
Female estimate, t=0-5	0.023	0.003	0.110*	-0.042	-0.032	0.009	-0.288	0.164**	-0.021
	(0.033)	(0.014)	(0.058)	(0.145)	(0.071)	(0.027)	(0.373)	(0.076)	(0.096)
Male-female	0.251***	0.073**	0.217	0.401**	0.355***	0.160***	0.940**	0.367***	0.141
Male observations	57,327	15,188	7,772	12,274	21,438	35,340	4,366	8,827	7,474
Female observations	36,507	12,976	9,490	6,580	6,831	25,772	2,071	6,659	1,945
Number of males	8,615	1,925	1,334	1,871	3,347	5,904	594	1,321	676
Number of females	6,113	1,837	1,806	1,145	1,183	4,439	337	1,122	208

Notes: The estimated effects are averages of the lead-lag effects similar to what is shown in Table 2. All models are estimated using the Sun and Abraham (2021) staggered event study based on equation (2), including age group dummies and year FE. Model (1) also includes position-by-years-in-position FE and science-by-university FE. Models (2)-(5) include position-by-years-in-position FE and university FE. Models (6)-(10) include years-in-position FE and science-by-university FE. The line Male-female shows the difference between the male and female estimates with stars indicating significance of a two-sided test of equality. Significance levels are indicated as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table B3: Effects of children on probability of graduation to PhD, all and by discipline. Controls: matched non-parents.

	(1) All	(2) All + pub	(3) Hum/soc sci	(4) Medicine	(5) Natural sci	(6) Tech sci
Male estimate, t=0-5	0.223***	0.212***	0.150***	0.358***	0.226***	0.228***
	(0.011)	(0.011)	(0.024)	(0.027)	(0.022)	(0.016)
Female estimate, t=0-5	0.096***	0.090***	-0.014	0.226***	0.060**	0.142***
	(0.013)	(0.013)	(0.024)	(0.024)	(0.026)	(0.028)
Male-female	0.128***	0.122***	0.164***	0.132***	0.166***	0.086***
Male observations	28,761	28,761	6,944	3,412	6,283	11,758
Female observations	21,001	21,001	7,218	5,075	4,062	4,273
Number of males	5,763	5,763	1,132	787	1,282	2,464
Number of females	4,324	4,324	1,241	1,165	872	940

Notes: The estimated effects are averages of the post-birth event-time coefficients from the event-study specification. All models are estimated using ordinary least squares including age group dummies, year FE, and position-by-years-in-position FE. Model (1)–(2) also include science-by-university FE, while models (3)–(6) include university FE. Model (2) adds in relation to (1) controls for publications and lagged cumulative publications. The line Male-female shows the difference between the male and female estimates with stars indicating significance of a two-sided test of equality. Significance levels are indicated as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

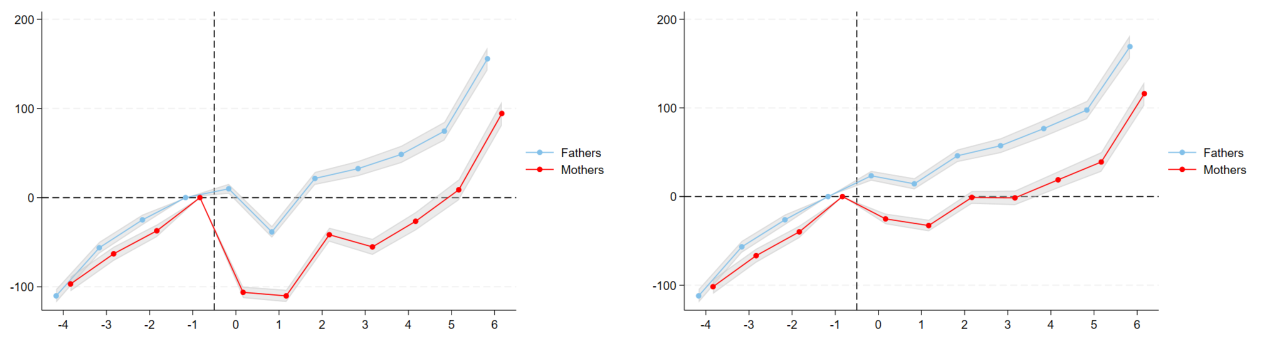
Table B4: Promotion. Controls: matched non-parents.

