Effects of Parental Death on Labor Market Outcomes and Gender Inequalities*

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Abstract

Nearly everyone experiences the death of a parent in adulthood, but little is known about the effects of parental death on adult children's labor market outcomes and the underlying mechanisms. In this paper, we utilize Danish administrative data to examine the effects of losing a parent on individual labor market outcomes and its contribution to gender earnings inequalities. Our empirical design leverages the timing of sudden, first parental deaths, allowing us to focus on the health and family support channels. Our findings reveal that the death of a parent has enduring negative effects on the earnings of both adult sons and daughters, with the effects being more pronounced for daughters. Moreover, the negative impact of mothers' deaths on daughters' earnings outweighs that of fathers' deaths. Consequently, mothers' deaths can account for 10% of the aggregate gender earnings gap. Our analysis demonstrates that both the mental health and family support channels are at play. Specifically, we observe that women are relatively more inclined to seek psychological assistance, while men tend to receive more mental health-related and opioid prescriptions following the loss of a parent. Additionally, we find that women with young children experience a comparatively larger drop in earnings after parental death due to the loss of informal childcare.

JEL classifications: D64, J10, J16

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"Death ends a life, but it does not end a relationship, which struggles on in the survivor's mind toward some final resolution, some clear meaning, which it perhaps never finds." (Anderson, 1968)

1 Introduction

Due to the age difference between parents and children, nearly everyone experiences the loss of a parent at some point in life. Parental death is most likely to occur when children reach adulthood, with 96% of the Danish population experiencing their first parental death at age 18 or older (Figure A.1). Given its prevalence, even small effects of parental death on individual children can have substantial impacts on aggregate economic outcomes. In this paper, we investigate how parental death influences individual earnings and emphasize its impact through the mental health and family support channels. Additionally, we examine the long-term effects of parental death and explore the interaction effects between parents and children based on gender within each operative channel. The combination of the prevalence of parental death in children's adulthood, and its enduring effects significantly contributes to aggregate gender inequality in the labor market. While parental death is ultimately unavoidable, comprehending the mechanisms by which it affects labor market outcomes and gender inequalities can empower policymakers to design targeted policies that address the negative consequences of parental death on labor market outcomes and subsequent gender inequalities.

The impact of parental death on individual labor market outcomes and gender inequality can be influenced by multiple mechanisms. First, bereavement can give rise to mental health crises (van den Berg *et al.*, 2017). Research by psychologists suggests that women are more prone to internal disorders, such as depression and anxiety, whereas men tend to exhibit more external disorders, such as substance abuse and antisocial behavior (Rosenfield and Mouzon, 2013). Second, the loss of grandparents, who often provide informal childcare, can have a negative effect on the labor market outcomes of adult children, particularly women (Garcia-Moran and Kuehn, 2017; Anstreicher *et al.*, 2022; Marcos, 2022). Furthermore, the labor market outcomes of adult children can be influenced by other factors following parental death, such as adult children assuming caregiving responsibilities for their parents or receiving inheritances from the deceased

parent (Arrieta and Li, 2022; Nekoei and Seim, 2023). Despite these potential mechanisms, there is limited empirical evidence on how parental death affects the labor market outcomes of adult children. Our study aims to fill this gap and untangle the various mechanisms at play.

We use administrative data covering the full Danish population from 1980 to 2019, and we adopt a unique empirical design to study the impact of losing a parent on the earnings of women and men as well as its implications for gender inequalities in labor market outcomes. Our empirical strategy allows us to primarily focus on the mental health and family support channels while controlling for other potential mechanisms. Specifically, we leverage the exogenous timing of *sudden* and *first* parental death to study the causal impact of losing a parent. We then use detailed mental health data on psychologist and psychiatrist consultations, as well as medical prescriptions, to shed light on the mental health effect. We also explore heterogeneous effects on families with or without young children. This allows us to examine the family support mechanism.

Furthermore, our empirical design, which focuses on sudden and first parental deaths, effectively addresses potential confounding factors associated with the bequest and elderly care channels. The bequest channel primarily becomes relevant after the second parental death, while the elderly care channel is less significant when parents are not widowed at the time of death and when they experience unexpected deaths despite relatively good health. Moreover, the Danish context, characterized by extensive public provision of elderly care (Danish Ministry of Health, 2017; Olejaz *et al.*, 2012; Rellstab *et al.*, 2020), diminishes the relevance of the elderly care channel.[1] Additionally, by leveraging the variation in the timing of sudden death, we mitigate concerns related to anticipatory effects prior to the first parental death, reverse causality, and selection bias stemming from certain groups of parents being more prone to premature deaths. Lastly, the extensive time span and large size of our panel data enable us to examine gender effects at two levels: the impact of mothers' v.s. fathers' deaths on daughters v.s. sons. We emphasize that our focus on first and sudden parental deaths is driven by identification and empirical considera-

[1] A parent with a cohabiting partner is likely to receive care from their partner before their death if necessary. However, after first parental death, the surviving widowed parent may need more elderly care because they have lost their spouse. We show that given the well-provided public elderly care system in Denmark, this channel is not significant in driving adult children's labor market outcomes.

tions. The mechanisms we document in our setting can operate across various causes of parental deaths, with profound implications for the broader population confronted with parental loss in adulthood.

We begin by presenting a set of stylized facts regarding changes in the employment and earnings of adult children following the first parental death. Our findings reveal persistent and long-run declines in both employment and earnings for adult children, commencing immediately after the occurrence of parental death. Subsequently, we formally introduce our empirical strategy, which leverages the timing of sudden and first parental death, and employs generalised difference-in-differences analysis to examine the effects of parental death on the labor market outcomes of adult children. Our analysis demonstrates that the loss of a parent has a long-term negative impact on the earnings of both women and men, with a more pronounced effect observed for women. Specifically, men experience a persistent decline in earnings, amounting to 4% in the fifth year after parental death. In contrast, women encounter a continuous drop in earnings, amounting to 6% in the fifth year after parental death. Furthermore, when distinguishing between the impact of mothers' and fathers' deaths, we find that mothers' deaths exert a larger negative influence on women's earnings, while fathers' deaths exhibit a comparable effect on the earnings of both men and women.

Next, we examine the potential role of health and family support in driving the effect of parental death on adult children's earnings, and consequently, on the gender earnings gap. First, we examine whether parental death causes more mental and physical health problems amongst adult children and whether there are any gender differences in the effects. Using detailed administrative data, we find that both mothers' and fathers' deaths result in more visits to psychologists and more mental health-related prescriptions. We also find gender differences in the mental health effect: women visit psychologists more than men do after parental death, and that is the case after deaths of both mothers and fathers. Specifically, compared to their matched controls, women visit psychologists 0.1 more times per year after mothers' deaths and 0.06 more times after fathers' deaths, which are 140% and 85% relative to the baseline mean, respectively. In contrast, the increase in psychologist visits for men is 0.025 and 0.018 after mothers' and fathers' deaths,

which are 132% and 95% relative to the baseline mean.

We also see an increase in the fraction of people receiving mental health-related prescriptions, 1.4 percentage points (pp) for women and 1.1pp for men, which are 10.7% and 13% relative to the baseline mean for women and men, respectively. Only for men, we find a noticeable increase in opioid prescriptions after parental death – a 10% increase relative to the baseline mean. Together, this evidence suggests that both men and women experience more mental health problems after parental death, but that the effects manifest differently by gender. In contrast, we do not find a noticeable gender difference in the effect of parental death on GP or hospital visits; and the effects of mothers' and fathers' deaths are also similar.

Second, we investigate how parental death impacts labor market outcomes and contributes to gender inequality through the informal childcare channel. Given that families with children aged 6 or younger typically have the greatest demand for informal childcare, we explore the heterogeneity of the effect of parental death on the earnings of men and women with or without young children in this age group. Our findings indicate that men and women without young children experience comparable declines in earnings following the deaths of both mothers and fathers. In contrast, the results for men and women with young children unveil a distinct gender disparity, as women's earnings exhibit a significantly greater reduction after parental death. Specifically, women with young children experience a 10% decrease in earnings following the deaths of both mothers and fathers, whereas men's earnings remain relatively unaffected after the death of their mothers and experience a 2% decrease after the death of their fathers. Consequently, the family support channel emerges as a prominent contributor to the observed gender-specific effects on labor market outcomes, with the deaths of both mothers and fathers exerting a similar impact.

To assess the extent to which parental death contributes to aggregate gender gaps in earnings, we begin by calculating the aggregate gender gap in Denmark for individuals who have not experienced the loss of either parent. Our analysis reveals a 26% gender gap in earnings within this population. Building upon this baseline, we demonstrate that the overall impact of the first parental death contributes to 5% of the aggregate gender gap in earnings. Moreover, this effect is primarily attributed to mothers' deaths, as the first maternal death alone accounts for 10% of the

aggregate gender gap in earnings.

We conduct a series of robustness checks and supplementary analyses to ensure the validity of our findings. First, we investigate potential alternative mechanisms, including fertility and cohabitation, inheritance, elderly care, and preferences for certain types of jobs and leisure. Next, we consider heterogeneity across geographic proximity between parents and adult children, causes of parental death, and parental age at death. Finally, we investigate the within-family spillover effect of parental death by examining how it influences spousal labor market outcomes.

Our paper contributes to the understanding of how mental health and family support affect individual labor market outcomes and gender inequalities (Banerjee *et al.*, 2017; Garcia-Moran and Kuehn, 2017; Anstreicher *et al.*, 2022; Ciccarelli and Van Soest, 2018; Fu *et al.*, 2017; Marcos, 2022). We exploit comprehensive data on individual health outcomes to examine the impact of parental death on both mental and physical health. We also leverage the variation of family composition, i.e., families with or without young children, to shed light on the family support channel. We find significant evidence that parental death negatively affects individual earnings and amplifies the gender earnings gap by deteriorating mental health and by loss of family support.

We also make a significant contribution to the literature on the impact of family health shocks on individual labor market outcomes (van den Berg *et al.*, 2017; Fadlon and Nielsen, 2021; Breivik and Costa-Ramón, 2022). Existing research in this field primarily examines the effects of fatal health shocks experienced by spouses or children on individual employment and earnings. While the consequences of such shocks are substantial and hold important policy implications, their rare occurrence limits their generalizability to the broader working-age population. Our study distinguishes itself by focusing on the effects of losing a parent during adulthood on individual outcomes and, given the prevalence of this event, on aggregate outcomes such as the gender earnings gap.