	phd to postdoc		phd to adjunct		phd to assoc		postdoc to assoc	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Male estimate, t=0-5	0.056***	0.055***	0.007***	0.008***	0.027***	0.026***	0.065***	0.059***
	(0.004)	(0.004)	(0.002)	(0.002)	(0.003)	(0.003)	(0.017)	(0.017)
Female estimate, t=0-5	0.035***	0.034***	0.007***	0.007***	0.012***	0.012***	0.017	0.016
	(0.004)	(0.004)	(0.002)	(0.002)	(0.003)	(0.003)	(0.018)	(0.018)
Male-female	0.021***	0.021***	0.001	0.001	0.014***	0.014***	0.048**	0.043*
Publication controls	NO	YES	NO	YES	NO	YES	NO	YES
Male observations	26,989	26,989	27,163	27,163	26,675	26,675	2,444	2,444
Female observations	20,006	20,006	19,973	19,973	19,702	19,702	1,232	1,232
Number of males	5,902	5,902	5,807	5,807	5,900	5,900	567	567
Number of females	4,435	4,435	4,368	4,368	4,437	4,437	330	330

Notes: All models are estimated using the Sun and Abraham (2021) staggered event specification based on equation (2), including age group dummies, year FE, years-in-position FE , and science-by-university FE. 'From' is the status in the year before childbirth. Promotion 'to' is an indicator that takes the value 0 before promotion, 1 in the year of promotion and missing all years after. The estimated effects for model (1) are averages of lead-lag effects similar to those shown in Figure 6 for the main sample. Model (2) adds in relation to (1) controls for publications and lagged cumulative publications. The line Male-female shows the difference between the male and female estimates with stars indicating significance of a two-sided test of equality. Significance levels are indicated as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Figure B2: Event-study estimates for income. Controls: matched non-parents.

(a) Wage income (b) Total income



Note: Wage income and total income are expressed in deflated thousand Swedish kronor (SEK) (index cpi 2022 = 100). Both figures are estimated using the Sun and Abraham (2021) staggered event specification based on equation (2), including age group dummies, year FE, years-in-position FE, and science-by-university FE.

Table B5: Effects of children on wage income and total earnings developments: all and by discipline. Controls: matched non-parents.

(a) Wage income: matched non-parents as controls

	All		Hum/soc sci		Medicine		Natural sci		Tech sci	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Male estimate, t=0-5	24.736***	19.793***	7.746	5.666	41.089***	34.877***	17.534***	13.075**	32.624***	27.430***
	(3.359)	(3.340)	(6.744)	(6.608)	(10.401)	(10.376)	(6.216)	(6.281)	(4.831)	(4.773)
Female estimate, t=0-5	-55.182***	-55.848***	-62.426***	-62.816***	-32.812***	-35.373***	-59.850***	-58.989***	-72.096***	-73.594***
	(3.500)	(3.461)	(6.314)	(6.190)	(6.724)	(6.457)	(6.261)	(6.221)	(8.532)	(8.185)
Male-female	79.919***	75.640***	70.172***	68.482***	73.901***	70.249***	77.384***	72.064***	104.720***	101.024***
Male observations	64,429	64,429	17,510	17,510	8,909	8,909	13,795	13,795	23,268	23,268
Female observations	42,627	42,627	15,262	15,262	11,221	11,221	7,687	7,687	7,566	7,566
Number of males	8,615	8,615	1,925	1,925	1,334	1,334	1,871	1,871	3,347	3,347
Number of females	6,113	6,113	1,837	1,837	1,806	1,806	1,145	1,145	1,183	1,183

(b) Total income: matched non-parents as controls

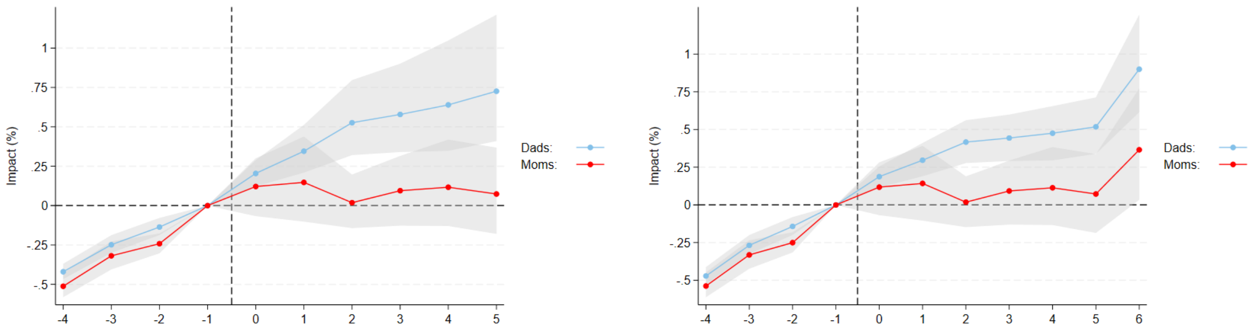
	All		Hum/soc sci		Medicine		Natural sci		Tech sci	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Male estimate, t=0-5	52.587***	47.850***	36.867***	34.857***	63.810***	57.741***	44.867***	40.638***	62.496***	57.566***
	(3.357)	(3.344)	(6.800)	(6.676)	(10.535)	(10.527)	(6.131)	(6.201)	(4.780)	(4.738)
Female estimate, t=0-5	-0.390	-1.093	-9.636	-10.063*	21.389***	18.793***	-4.544	-3.710	-12.628	-14.363*
	(3.444)	(3.407)	(6.178)	(6.067)	(6.743)	(6.495)	(6.150)	(6.110)	(8.347)	(7.994)
Male-female	52.976***	48.943***	46.503***	44.921***	42.422***	38.948***	49.412***	44.348***	75.124***	71.929***
Male observations	64,429	64,429	17,510	17,510	8,909	8,909	13,795	13,795	23,268	23,268
Female observations	42,627	42,627	15,262	15,262	11,221	11,221	7,687	7,687	7,566	7,566
Number of males	8,615	8,615	1,925	1,925	1,334	1,334	1,871	1,871	3,347	3,347
Number of females	6,113	6,113	1,837	1,837	1,806	1,806	1,145	1,145	1,183	1,183

Notes: Income measures are deflated by CPI in thousands of SEK. The estimated effects for model (1) are averages of lead-lag effects similar to those shown in Figure 7. Model (2) adds in relation to (1) controls for publications and lagged cumulative publications. All models are estimated including age group dummies, year FE, and position-by-years-in-position FE. Model (1)–(2) also includes science-by-university FE, while models (3)–(10) include university FE. The line Male-female shows the difference between the male and female estimates with stars indicating significance of a two-sided test of equality. Significance levels are indicated as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

C Comparison of Poisson vs. standard fixed effects

Figure C1: Comparison of publication estimates using Poisson and OLS-regressions.

(a) Poisson (b) OLS

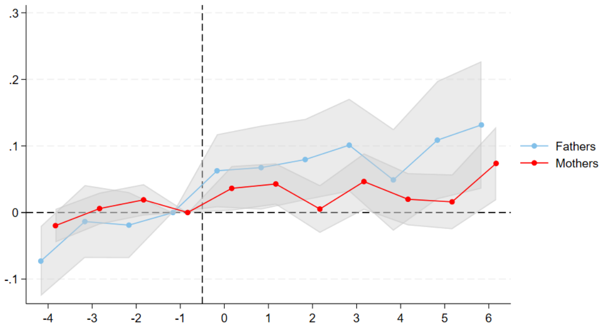


Note: The figure show male and female publication impact in percent after childbirth using Poisson and OLS. Standard errors were calculated using bootstrapping with 500 replications following the method of Kleven et al. (2021). Because the Poisson would not converge using the same specification as in the main text, we replaced science-by-university FE with science field FE for both specifications. As before, we include age interval dummies (15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59), and position-by-years-in-position FE.

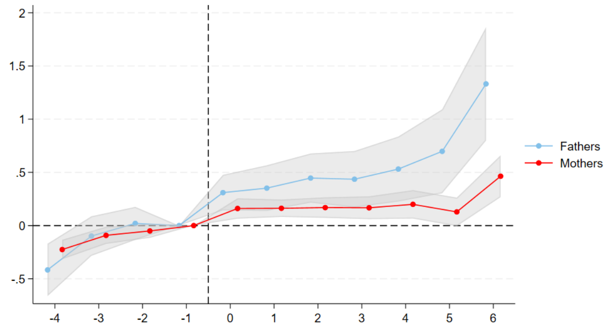
D Publication effects in different fields

Figure D1: Publication outcomes by science after childbirth

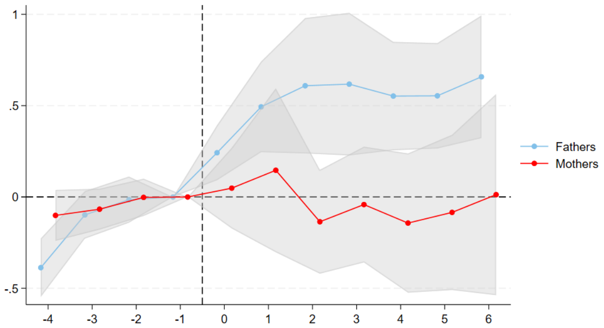
(a) Humanities and social sciences



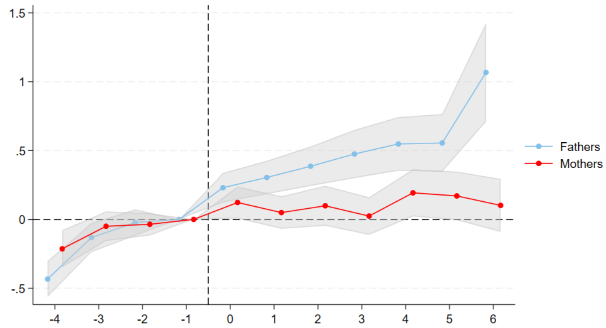
(b) Medicine



(c) Natural sciences



(d) Technical sciences



Note: All figures are estimated using the Sun and Abraham (2021) staggered event specification based on equation (2), including age group dummies, year FE, position-by-years-in-position FE, and university FE.