Our paper also aligns closely with the literature examining the impact of parental health shocks on children's outcomes. Several studies have investigated the effects of parental health shocks during children's upbringing on their mental health and educational outcomes (see e.g., Aaskoven *et al.*, 2022; Alam, 2015; Adda *et al.*, 2011; Chen *et al.*, 2009; Corak, 2001; Kristiansen,

2021). In contrast, our study focuses on the labor market outcomes of *adult* children following the loss of a parent, which is much more prevalent. Furthermore, the mechanisms driving the effects of parental health shocks on young children's outcomes differ significantly from those impacting the outcomes of adult children following parental death. Parental death influences young children through human capital investment and the development of non-cognitive skills, while it affects adult children through family support and health. Given the prevalence of the event we examine, the results presented in our paper have wider implications for assessing population-level well-being compared to the existing literature in this field.

Finally, our paper contributes to the understanding of factors that contribute to the gender gap in employment and earnings. In their review of the literature, Blau and Kahn (2017) highlight various socioeconomic factors that explain the gender pay gap. In our study, we provide novel evidence demonstrating that parental death and the underlying mechanisms of mental health and family support play a significant role for the gender earnings gap.

The rest of the paper is structured as follows. Section 2 briefly outlines the institutional setting in Denmark. Section 3 presents the data and descriptive analyses. Section 4 describes our empirical strategy. Section 5 discusses the main results, and Section 6 the underlying mechanisms. Section 7 includes a battery of robustness analyses. The final section concludes the paper and discusses the policy implications of our results.

2 Institutional background

For many of the outcomes we consider in the paper, it is necessary to understand the institutional background in Denmark. For example, when considering health outcomes, it is important to know that healthcare is generally provided free of charge in Denmark. Therefore, we provide more details on the institutional setting in the following.

2.1 Healthcare

The Danish health care system is described in detail by the Danish Ministry of Health (2017) and Olejaz *et al.* (2012), but we provide an overview here. In the Danish healthcare system, gen-

eral practitioners (GPs) serve as the initial point of contact for most health concerns. While GPs typically operate in private practices, they are predominantly funded by public authorities, and patients receive treatment free of charge. GPs play a crucial role in referring patients to specialized practitioners, such as psychiatrists or dermatologists, or to hospitals for more specialized or inpatient treatments. Both treatments by specialized practitioners and hospitals are also provided free of charge to patients.

However, there are a few exceptions to the provision of free healthcare in Denmark. Patients may be required to pay a co-payment for accessing certain services, such as psychologists and physiotherapists, after obtaining a referral from their GP. In the case of psychologists, treatment is partially funded by the authorities for specific conditions, including suicide attempts, serious somatic illness, and, importantly for our analysis, after the bereavement of a close relative.

Prescribed medications are subject to a co-payment that decreases proportionally with the total amount spent on medication within a year. Once the yearly expense threshold (DKK 4,110 or USD 590 in 2019) is reached, medications are provided free of charge. Medications administered in hospitals are also provided free of charge to patients. All interactions with the publicly funded healthcare system in Denmark are recorded in the Danish health registers, allowing for comprehensive data collection and analysis.

2.2 Childcare

In Denmark, children are entitled to access formal children from they are 26 weeks old until they reach school age (European Commission, 2022). Child care is heavily subsidized; the local municipalities pay at least 75% of the cost of childcare provision (European Commission, 2022). In 2012, the average annual cost of full-time childcare for children below school age ranged between approx. 18,000 DKK ($\approx$ 2,400 USD) and 33,000 DKK ($\approx$ 4,400 USD) depending on the type of care chosen (Naumann *et al.*, 2013). Large discounts are given to low-income parents as well as to families with more than one child. The relatively cheap provision of child care transmits to large take-up rates in formal child care. In 2012, 90-98% of children under the age of 6 enrolled in formal childcare (Naumann *et al.*, 2013). However, most childcare providers are only open during core

working hours (6:30/7:00am) to around 16:00pm, Monday to Friday. Out-of-hours provision of childcare is sometimes available for shift workers, but it is rare. More details are provided by the Ministry of Social Affairs (2000), the European Commission (2022) and Naumann *et al.* (2013).

Despite the extensive provision of formal childcare in Denmark, informal childcare provision by grandparents is also very common, partly due to women's high labor market participation rate. For example, Glaser *et al.* (2013, p. 8) reports that Danish grandparents are amongst the most likely to be involved in the care of grandchildren across Europe: "The highest incidence of grandparents providing any childcare is in the Netherlands and Denmark, with around 57% of grandparents looking after a grandchild in the past 12 months."

2.3 Elderly care

Extensive care for elderly people is provided free of charge by Danish municipalities. Initially, elderly care tends to be provided in the home of the individuals in need of care. Care assistants employed by the municipalities visit the individuals on a needs basis. If individuals need more extensive care, municipalities offer individuals to move to a care home where full-time care is available. Although care is provided free of charge, individuals moving into care homes pay rent and pay for the food provided. More details are provided by the Danish Ministry of Health (2017) and Olejaz *et al.* (2012).

2.4 Inheritance

When one of the spouses in a married couple dies in Denmark, a commonly used option in Danish inheritance law allows the surviving spouse to choose not to share the estate of the deceased spouse with any potential children until the surviving spouse dies too (Grønborg and Ravn-Petersen, 2022). For example, this would allow a surviving spouse to continue living in a house owned by the deceased spouse, and thus, minimize disruption for the surviving spouse. Thus, research on the effects of inheritance tends to only consider the death of the second biological parent (see e.g., Boserup *et al.*, 2016). However, if the deceased spouse has one or more children with a third party, those children may object to the surviving spouse remaining in an undivided

estate and demand the estate of the spouses to be split, resulting in immediate inheritance to the children after parental death. By default, the remaining spouse and any children split the estate of the deceased spouse fifty-fifty. If the deceased parent has signed a will, this ratio may be different (Grønborg and Ravn-Petersen, 2022).

3 Data and descriptive analysis

3.1 Data

Throughout the paper, we rely on population-level register data from Denmark. The main advantage of these data is that we observe child-parent linkages for children born in the 1950s or later. Starting in 1980, we observe a wide range of demographics for the entire population, including links between spouses and cohabiting partners, individual's ages, ages of their children, and home region (FAIN/BEF). Furthermore, we observe deaths and causes of death back to 1970 (DODSAARS/DODSAARG). These data allow us to identify our treatment sample of individuals with first and sudden parental deaths.

We estimate the effect of the first parental death on a wide range of outcomes that are observed for the entire population. Firstly, from 1980 we observe earnings and labor market outcomes, including participation, unemployment, as well as a proxy for hours worked (IND/AKM/IDAS/ IDAN/IDAP).[2] Starting in 1990, we have data on the number of consultations with private practicing GPs, psychologists, and psychiatrists (SYSI/SSSY), and from 1994 we also observe both in- and out-patient hospital visits due to somatic illness (LPR_ADM/ LPR_DIAG). From 1995, we observe all hospital visits due to psychiatric treatment (PSYK_ADM/ PSYK_DIAG), as as well as all medicines prescribed by doctors for relevant diagnoses (LMDB).[3] We focus on prescriptions related to mental health and the use of painkillers, and we are able to observe the purchase of opioid painkillers separately. Also from 1995, data are available on formal childcare enrolment at the child level (DAGI/ BOERNFB), although the childcare registers are the only registers with partial

[2]The proxy for hours worked is derived from ATP pension payments, see Kleven *et al.* (2019) for details.

[3]We have access to prescriptions for the following indications: 1) Musculo-skeletal system: M01AA01-M09AX10. 2) Nervous system: N01AB01-N07XX12. 3) Various: V03AB01-V03AX03.

coverage in some municipalities, particularly before 2005. We are interested in formal childcare before children reach school age, so we focus on childcare provision for children 6 years old or younger.

3.2 Treatment group

To identify the effects of losing a parent on individual labor market outcomes, we use population data and leverage the timing of the first parental sudden death to overcome the following empirical challenges. First, elderly parents may fall ill before death. Adult children may anticipate the death of their parents, given their parents' health conditions and adjust their labor market behavior. Second, there is a reverse causality. Adult children may first lose their employment and earnings, which affects the total level of family resources and could cause a deterioration of elderly parents' health. To address the anticipation effect and the reverse causality problem, we only focus on parental deaths that are sudden and unexpected. In particular, from the register containing information on causes of death, we select parental deaths due to heart diseases, cerebrovascular diseases, acute respiratory infections, and traffic or other (external) accidents. The use of such sudden causes of death to examine the causal effect of family members' fatal health shocks is already documented in existing literature, see e.g., van den Berg *et al.* (2017) and Fadlon and Nielsen (2021). To this end, we focus on the sudden death of one's first parent primarily out of identification and empirical concerns. The effect we find in this paper, including the underlying mental health and family support mechanisms, can be well generalized for all causes of parental deaths and indicate the parental death impact on the general population that lost their parents.

Further, the focus on the first parental death helps to control for both the bequest and elderly care channels. Specifically, the bequest channel is more relevant after the second parental death when adult children become the primary heir of the deceased parents' estate. In addition, the elderly care channel is less relevant for the *sudden* and first parental deaths. Before sudden deaths, parents are relatively healthy, and their spouses would typically be their primary caregivers. Moreover, the elderly care channel is also less relevant in the Danish context with an extensive public elderly care system (Danish Ministry of Health, 2017; Olejaz *et al.*, 2012; Rellstab *et al.*,

2020). On the other hand, after the first parental death, the surviving widowed parent may need more elderly care because they have lost their spouse. In Section 7, we provide evidence to show that given the well-provided public elderly care system in Denmark, this channel is not significant in driving the majority of adult children's labor market outcomes.

Although we can observe parental deaths back to 1970, for most of our analyses, we need to include pre- and post-trends in outcomes, typically 3 years before and 5 years after the first parental death. Most of our outcomes are available from 1980-2019, and so we limit the treatment group to the first parental deaths occurring between 1983 and 2014.