Online appendix

OA1 Positions in the Swedish academic system

Table OA1.1: List of positions and group type.

Swedish name	English translation	Group
Professorer	Professors	Research
Lektorer	Associate professors	Research
Adjunkter	Teaching adjuncts	Teaching
Annan forskande och undervisande personal	Other research and teaching staff	Research
Doktorander	PhD students	Research
Administrativ personal	Administrative staff	Admin & support
Bibliotekspersonal	Librarians	Admin & support
Teknisk personal	Other research and teaching staff/technical staff	Other
Arvodister	Temporary staff	Other
Meriteringsanställningar	Postdocs	Research

Note: The column "English translation" shows the names used in English for the corresponding Swedish word to the left. They are also official names except where here noted. The Swedish word *lektor* is a permanent position mainly devoted to teaching. Lektor is officially translated as senior lecturer with associate professor reserved for those who have obtained status as *docents*. However since we cannot distinguish the two systematically we use the term associate professor throughout. The Swedish *Meriteringsanställningar* comprises postdocs, assistant professors and associate senior lecturers, but cannot be distinguished. We refer to them all as postdocs in the paper. *Source*: Ejermo and Sofer (2024).

OA2 Publication data

Data on publications were collected by linking staff data from universities with Scopus author-ids. These data were then pseudonymized and linked to both staff registries at Statistics Sweden and other administrative data.

To create this database, colleges and universities were first asked to provide lists of all individuals engaged in research or teaching at their universities. The lists were requested based on the premise that staff lists can be considered public documents according to Swedish law. Moreover, researchers have extended rights to use and create databases, enabling them to obtain individuals' personal identifiers, such as social security numbers (SSNs).

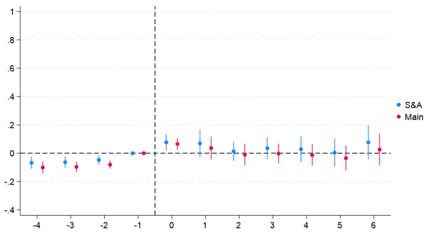
Most academic institutions complied with the request, although some academic institutions did not respond to it, despite repeated reminders. Eventually, 22 out of the 25 institutions supplied the requested information. They typically provided information on first name(s), last name, and e-mail address of relevant individuals. However, the supplied information varied in terms of both content (e.g., multiple rows per person, email or not, nonstandardized positions or not, temporary or permanent positions, affiliation information at the university, etc) and coverage in terms of the years covered. After careful harmonization and pseudonymization of the data, it was sent to Fraunhofer ISI, Germany, for linking names and individuals with author IDs in the Scopus database. With respect to the scope of the database, the Swedish university system had from 50,000 employees in the mid-1990s to close to 80,000 in 2021. About 60 percent of them are researchers or teachers. The staff lists submitted had 70,202 unique individuals, of whom about 35 percent, or 25,020, were linked to an author ID in Scopus. This might seem low, but many individuals never publish.

Ejermo et al. (2016) found that around 85 percent of linkable publications were linked. Fraunhofer ISI delivered a panel that included the number of publications per individual and per year, a collaboration matrix detailing who collaborated with whom in a given year, the number of publications on which they collaborated, and the number of citations to an individual's publications in a given year. These citation counts were created by adding up the number of citations to a publication using a three-year window after the publication year.

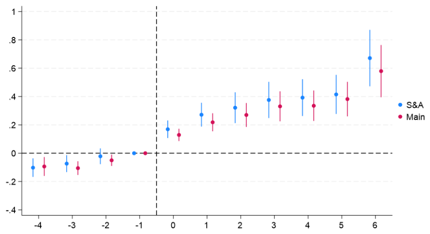
OA3 Fixed effects vs. interaction-weighted estimates

Figure OA3.1: Twoway fixed effects vs. Sun and Abrahams event-study model for alternative specifications – publication as outcome