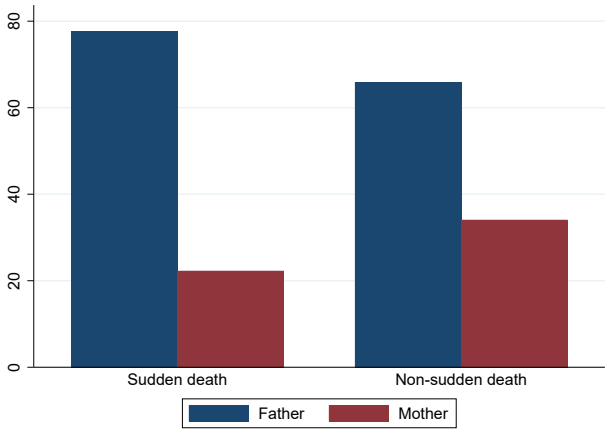
Because we want to focus on the first parental death, we limit our treatment group to individuals with two known parents present in the population the year before the first parental death is observed. This excludes a small subset of individuals with one unknown parent or with a parent living abroad, as we do not know the timing of death for this small group of parents. Finally, we limit the treatment group to individuals of prime working age, 25 to 50 years old at the time of first parental death, as we are particularly interested in labor market outcomes.

3.3 Summary statistics

As mentioned above, we only focus on parental deaths that are sudden and unexpected. In this section, we explore whether or not the sample of unexpected deaths is generally comparable to the full population of deaths. Although this is not important for the identification of the effects of unexpected deaths, it is important for the external validity of our estimates; namely, whether or not they generalize to the full population of parental deaths.

Figure 1 shows that the first deceased parent is more likely to be a man for the subsample of unexpected deaths relative to expected deaths. In our analyses, we consider this by separately estimating the effects of mother and father deaths. In Table 1, we further explore the characteristics of children whose first parent dies suddenly and non-suddenly, respectively. Parents dying unexpectedly tend to be slightly older than parents whose death can be anticipated because of pre-existing illnesses. This age difference is driven by the likelihood of dying from heart diseases and cerebrovascular diseases, which increase with age. However, we also see that although

Figure 1: Gender of first deceased parent



Notes: This figure presents the gender composition of the first deceased parent by sudden deaths vs. nonsudden death. Sudden deaths include heart diseases, cerebrovascular diseases, and traffic or other (external) accidents. Non-sudden deaths include the remainder of deaths. We include the first parental deaths occurring between 1983 and 2014 for children aged 25-50 in the year of the first parental death and with two known parents. See Table A.1 for sample sizes.

parents are slightly older when dying unexpectedly, this only translates into a marginal age difference between children losing their unexpectedly and expectedly.[4] We see that the two groups of children appear very similar across characteristics. We conclude that our sample of children whose first parent dies suddenly does not differ systematically from the general population of children experiencing parental death.

3.4 Descriptive analysis

To motivate our analysis of the effects of parental death on adult-child outcomes, we first provide a set of event studies, largely following the specification of Kleven *et al.* (2019). This provides estimates of the effect of parental death on adult-child outcomes without the need for a control group. Using the treatment group described above and a panel of observations ranging from 3 years before parental death to 5 years after parental death, we run the following regression for the various outcomes we consider:

[4]In Figure A.2, we show the full age distribution of deceased parents split by sudden vs. non-sudden cause of death. Figure A.3 shows the corresponding child age distribution.

Table 1: Summary statistics for adult children at $t = -1$

	Sudden death, mean	Non-sudden death, mean
Age	36.77	36.74
Male	0.53	0.52
Share with college or above	0.21	0.22
Share with high school	0.50	0.52
Share without high school	0.29	0.26
Cohabitation	0.61	0.59
Number of children	1.38	1.37
Age of youngest child	7.88	7.72
Share with children under 6	0.34	0.34
Mother age	65.29	64.17
Father age	69.42	67.83
Mother married	0.85	0.81
Father married	0.86	0.82
First death age	69.85	67.90
Employment	0.84	0.84
Intensive margin	1012.68	1017.37
Annual earnings (1,000DKK)	298.03	306.08
N	215654	543515

Notes: This table shows the summary statistics for children in the calendar year preceding the first parental death, split by first parent sudden vs. non-sudden death. We include the first parental deaths occurring between 1983 and 2014 for children aged 25-50 in the year of the first parental death and with two known parents. All statistics are derived from Danish population-level register data; the specific datasets used for this exercise are described in Section 3. Table A.1 in Appendix A further splits the two groups by the gender of the deceased parent.

$$Y_{ity} = \sum_{k=-3, k\neq -1}^{5} \delta_k \cdot \mathbb{1}[k = t] + AgeYear_{iy} + EduYear_{iy} + \epsilon_{ity} \quad (1)$$

where Y_{ity} represents the outcomes of interest, e.g., earnings, at calendar year y for individual i whose first parent died $t = -3, ..., 5$ years from year y. δ_k are the coefficients of interest, identifying the effects of parental death on individual labor market outcomes relative to the omitted year before the incident. δ_k is identified from the variation in age at the time of the first parental death. However, as returns to age may change over time, and there is no control group experiencing a similar change in returns to age in this setup, we control for age in years dummies interacted with year-fixed effects ($AgeYear_{iy}$); this interaction allows the effect of age to change over time, which is important because of our long sample period. Finally, we control for education-level fixed effects ($EduYear_{iy}$), which similarly interacted with year-fixed effects. We run regressions separately for women and men.

Figure 2 shows that the labor supply of both women and men is affected by sudden parental deaths. Women are initially relatively more affected at the extensive margin, and men are more at the intensive margin. 5 years after the first parental death, the participation rate of both women and men is around 0.7% lower. The effect on labor supply also transmits to lower earnings following the first parental death for both women and men. Considering the inverse hyperbolic transformation of earnings, we see a drop in earnings of around 5% for both women and men.[5] This is our first evidence of parental deaths causing significant and long-term earnings penalties for both women and men.

In Figure A.4, we show comparable results for first, *non*-sudden parental deaths. Qualitatively, the average reductions in labour supply and earnings following *non*-sudden parental deaths are very similar to those of sudden parental deaths. However, Figure A.4 also shows evidence of pre-trends; the decline in labour supply and earnings appear to start already before *non*-sudden parental deaths. This is because this group of parents is likely ill before death, and parental illness may affect children through many of the same channels we are considering in the context of

[5]We focus on the inverse hyperbolic transformation of earnings because it allows us to include zero earnings and coefficients can be interpreted as percentage changes.

sudden deaths, e.g., mental health and family support. Therefore, we focus only on sudden deaths, ruling out anticipation of parental death and pre-trends in the outcomes we consider. However, these descriptive results suggest that the effects of parental death are very similar independently of sudden or *non*-sudden causes of death.

4 Empirical strategy

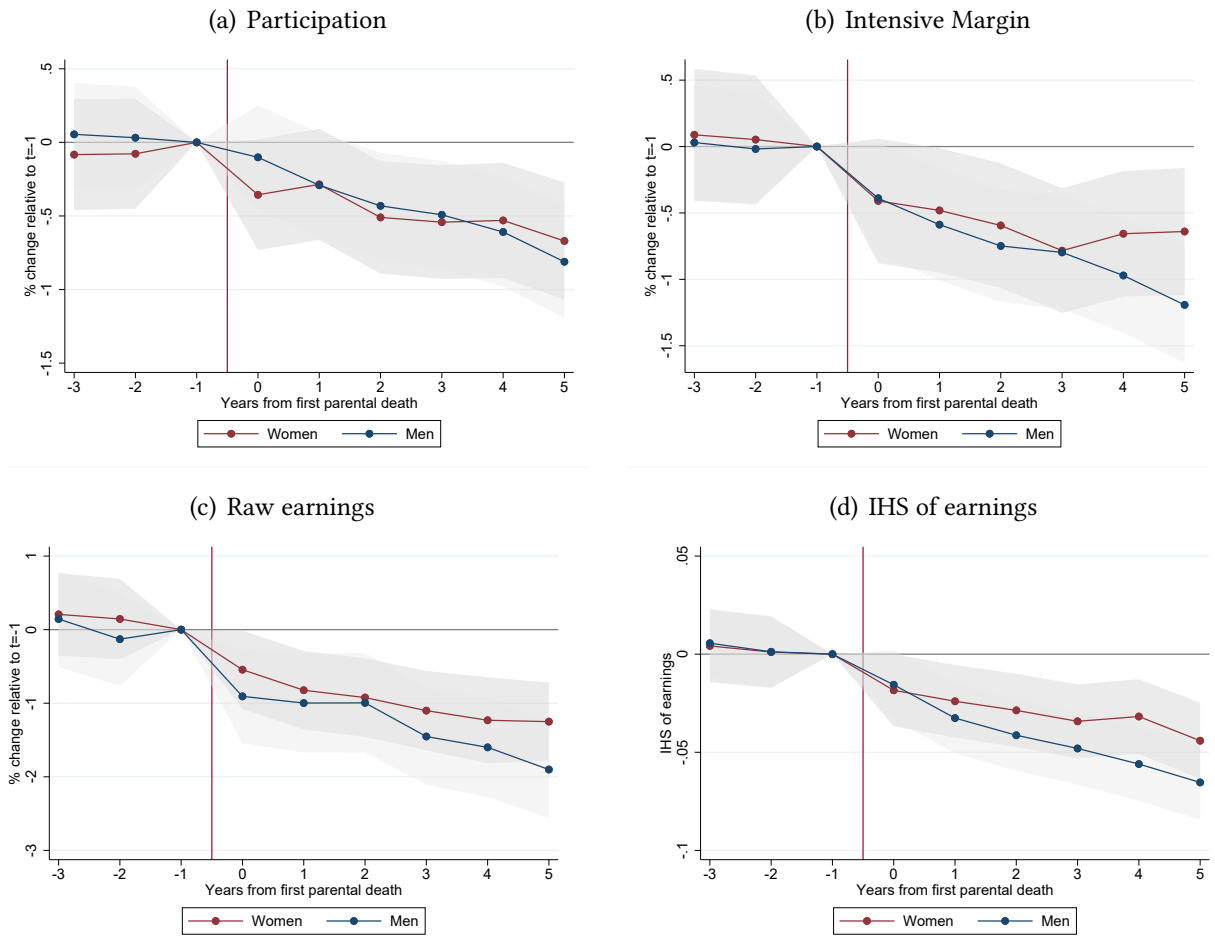
Although the descriptive analysis above provides some initial evidence of the effects of parental death, both individual labor market outcomes and parental health conditions (and the timing of parental death) might be endogenously determined by both observed or unobserved factors. For instance, adult children who lose their parents in their twenties may be very different in terms of socioeconomic characteristics compared to those who lose their parents in their fifties. To address this selection concern, we employ panel data with matched controls which allows us to estimate a model controlling for individual fixed effects. Specifically, we use nearest-neighbor matching to find a control individual for each treated individual that has similar socioeconomic characteristics but does not experience the death of either of their parents in the 5-year window following the parental death of their matched treated individual. Thus, the matched control individuals serve as suitable counterfactuals for the treated individuals. We apply nearest-neighbor matching on age, gender, education level, sector (public or private), cohabitation status, residential region, number of children, and age of the youngest child one year prior to the treated individual's first parental death. We further match on employment and earnings history in the 3 years preceding the treated individual's first parental death.[6] Because the effects of the first parental death may persist in the long run, and thus, affect the estimates of the second parental death effect, we restrict our attention to the first parental death.[7]

Formally, with our data on matched controls as well as on our treatment group, we can estimate the following event study separately for women and men:

[6] All variables are included as fixed effects in the matching procedure. Continuous variables such as earnings are first discretized into several quantile groups, and the resulting categorical variables are then used as fixed effects.