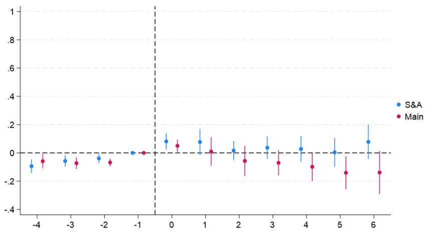
(a) female: year FE



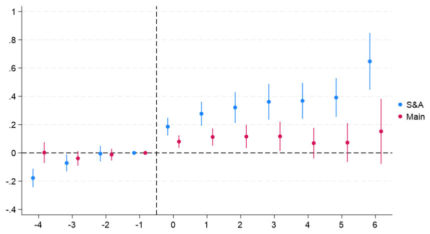
(b) male: year FE



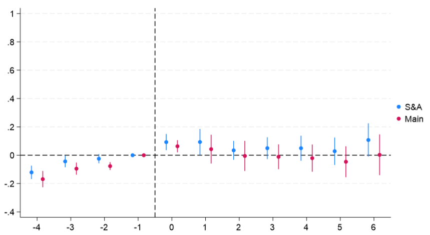
(c) female: + age



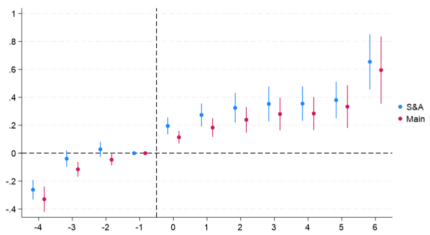
(d) male: + age



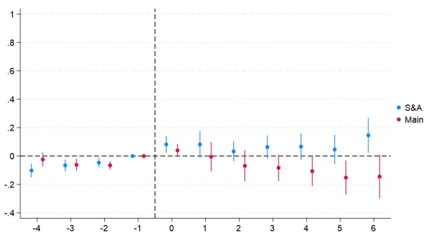
(e) female: + position FE



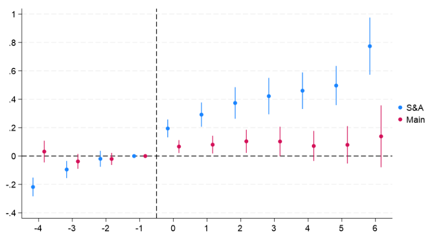
(f) male: + position FE



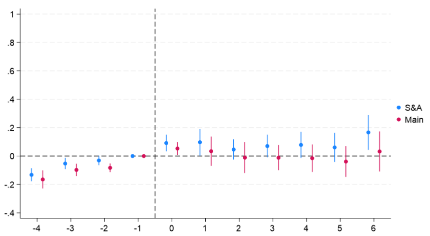
(g) female: + science FE



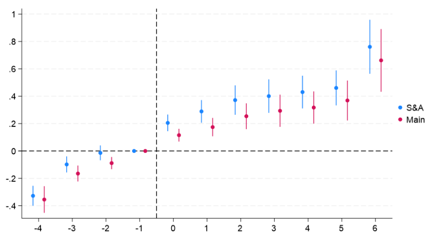
(h) male: + science FE



(i) female: + position x year FE



(j) male: + position x year FE

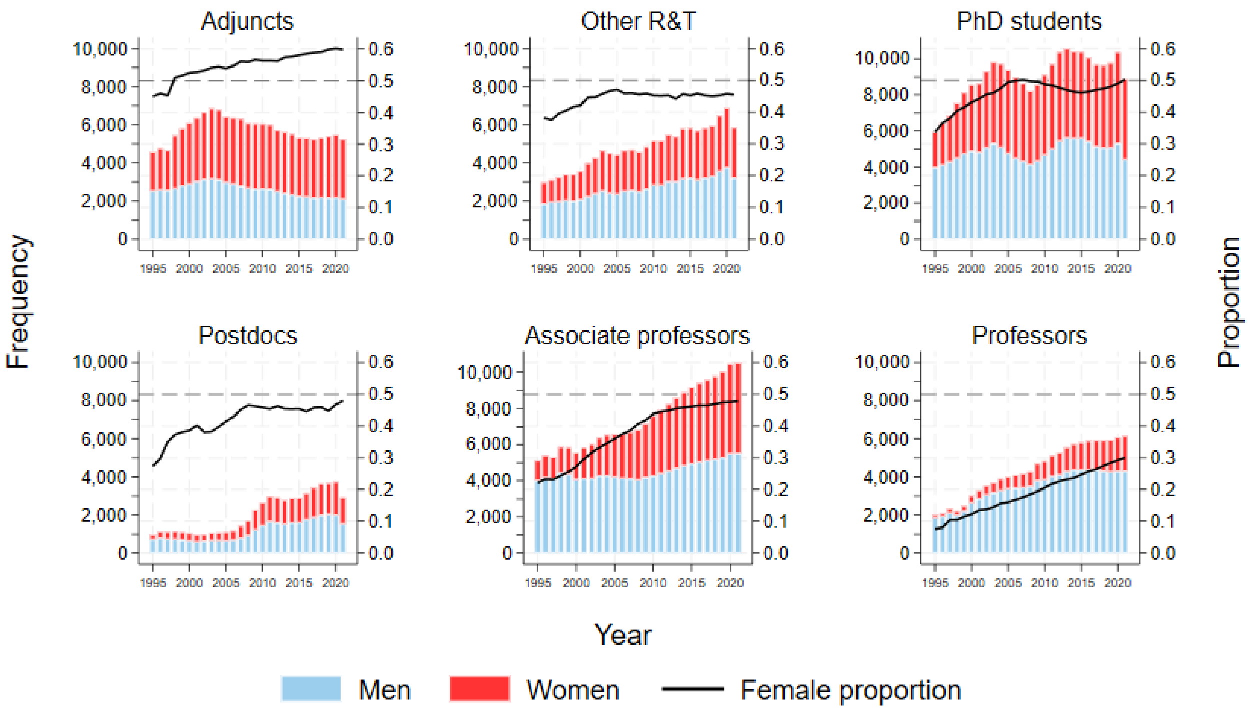


Note: All figures compare the estimates from Sun and Abraham (2021) with those of a non-staggered event-study model. Subgraphs (a) and (b) use only year fixed effects (FE), (c) and (d) add year before birth age FE for the event-study model and age group dummies. (e) and (f) before birth position FE, (g) and (h) add before birth science area FE and (i) and (j) replace position FE with year before birth position x year in position FE. (i) and (j) use the full set of controls as specified in the main text.

OA4 Further descriptive data

OA4.1 Gender gap in positions

FIGURE OA4.1: GENDER GAP IN POSITIONS



Note: Number of men and women measured are shown on the left y-axis, the female proportion on the right y-axis.

Figure OA4.1 shows research and teaching staff by position at Swedish universities from 1995 to 2020. The number of men and women are indicated by bar height against the left axis. The proportion of women is indicated by the black line against the right axis with gender parity indicated by the dashed line. Throughout the period, the share of women has been below fifty percent in all categories except for (teaching) adjuncts and PhD students. The female share among adjuncts has steadily increased to around 60 percent by 2020. The category of PhD students has the most balanced distribution of men and women, reaching close to gender parity already in 2005. Among postdocs, the share of women is converging towards the share of men rising from 27 percent in 1995 to 48 percent in 2020. The most significant gender gaps are found among permanent positions, among associate professors and professors. A strong catch-up has taken place for women among associate professors, reaching close to gender parity in 2020. The most unbalanced position is professors, but here also a substantial convergence has taken place with the percentage of female professors rising from approximately 8 percent in 1995 to 30 percent by 2020. The convergence pattern was similar for "other research and teaching positions" until 2004. Since then, the female share has stabilized at around 46 percent.