[7] The adult children in the treatment group may experience a second parental within the sample period. We find that the gap between parental deaths is more than 5 years for 91% of our sample, and our results are similar if we limit our treatment group to these children.

Figure 2: Descriptives: Effect of sudden parental death



Notes: This figure plots the estimated coefficients from Equation 1 for men's and women's labor market outcomes. For panel (a)-(c), we follow Kleven *et al.* (2019, p. 188) and convert the estimated coefficients into percentage change relative to the baseline. Participation is measured as strictly positive ATP contributions. The intensive margin is based on ATP contributions, similar to Kleven *et al.* (2019). ATP-pension contributions are paid proportionally to hours worked. Earnings are inflated to 2020 levels and include earnings from both employment and self-employment. The sample consists of all sudden, first parental deaths from 1983 to 2014 for children aged 25-50 in the year of first parental death and with two known parents. See Table A.2 for details on the sample. 95%-confidence interval indicated.

$$Y_{ity} = \sum_{k=-3, k\neq -1}^{5} \left(\delta_k \cdot \mathbb{1}[k = t] \cdot D_i + \theta_k \cdot \mathbb{1}[k = t]\right) + \gamma_i + \gamma_y + Age_{iy} + \epsilon_{ity} \tag{2}$$

where Y_{ity} represents the outcomes of interest: employment and earnings for worker i in calendar year y whose first parent died $t = -3, ..., 5$ years from year y. D_i is an indicator variable equal to 1 for the treated (those experiencing parental sudden death), and equal to 0 for the matched controls. In the regressions, we omit this indicator for the year prior to the event (-1), and thus, this serves as the reference year. The term δ_k are the coefficients of interest, identifying the effects of parental death on individual labor market outcomes relative to the matched counterfactual and the omitted year before the incident. Additionally, we also control for year fixed effects (γ_y), individual fixed effects (γ_i), time since event fixed effects (θ_k), and age fixed effects (Age_{it}). Standard errors are clustered at the individual-by-match ID level.

The key identifying assumption for our analysis is that the earnings and employment of the individuals who have lost a parent would otherwise have evolved similarly to their matched controls following the event. Estimates from Equation 2 will provide visual support for the parallel trends assumption.

The event study analysis will show the dynamic long-term effects of parental death on individual employment and earnings, but to obtain aggregate estimates of how parental death affects our outcomes of interest, we estimate the following difference-in-difference model. We use the same time window and estimate the model on men and women separately. We estimate the following equation:

$$Y_{ity} = \beta D_i \cdot post_t + \gamma_i + \gamma_t + \gamma_y + Age_{iy} + \epsilon_{ity} \tag{3}$$

where D_i is an indicator variable equal to 1 for the treated individuals, and $post_t$ is an indicator variable equal to 1 for observations after parental death. We also control for sets of fixed effects similar to the event study analysis, including time-from-event fixed effects, γ_t, and calendar year fixed effects γ_y. We still use the observations within 3 years before and 5 years after parental death and their matched controls. The coefficient of interest is β, which measures the effect of parental

death on employment and earnings relative to the matched controls. We estimate Equation 3 separately for men and women.[8]

As an alternative to the combination of fixed effects and a control group of matched nearest-neighbours (also used by van den Berg *et al.*, 2017), another widely used identification strategy relies on a control group of individuals who experience the same treatment but Δ years later. This approach is applied in, e.g., Fadlon and Nielsen (2019, 2021). The control groups in Fadlon and Nielsen (2019, 2021) are composed of individuals that will be treated in the future outside the estimation window. Our combination of fixed effects and a control group of matched nearest-neighbours, however, is largely in the same spirit as that of Fadlon and Nielsen (2019): Our control group does not lose either of their parents in the estimation window, but they will almost certainly lose their parents in the future, though it may be due to sudden or non-sudden reasons.[9] In the data section, we show in that the group of children whose parents die suddenly are very similar to the children whose parents die from non-sudden reasons. Hence, there is no systematic difference between using adult children whose parents die suddenly in the future as the control group, and using the combination of children whose first parent dies of both sudden and non-sudden reasons in the future as the control group.

One may still worry that even if adult children whose parents die suddenly look similar to the adult children whose parents die expectedly on aggregate, the anticipatory effect of non-sudden deaths may still bias the results. For example, if we find a matched control for a treated individual whose parent dies suddenly, and the control individual's parents are both alive during the window but are seriously ill. Parental illness generates an anticipatory effect for the control group as the matched control downward adjusts their employment and earnings during their parental illness. If so, comparing the treated individual employment and earnings behavior to their matched controls would lead to a downward biased estimate of the negative impact of parental death. Then,

[8]When considering the differential effect of mothers' and fathers' deaths, we estimate:

$$Y_{ity} = \beta_m M_i \cdot post_t + \beta_f F_i \cdot post_t + \gamma_i + \gamma_t + \gamma_y + Age_{iy} + \epsilon_{ity} \tag{4}$$

where M_i is an indicator equal to one if the first deceased parent is the mother, and F_i is an indicator equal to one if it is the father. Notice that a time-invariant mother/father death term is not included as that is absorbed by the individual fixed effects.

[9]Only exceptions to this are the very few children who die before their parents.

our estimates comparing individuals who experience sudden parental death to control individuals whose first parental death may be anticipated in the future will yield a lower bound estimate of the effect of first parental death. In the context of our paper, we prefer a combination of fixed effects and a control group of matched nearest-neighbours as we need a large sample size in order to gauge the two layers of gender effects. We also include a robustness check following exactly the strategy of Fadlon and Nielsen (2019, 2021) in Section 7.8.

5 Results

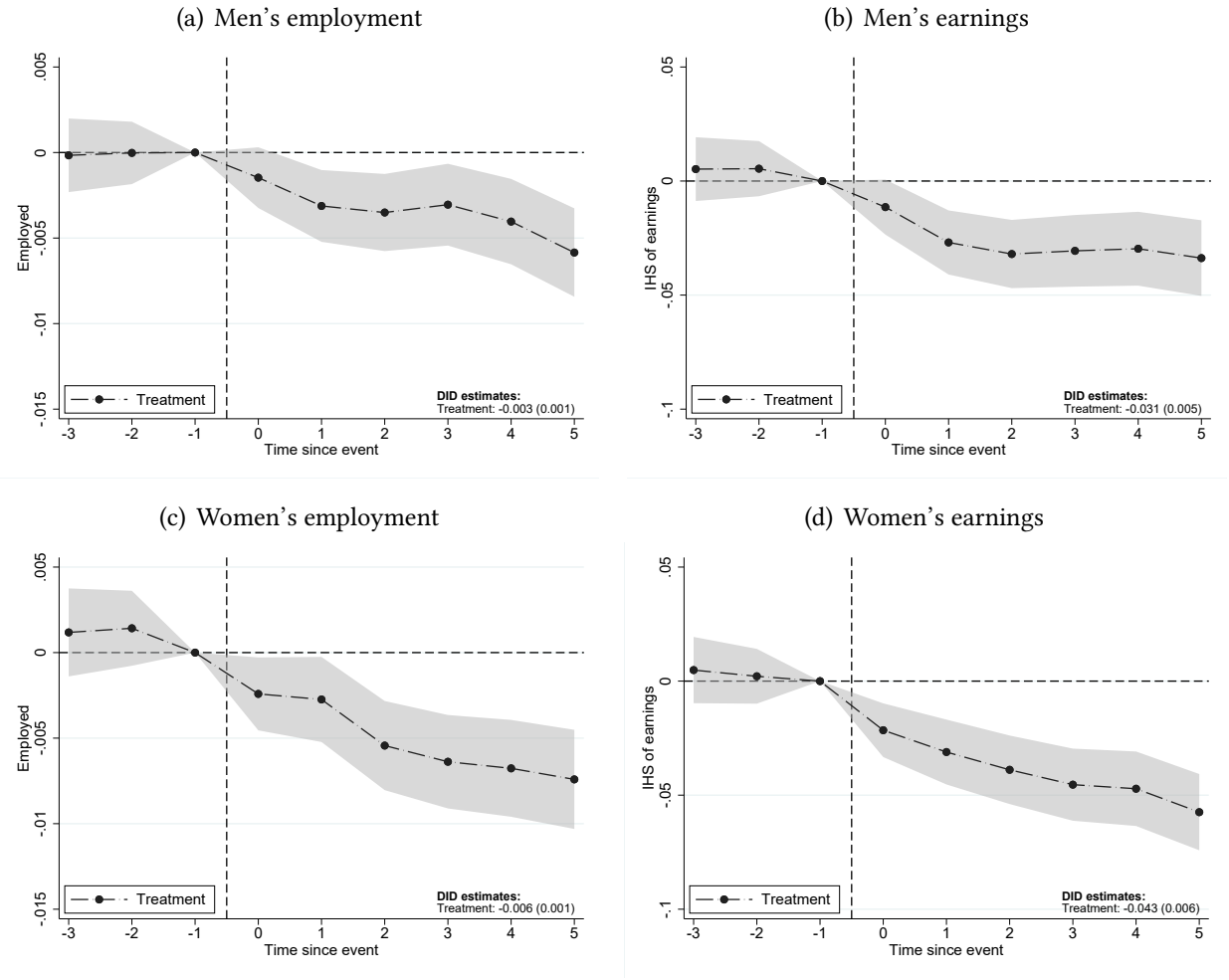
In this section, we focus on the effects of parental death on labour market outcomes. We first present the results from our dynamic event study, which allows us to inspect pre-trends in outcomes as well as dynamics in treatment effects. Next, we discuss the aggregate effects of parental death and their implications on gender inequalities in the labour market.

5.1 Dynamic effects

Figure 3 shows the event study analysis of the impact of parental death on the employment and earnings of women and men. We see that prior to the occurrence of the first parental death, the raw earnings and employment for both the treated individuals and their matched controls are almost identical. The absence of differential pre-trends in the outcome variables provides support for our empirical strategy.

We find that right after the first parental death, the treated individuals experience a persistent drop in employment and earnings. This is the case for both men and women. Men's employment drops only slightly in the first year after parental death, but further decreases to drop by 0.6pp in the fifth year after parental death. For earnings, we observe a persistent drop after parental death and the drop increases over time. After the fifth year of parental death, earnings of treated men have decreased by around 4% relative to their matched controls. Similarly, the employment rate of women decreases by 0.75pp after 5 years of parental death. The drop is more striking in the earnings dynamics of women. Female earnings drop by 2% right after parental death and drop by as much as 6% after 5 years from parental death, again compared to their matched controls.

Figure 3: Event study: Effect of parental death by gender



Notes: This figure plots the estimated coefficients from Equation 2 for men's and women's employment and earnings. Employment is measured as strictly positive ATP contributions. ATP-pension contributions are paid proportionally to hours worked. IHS of earnings refers to the inverse hyperbolic sine transformation of earnings inflated to 2020 levels and includes earnings from both employment and self-employment. The sample consists of all unexpected, first parental deaths from 1983 to 2014 and their matched controls for children aged 25-50 in the year of first parental death and with two known parents. See Table A.2 for details on the sample. 95%-confidence interval indicated. Standard errors are clustered at the individual-by-match ID level.

5.2 Aggregate effects

To visualize the aggregate impact of first parental death on gender employment and earnings gap, we report the difference-in-differences estimates for men and women in Figure 4. We find that first parental death contributes to a meaningful share of gender employment and earnings gap. Specifically, the impact of first death on men's overall employment within 5 years is 0.34pp; while that for women is 0.61pp, i.e., almost double the effect for women compared to men. Similarly, the impact of first death on men's overall earnings is a drop of 3.1%, while that for women is 4.3%, i.e., also a third higher for women than for men.

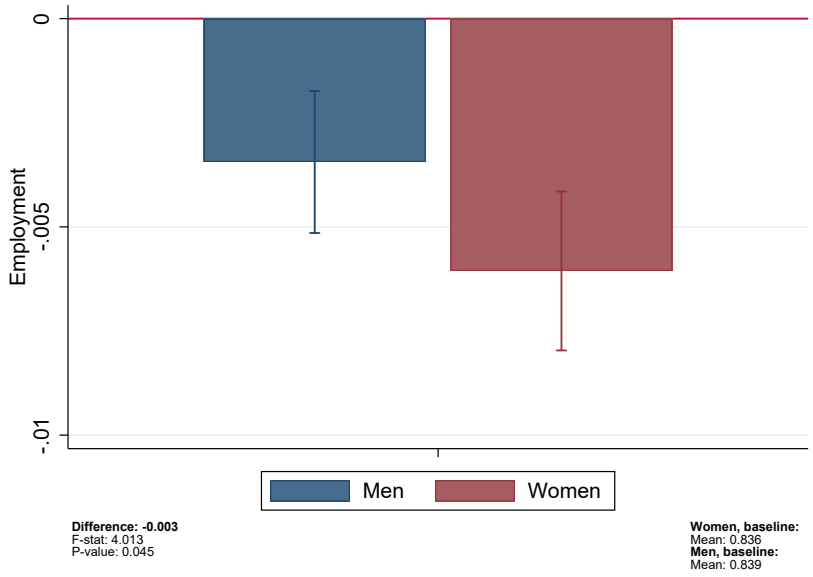
We further split the first deaths by mothers' deaths vs. fathers' deaths and examine the gendered effect on earnings for adult children. Figure 5 shows that compared to fathers' deaths, mothers' deaths cause a significantly larger drop in the earnings of women. Thus, mothers' deaths contribute to generating gender inequalities in earnings. Specifically, the negative effect on women's earnings due to mothers' deaths is almost 6%, while that due to fathers' deaths is less than 4%. In contrast, we find similar effects of mothers' deaths and fathers' deaths on the earnings of men.

Since parental death is prevalent among adults (96% of the population experience their first parents' death in adulthood), almost everyone in the economy will be affected by parental death. Thus, the individual treatment effect would effectively be aggregated into the treatment effect of the entire population. Considering that the average age at first parental death is just above 36 years, these negative effects will affect children for many years in the labor market, which again has profound implications for aggregate gender inequalities in labor market outcomes. To quantify the effect of how parental death contributes to the aggregate gender earnings gap, we first calculate the aggregate gender earnings gap using Danish population data and then interpret the treatment effect relative to that. Using the Danish population aged between 25-50 and the population that has not yet lost either of their parents, we calculate the mean annual earnings for men and women separately, defining the aggregate earnings gap as $\frac{\text{Men's average earnings} - \text{Women's average earnings}}{\text{Women's average earnings}}$.

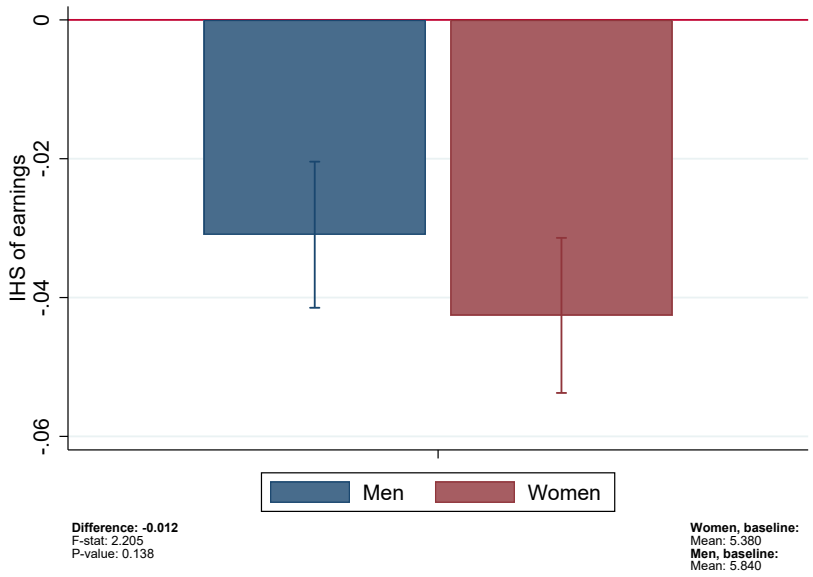
In Figure 6, we first show that the gender earnings gap is 26% in Denmark. Next, we illustrate that the first parental death (mothers' and fathers' deaths combined) can account for 5%

Figure 4: Matched control: Overall effect of parental death by gender

(a) Employment



(b) Earnings

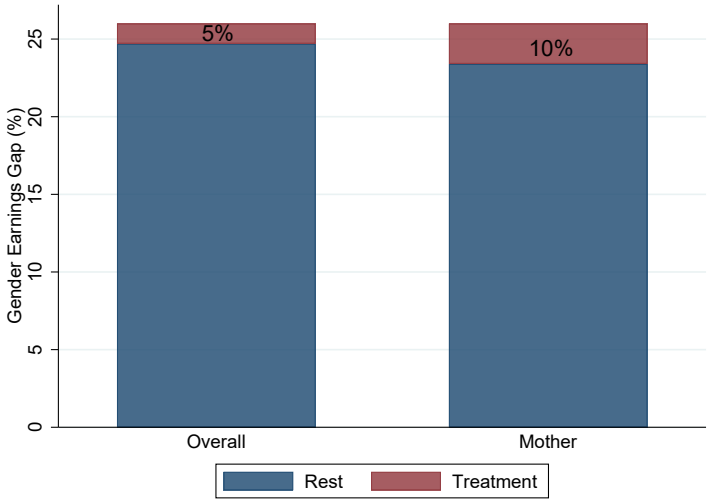


Notes: This figure plots the estimated coefficients from Equation 3 for men's and women's employment and earnings. Employment is measured as strictly positive ATP contributions. ATP-pension contributions are paid proportionally to hours worked. IHS of earnings refers to the inverse hyperbolic sine transformation of earnings inflated to 2020 levels and includes earnings from both employment and self-employment. The sample consists of all unexpected, first parental deaths from 1983 to 2014 and their matched controls for children aged 25-50 in the year of first parental death and with two known parents. See Table A.2 for details on the sample. Effects are within 5 years after the first parental death. 95%-confidence interval indicated. Standard errors are clustered at the individual-by-match ID level.

Figure 5: Matched control: Earnings, mothers' vs. fathers' deaths

Notes: This figure plots the estimated coefficients from Equation 4 for men's and women's earnings. IHS of earnings refers to the inverse hyperbolic sine transformation of earnings inflated to 2020 levels and includes earnings from both employment and self-employment. The sample consists of all unexpected, first parental deaths from 1983 to 2014 and their matched controls for children aged 25-50 in the year of first parental death and with two known parents. See Table A.2 for details on the sample. Effects are within 5 years after the first parental death. 95%-confidence interval indicated. Standard errors are clustered at the individual-by-match ID level.

Figure 6: Gender earnings gaps



Notes: This figure shows the treatment effect of first parental death (left bar) and mother death (right bar) in contributing to the aggregate gender earnings gap.

of the aggregate gender earnings gap. The effect is more salient if the first deceased parent is the mother. In particular, mothers' deaths can account for 10% of the aggregate gender earnings gap. Altogether the results suggest that parental death has a long-term negative impact on both men's and women's earnings, with mothers' deaths having a much larger impact on women's outcomes. Overall, first parental deaths, and mothers' deaths in particular, can account for a significant share of the aggregate gender earnings gaps.