In conclusion, Figure OA4.1 suggests that women are catching up with men in all positions, although a gap remains at the professor level. The increase in the number of women in adjunct, and possibly other research and teaching positions, suggests that the barrier to achieving gender parity is easiest to overcome in less research-intensive roles outside clearly defined career trajectories.

OA4.2 Transitions along the career ladder

Table OA4.1 reports year-to-year transitions from academic research and teaching positions to any university position for the population of research and teaching staff over the period 1996–2012, which forms the basis of the econometric analyses. The table includes the probability of remaining in the same position, moving to another position, or exiting academia. In this context, exit should not be interpreted as necessarily permanent, as individuals may be temporarily unobserved—for example, due to parental leave—and subsequently reappear in the data. Overall, most individuals remain in the same position from one year to the next, including PhD students. Among PhD students and those in Other research and teaching positions, the largest mobility is out of academia. Switches from PhD student to other positions tend to be upward and relatively often take place to Other research and teaching positions, whereas those in Other research and teaching tend to go to many different types of positions, reflecting its temporary nature. Postdocs frequently go to an Associate professorship or to Other research and teaching. Associate professors, already tenured, is the most common origin for (full) Professors. Transition patterns are broadly similar for men and women. However, women exhibit slightly higher exit rates (temporary or permanent) from most positions, except for full Professor. Moreover, women have lower observed rates of upward mobility at each major career step: from PhD student to postdoc, from postdoc to Associate professor, and from Associate professor to full Professor.

Table OA4.1: Transitions between university positions, Sweden 1996–2012

(a) Women

	Professor	Assoc Prof	Adjunct	Other R&T	PhD Student	Postdoc	Other Uni Positions	Not observed	Total
Professor	8,516	84	4	88	2	1	106	405	9,206
	92.50	0.91	0.04	0.96	0.02	0.01	1.15	4.40	100.00
Assoc Prof	1,046	29,983	251	565	26	381	477	2,208	34,937
	2.99	85.82	0.72	1.62	0.07	1.09	1.37	6.32	100.00
Adjunct	7	1,754	42,009	477	1,022	61	954	5,293	51,577
	0.01	3.40	81.45	0.92	1.98	0.12	1.85	10.26	100.00
Other R&T	189	1,059	834	16,174	1,740	821	1,297	7,537	29,651
	0.64	3.57	2.81	54.55	5.87	2.77	4.37	25.42	100.00
PhD Student	2	853	1,274	2,115	44,837	620	1,532	11,447	62,680
	0.00	1.36	2.03	3.37	71.53	0.99	2.44	18.26	100.00
Postdoc	42	776	35	689	8	6,547	207	1,157	9,461
	0.44	8.20	0.37	7.28	0.08	69.20	2.19	12.23	100.00

(b) Men

	Professor	Assoc Prof	Adjunct	Other R&T	PhD Student	Postdoc	Other Uni Positions	Not observed	Total
Professor	44,775	311	7	378	0	2	521	2,222	48,216
	92.86	0.65	0.01	0.78	0.00	0.00	1.08	4.61	100.00
Assoc Prof	3,136	57,773	358	823	48	388	749	3,728	67,003
	4.68	86.22	0.53	1.23	0.07	0.58	1.12	5.56	100.00
Adjunct	18	1,709	37,649	289	654	63	785	3,780	44,947
	0.04	3.80	83.76	0.64	1.46	0.14	1.75	8.41	100.00
Other R&T	563	1,655	730	22,235	1,435	999	1,432	7,973	37,022
	1.52	4.47	1.97	60.06	3.88	2.70	3.87	21.54	100.00
PhD Student	7	916	1,087	2,482	54,617	783	1,905	11,717	73,514
	0.01	1.25	1.48	3.38	74.29	1.07	2.59	15.94	100.00
Postdoc	80	1,260	23	1,000	7	9,217	313	1,236	13,136
	0.61	9.59	0.18	7.61	0.05	70.17	2.38	9.41	100.00

Notes: Transitions between university positions in Sweden 1996–2012 showing counts of individuals and percentage of totals moving from a position shown in the foremost left column to another indicated by columns to the right, presented by gender. "Other university positions" include administrative staff, technicians, and temporary positions. "Other R&T" = Other researching and teaching staff. "Not observed" = Individuals outside academia, permanently or temporarily.

OA4.3 Childlessness and age at first birth

Figure OA4.2 examines the rate of childlessness by gender over time among researchers and teachers at age 55 an age at which family formation has for the vast majority, at least begun, and in most cases been completed.[10] For comparison we include data for the whole population of Sweden and for highly educated individuals with at least two years of tertiary education. Thus, a person is only included once in each series.[11] The picture gives an indication of the compatibility between work and children among academics and relates data to other parts of the population for comparison.

Levels of childlessness display considerable variability among researchers and teachers for both genders but especially among women. The general trend is one of an increased share of

[10] Choosing a lower age threshold does not materially change this picture.

[11] University researchers and teachers are generally among the highly educated, and both groups are part of the whole population. Excluding researchers and teachers from these groups has no visible impact on the trends.

childless men over the period, where men in academia tend to follow trends in society as a whole, especially the group of highly educated (Morgan et al., 2021). While there is neither a clear trend in childlessness for women in academia, nor for other groups, it is striking that childlessness is generally more common among academic women, both compared to academic men and other women in society. This suggests that women indeed might be refraining from having children when they pursue an academic career. While earlier work has shown that the desire to have children lead to exit from academia for women (Ecklund and Lincoln, 2011), our result suggests in line with earlier studies that women who do stay in academia may face a penalty in terms of abstaining from having children for career reasons (e.g., Mason and Goulden, 2004). Moreover, earlier research has also found that, for Sweden, women working in law and in academia abstain from having a second or third child as compared to medical doctors (Stanfors, 2014).