6 Mechanisms

In this section, we turn to discuss the mechanisms driving the impact of parental death on men's and women's earnings, and the underlying channels for the resulting gender inequalities. The two primary mechanisms are the effects of parental death on mental health, and the family support channel.

6.1 Health

One important channel through which parental death affects adult children's labor market outcomes is health. This includes the effects of parental death on both physical health and mental

health. To examine the effect of parental death on individual physical and mental health conditions, we harness rich administrative data on individual visits to privately practicing health professionals and hospitals. Our data on visits to private practitioners include primary doctors / general practitioners, clinical psychologists, and psychiatrists. For visits to hospitals, we also observe detailed diagnoses for the treated individuals.

6.1.1 Mental health

In this subsection, we examine the effect of parental death on mental health outcomes. We consider three different ways mental health issues can be treated and manifest. We look at the effects of mothers' vs. fathers' deaths on men's and women's: 1) Visits to clinical psychologists and psychiatrists. 2) Medical prescriptions related to mental health, e.g. anti-depressants.[10] 3) Substance abuse and alcohol abuse behavior, using prescription data on opioids and alcohol dependence treatment.[11]

We first consider the effect of parental death on consultations with psychologists and psychiatrists. Figure 7, Panel (a), shows that both men and women visit clinical psychologists more after parental death compared to their matched control. Focusing on the gender-specific effects, we first find that women visit psychologists more than men after both mothers' and fathers' deaths. Second, we find that mothers' deaths lead to more psychologist visits for both men and women.[12] In particular, for women, mothers' deaths cause 0.037 more visits per year relative to fathers' deaths. Figure 7, Panel (b), shows that parental deaths also cause an increase in consultations with psychiatrists for women after mothers' deaths. This suggests that parental death has an effect on mental health and that the effect is seen for both milder and more severe types of mental health events.

[10] All medical prescriptions are classified into ATC-codes. We classify ATC-codes N05*, N06A*, N06B*, and N06C* as mental health related.

[11] In the prescription data, we extract information on both treatment of alcohol dependence (ATC-codes N07BB*, including Antabuse), and on opioid painkillers (ATC-codes N02A*). Opioid painkillers are often misused (Fadlon and Nielsen, 2019).

[12] Mothers' deaths may cause additional mental health effects for a number of reasons, e.g. because children have a stronger attachment with their mothers. Another reason could be that children expect their father to die before their mother (which is the most common, see Figure 1); the unexpected order of parental deaths could cause additional mental health effects.

Figure 8 shows that both men and women increase their mental health prescriptions after mothers' deaths, 1.4pp for women and 1.1pp for men. The baseline averages are 8.3% for men and 13.1% for women, suggesting that men see an increase in mental health prescriptions of 13%, compared to women's increase of 10.7%. The effect on mental health-related prescriptions is significantly smaller after fathers' deaths compared to mothers' deaths. Only for men, we find a noticeable increase in opioid prescriptions after parental death – an almost 10% increase after mothers' deaths relative to the baseline mean; the effect of fathers' death is slightly smaller. Because opioids are likely to be misused (Fadlon and Nielsen, 2019), we interpret opioid usage as a proxy for substance abuse. In Figure A.5, we also show suggestive evidence that the uptake of treatment for alcohol dependence increases after parental death. For both opioid prescriptions and treatment of alcohol dependence, we see that the effect of parental death is positive and significant for men but not for women, suggesting that mental health reactions following parental death manifest differently for women and men.

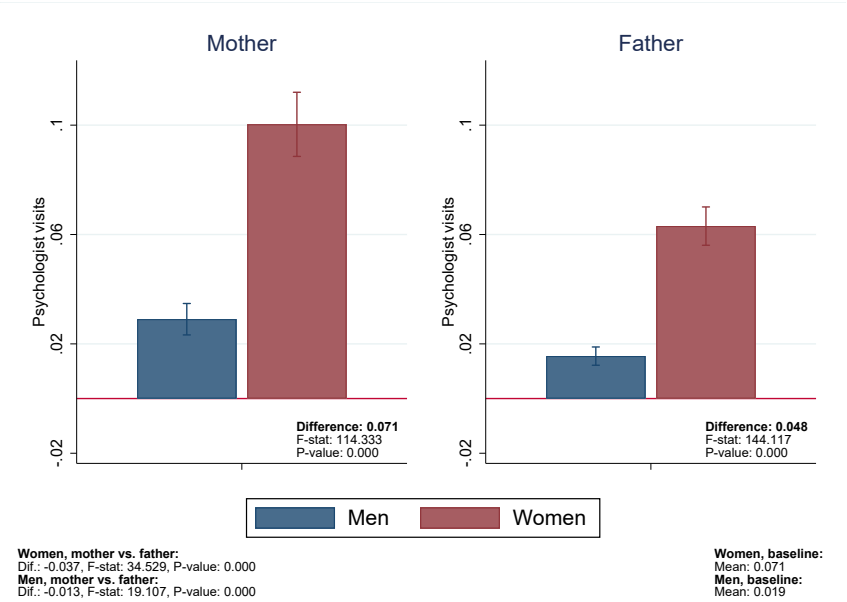
6.1.2 General health

Figure 9 reports the effect of mothers' vs. fathers' deaths on individuals' annual number of visits to GP and hospitals. We find that both mothers' and fathers' deaths increase men's and women's total number of visits to GPs and hospitals compared to their matched controls. In addition, mothers' deaths have a larger impact on men's and women's hospital visits and men's GP visits. For instance, after maternal deaths, men increase their GP (hospital) visits by 0.20 (0.029) per year, 5.7% (5.9%) percent relative to their baseline mean; women increase their GP (hospital) visits by 0.21 (0.03) per year, 2.7% (4.1%) percent relative to the baseline mean. The effect of paternal deaths on men's and women's hospital and GP visits is smaller: Paternal deaths increase men's GP (hospital visits) by 0.14 (0.018) and women's GP (hospital) visits by 0.145 (0.006). In sum, we see that mothers' and fathers' deaths have different effects on adult children's visits to GPs and hospitals. However, gender differences in the effects of parental death on daughters' and sons' GP and hospital visits are small.

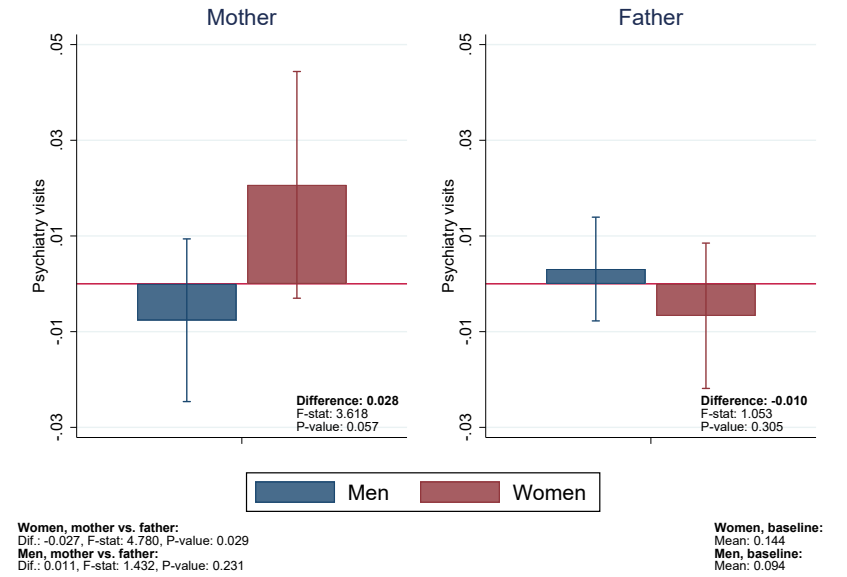
Rather than an actual deterioration in health status, the increase in GP and hospital visits

Figure 7: Matched control: Psychologist and psychiatrist visits, mothers' vs. fathers' deaths

(a) Psychologist visits



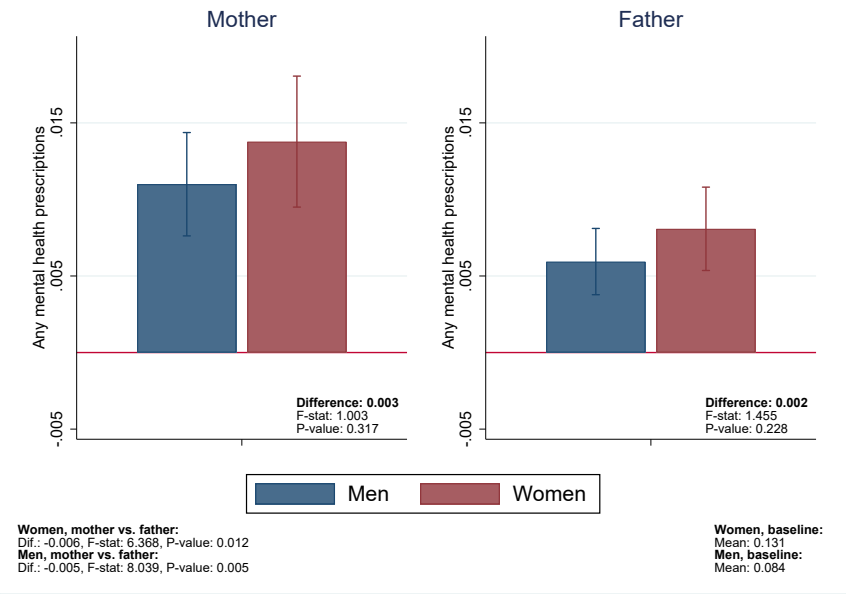
(b) Psychiatrist visit



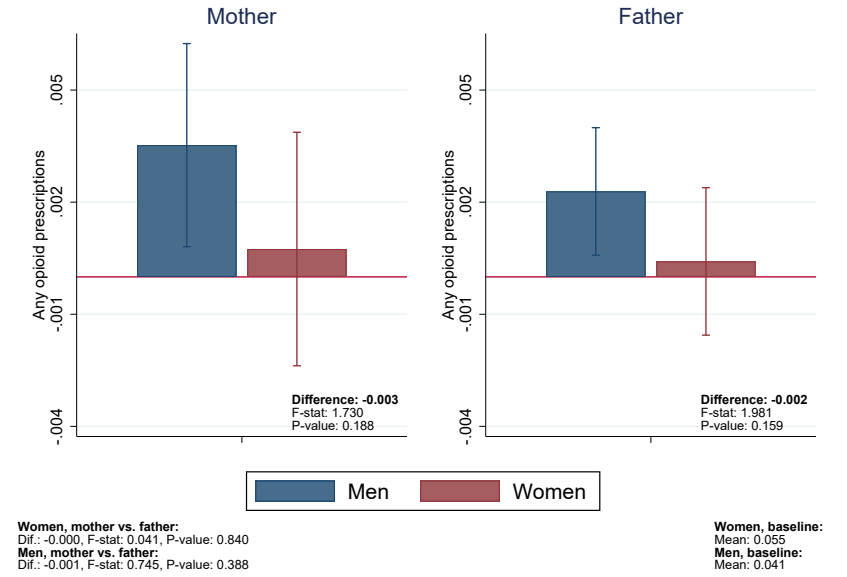
Notes: This figure plots the estimated coefficients from Equation 4 for men's and women's psychologist and psychiatrist visits. Psychiatrist visits include both consultations with psychiatrists at psychiatric hospital wards and private practicing psychiatrists. Data on psychologist visits are available from 1990-2019, leaving a balanced panel of 151,694 women and 168,590 men. The combined psychiatry data are available from 1995-2014, leaving a balanced panel of 87,284 women and 97,140 men. Half of the individuals are treated, and the other half are matched controls. Effects are within 5 years after the first parental death. 95%-confidence interval indicated. Standard errors are clustered at the individual-by-match ID level.

Figure 8: Matched control: Prescriptions, mothers' vs. fathers' deaths

(a) Any prescribed medicine related to mental health



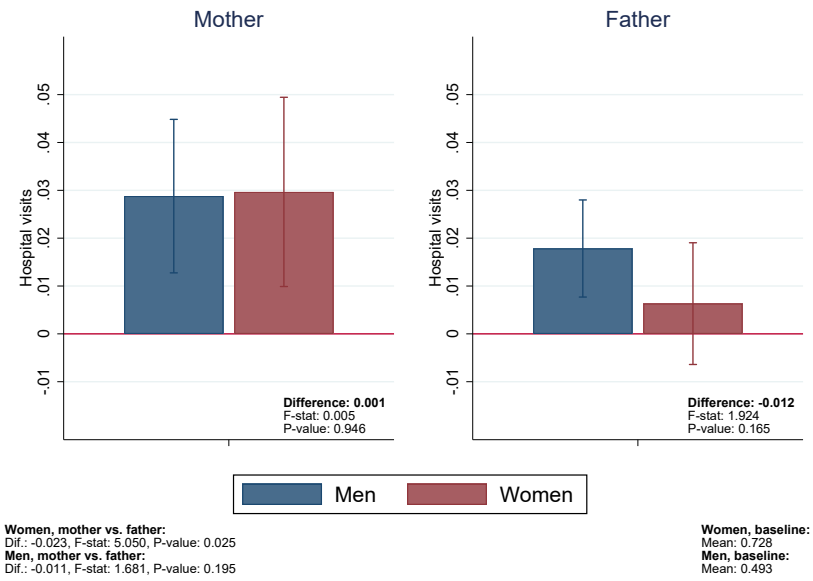
(b) Any prescribed opioid painkillers



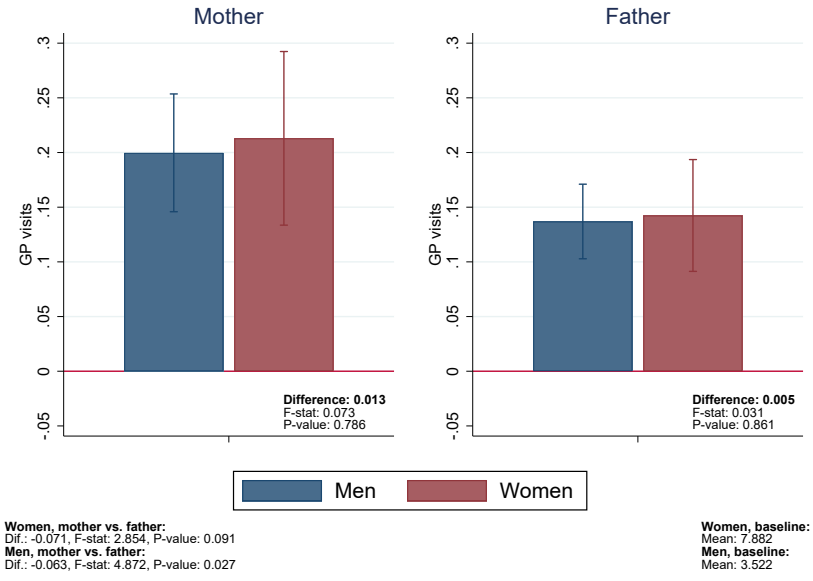
Notes: This figure plots the estimated coefficients from Equation 4 for men's and women's mental health and opioid prescriptions. All medical prescriptions are classified into ATC codes. We classify ATC-codes N05*, N06A*, N06B*, and N06C* as mental health related, ATC-codes N02A* as opioid painkillers. The prescription data are available from 1995, leaving a balanced panel of 113,006 women and 123,560 men. Half of the individuals are treated, and the other half are matched controls. Effects are within 5 years after the first parental death. 95%-confidence interval indicated. Standard errors are clustered at the individual-by-match ID level.

Figure 9: Matched control: Hospital and GP visits, mothers' vs. fathers' deaths

(a) Hospital visits



(b) GP visits



Notes: This figure plots the estimated coefficients from Equation 4 for men's and women's hospital and GP visits. Hospital visits include both in- and outpatient visits at non-psychiatric hospital wards, these data are available from 1994-2018, leaving a balanced panel of 115,906 women and 127,770 men. Data on GP visits are available from 1990-2019, leaving a balanced panel of 151,694 women and 168,590 men. Half of the individuals are treated, and the other half are matched controls. Effects are within 5 years after the first parental death. 95%-confidence interval indicated. Standard errors are clustered at the individual-by-match ID level.

could be caused by a higher level of self-screening after parental death. Family members' fatal health shocks may incentivize individuals to undertake more rigorous health monitoring and screening (Fadlon and Nielsen, 2019). To rule out that our results are driven by self-screening, we further explore the effects of parental death on hospital visits due to screening in Section 7.6. We do not find evidence of our results being driven by self-screening, and thus, we conclude that the observed increase in GP and hospital visits reflect a deterioration of physical health after parental death.

6.2 Family support

In this subsection, we investigate the effects of parental death on earnings and gender inequality through the family support channel. Existing literature has intensively focused on family support in terms of informal childcare (Garcia-Moran and Kuehn, 2017; Anstreicher *et al.*, 2022; Bick, 2016). Households with children aged 6 or younger (most children have started school by age 6) are in greatest need of informal childcare, especially at times when formal childcare is not available. To examine the family support channel through informal childcare, we estimate Equation 4 on men and women with or without young children (age 0-6 one year before parental death) separately. If the family support channel plays a role in contributing to the effects of parental death, we would see that those with young children have a larger earnings drop compared to those without young children.

Figure 10 presents the estimated effects of first parental death on men's and women's earnings for those with or without young children respectively. We also examine gender-specific effects by mothers' vs. fathers' deaths. Overall, women with young children experience a much larger earnings penalty after the first parental death compared to women without young children. Specifically, the earnings of women with young children drop by almost 10% after parental death, whereas the earnings of men with young children are only marginally affected. Comparing the differential effect of mothers' vs. fathers' deaths, we find that mothers' deaths have a slightly larger impact on women with young children, and thus, contribute to the gender earnings inequality resulting from parental death. The sharp difference in earnings penalties from

parental death between women with and without young children – approx. 6pp – suggests that family support is an important channel for explaining women's employment and earnings drop after parental death. In contrast, we do not find evidence of a significant differential impact of parental death on the earnings of men with or without young children. Thus, the family support channel contributes markedly to the gender earnings gap generated by parental death.[13]

If a family loses access to informal childcare, they may substitute this with formal childcare. Thus, we check if men and women with young children switch to formal childcare after parental death. If so, to what extent is there a gender difference? To answer this, we examine the effect of first parental death on the probability of men and women with young children enrolling children in formal childcare. In Figure A.6, we find that first parental death significantly increases men's and women's uptake of formal childcare, and men with young children are more likely to enroll their children in formal childcare than women after experiencing parental death. This suggests that formal childcare and parental informal childcare are substitutes for each other. More importantly, our results suggest that men are more likely to substitute informal childcare with formal childcare, which again will allow them to keep working. Considering the effects of mothers' vs. fathers' deaths on enrollment in formal childcare, we find that mothers' deaths, as opposed to fathers' deaths, lead men to enroll their youngest children more in formal childcare, though the difference is small.