Figure OA4.2: Childlessness at age 55

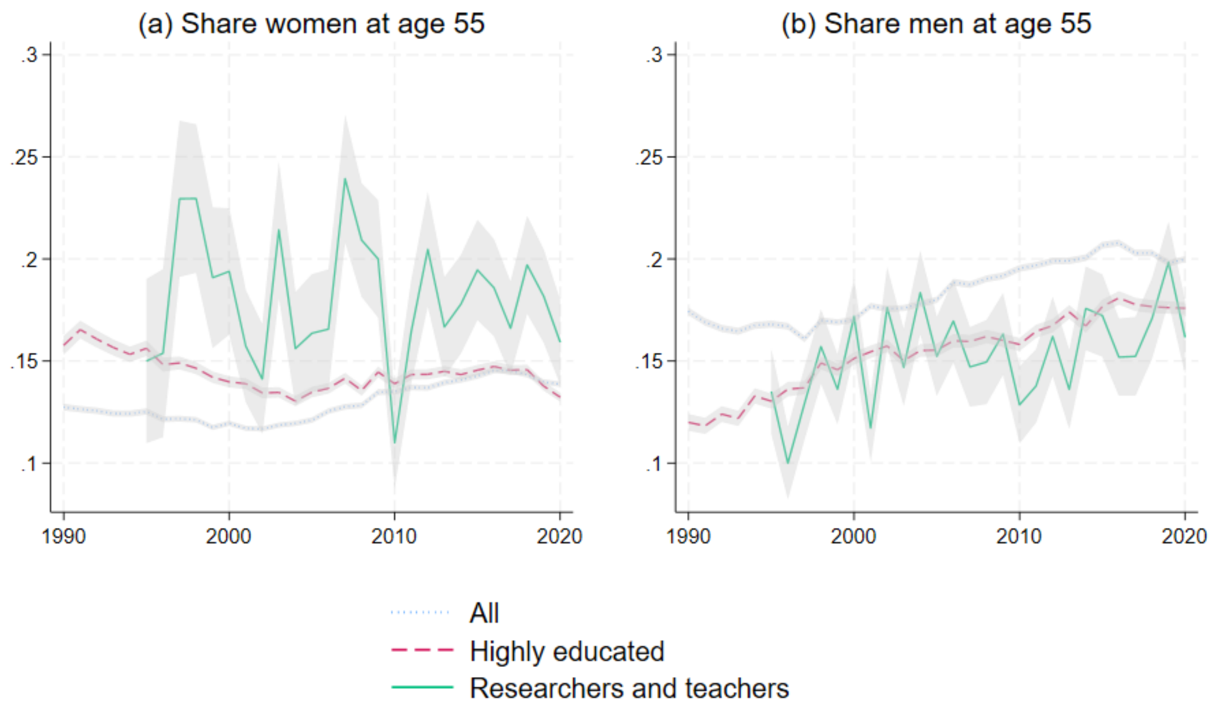
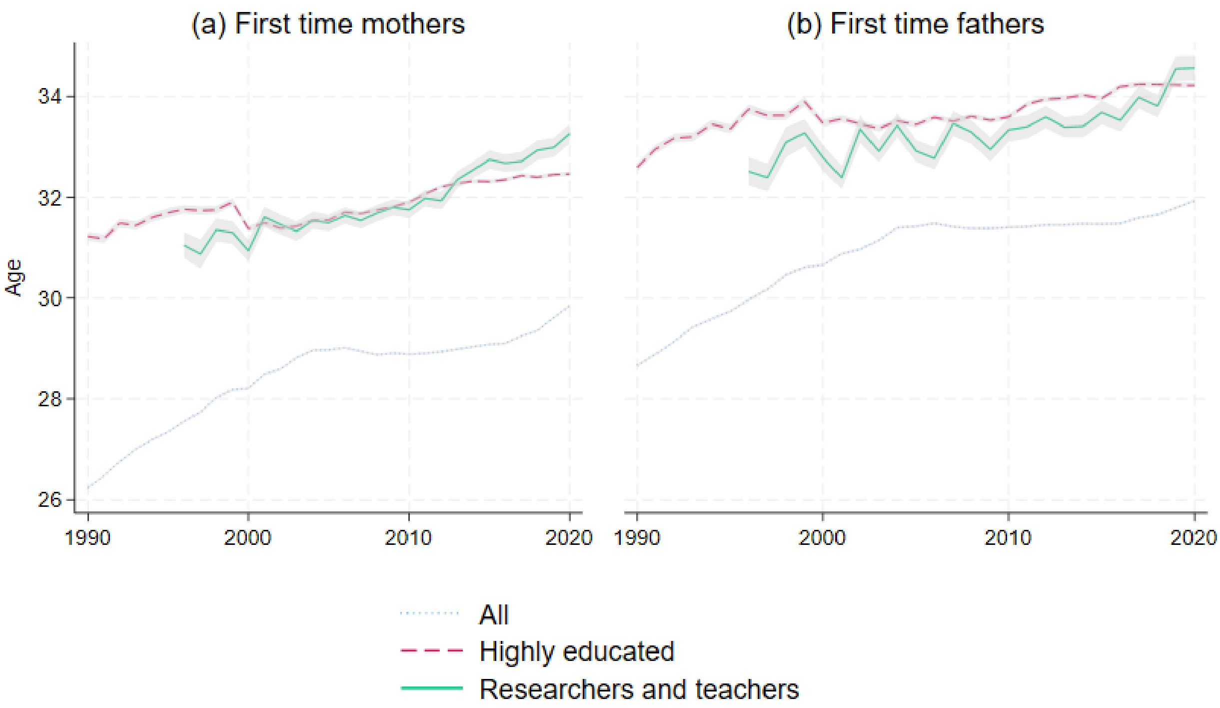


Figure OA4.3 shows the evolution of age of first-time mothers and fathers for the same groups; the whole population, Highly educated and Researchers and teachers. It is well-known that parent age at first birth has been rising, a contributing factor for generally lower fertility. This age is higher for highly educated and researchers and teachers than in the rest of society.

Again, the trends among first time fathers seem to follow that of highly educated. First time mothers also seemed to follow this trend, but around 2013 the trend started to tick upward at a faster rate and in 2020 the average age of first time mothers was more than 33 years and less than 33 among highly educated. Again, academia seems less compatible with having children according to this metric.

Figure OA4.3: Parental age at birth



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