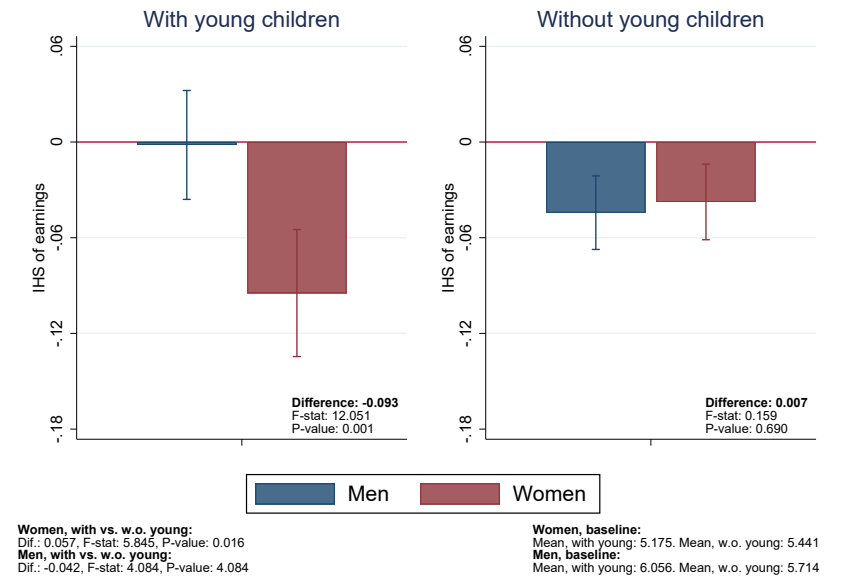
7 Supplementary outcomes and robustness checks

We conduct a series of robustness checks and supplementary analyses to ensure the validity of our findings. First, we examine the heterogeneous effects of parental death based on the health status of the surviving widowed parent. While we observe that only a small proportion of widowed parents undergo sustained hospital treatment, we find that the effect of first parental death is more pronounced for women in such cases. Second, we explore the interaction effect of first parental death and parental wealth on individual labor market outcomes, finding no evidence to suggest

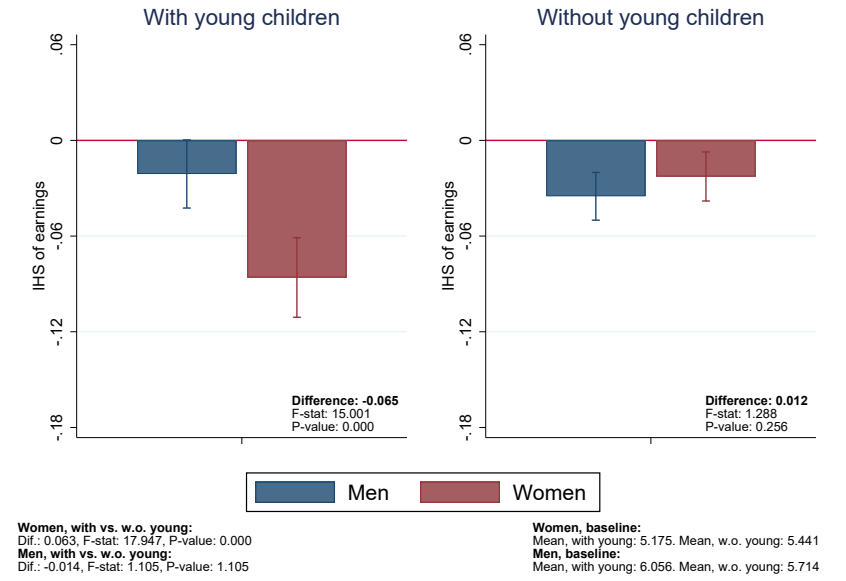
[13] We also examine the heterogeneity by age of the youngest child between 0-6 and 7-14 and reported it in Figure A.7. We find that women with children under age 6 experience the largest decline, consistent with the fact that younger children need intensive care.

Figure 10: Matched control: Earnings by young children, mothers' vs. fathers' deaths

(a) Mothers' deaths



(b) Fathers' deaths



Notes: This figure plots the estimated coefficients from Equation 4 for men's and women's earnings, but the sample is divided depending on whether individuals have a child aged 6 or younger. IHS of earnings refers to the inverse hyperbolic sine transformation of earnings inflated to 2020 levels and includes earnings from both employment and self-employment. The sample consists of all unexpected, first parental deaths from 1983 to 2014 and their matched controls, see Table A.2 for details on the sample. Effects are within 5 years after the first parental death. 95%-confidence interval indicated. Standard errors are clustered at the individual-by-match ID level.

that the decline in earnings following parental death is driven by the bequest channel. Third, we investigate the impact of parental death on fertility and cohabitation, ruling out the possibility that changes in these behaviors are driving the observed deterioration in labor market outcomes. Fourth, we investigate the within-family spillover effect of parental death by examining how it influences spousal labor market outcomes. Specifically, we find a meaningful negative impact of parents-in-law deaths on women's earnings through the family support channel. Fifth, we find no evidence to support the notion that parental death affects earnings through its impact on preferences for certain types of jobs and leisure. Sixth, we consider whether the effect of parental death on health outcomes are driven by an increase in screening for illnesses, rather than an actual deterioration in health. Seventh, we conduct further analyses that consider heterogeneity based on factors such as geographic proximity between parents and adult children, causes of parental death, and parental age at death. Finally, we show that our results are robust to using of a control group similar to Fadlon and Nielsen (2019, 2021).

7.1 Care for parents

As noted in the introduction, parental death can potentially also affect adult children's labor market outcomes through the elderly care channel. In particular, elderly parents may require care from their adult children before death. When parents pass away, adult children would be released from elderly care and be able to increase their labor supply.

Due to our empirical design, this channel is less relevant because we focus on the sudden death of the first parent: parents are generally healthy before death. Even if the first deceased parent requires elderly care, our data show that 90% of the parents are married, and thus, they are more likely to receive care from their spouses rather than their adult children.

Elderly care may also affect our results through another channel: when the first parent passes away, the remaining parent becomes widowed and may need more care from their adult children. However, this channel is less relevant in the Danish context where an extensive public elderly care system is in place (Danish Ministry of Health, 2017; Olejaz *et al.*, 2012). Existing literature using data from the Netherlands (Rellstab *et al.*, 2020) finds a null effect of care for elderly parents

on adult children's labor market outcomes due to a similarly extensive public elderly care system.

To provide evidence that the care for widowed parents is not driving the labor market deterioration of adult children after the first parental death, we follow the existing literature (Rellstab *et al.*, 2020; Arrieta and Li, 2022), and exploit variation on whether the surviving, widowed parent is ill or not to identify a potential elderly care effect. Ill widowed parents are more likely to require care from adult children than healthy parents. Using hospitalization data, we examine the heterogeneous labor market effects by parental health status. In our sample, around 20% of widowed parents have undergone hospital treatment for more than three months within five years after the first parent's death (including continuous outpatient care). The small share of widowed parents undergoing hospital treatment suggests that even if we find some evidence of an elderly care channel, this will affect only a small share of adult children and is unlikely to be the driving the majority of adult children's decline in earnings after first parental death. We present the heterogeneity analysis by parental health status in Figure A.8. We find no heterogeneity in the effect on men's earnings by parental health status; this suggests that the elderly care channel does not drive men's deterioration in earnings after the first parental death. In contrast, women's earnings drop by 2.7pp more when widowed parents are ill, suggesting that the elderly care channel may play a role in women's decline in earnings after parental death.

However, the heterogeneous effect of whether widowed parents are ill could also confound with family support or the mental health channel. Specifically, ill parents are less likely to provide family support to adult children, thus affecting adult children's earnings through family support channels. In addition, adult children may experience different mental health effects when their widowed parent is ill. To control for the family support channel, we restrict our sample to men and women without young children as this group of people is less likely to need family support from their parents. To check heterogeneous effects on mental health, we estimate the effect of parental death on visits to psychologists by the widowed parent's health status. We find that when widowed parents are ill, women visit psychologists more than when widowed parents are healthy. To this end, the differential effect on women's earnings by the widowed parent's health status can be driven by a combination of both mental health and elderly care channels. Lastly, we

emphasize that even if this heterogeneity analysis provides suggestive evidence that the elderly care channel may affect women, this channel will affect only a small share of women given that 80% of widowed parents generally are healthy within 5 years after spousal death. Thus, this channel is unlikely to be the driving force of women's general decline in earnings after parental death.

7.2 Inheritance

Our empirical design focuses on the first parental death. As described in Section 2, after the first parental death, the entire estate of the deceased parent is usually kept by the spouse for married couples. Thus, by focusing on the first parental death, this channel is less relevant in driving the effect of parental death on adult children's labor market outcomes. However, to reassure that bequest is not a significant driver of our results, we conduct a heterogeneity analysis exploiting information on parental wealth before death (bequests are not observed directly). We regress adult children's earnings on the interaction term between a treatment indicator and parental wealth one year before the first parental death. If parents are wealthy, adult children tend to receive more bequests. If bequests are driving the earnings decline, we would expect the interaction term to be negative.

We report the results by gender of parental death and adult children in Table A.3. We find no impact of the interaction term on adult children's earnings. As an alternative, we also interact the treatment indicator with adult children's own assets and regress the interaction term on adult children's earnings. The coefficient of the interaction term measures the impact of own wealth increase on adult children's earnings after parental death. We still find no statistically or economically meaningful impact on individual earnings. Altogether, this evidence suggests that the bequest channel does not drive the decline in earnings after the first parental death.

7.3 Effects on cohabitation and fertility

Parental death could also affect adult children's labor market outcomes by impacting family behavior. For example, if parental death changes cohabitation and marital status, or affects fertility,

we would expect derived effects on adult children's labor market outcomes. Figure A.9 shows the effect of parental death on fertility and cohabitation.

We find no effect of mothers' or fathers' death on men's and women's cohabitation status, suggesting that changes in cohabitation do not drive the labor market effect. Further, we find that first parental death reduces adult children's fertility rate. Relative to the matched controls, the total number of children is 0.012 lower for both men and women after losing a mother, while the total number of children is 0.003 lower after paternal death. Because higher fertility is associated with lower employment and earnings, especially for women, then a reduction in fertility would predict an increase in employment and earnings. This suggests that fertility behavior change cannot drive the observed labor market deterioration for men and women after parental death.

7.4 Effects on spouses

Parental death may not only affect the labor market outcomes of daughters and sons, it could also have a spillover effect on the labor market outcomes of daughters-in-law and sons-in-law. In this subsection, we explore the spillover effect of parental death on the earnings of daughters-in-law and sons-in-law. Because the treated individuals are men and women who lost their first parents-in-law, the sample is restricted to those who are cohabited or married. Our control group is again obtained through nearest-neighbor matching, and for each treated individual, we identify an observationally similar matched control who is also married or cohabiting, but who does not lose either of their parents-in-law in the sample window. When obtaining the matched controls, we also control for whether the individual's own parents are still alive to ensure that the two groups are comparable in terms of their own parent death status.

The estimated effects of parent-in-law death are presented in Figure A.10. We find that parents-in-law's deaths have no impact on men's earnings. In contrast, parents-in-law's deaths significantly and negatively impact women's earnings. The effect is much larger and more significant for mothers-in-law's deaths. Women's earnings drop by 3.6% after mothers-in-law's deaths and 1.8% after the fathers-in-law's deaths. Next, we examine whether this effect is due to mental health or family support channels. We find no effect of parents-in-law death on women's visits

to psychologists, so we attribute the decline in women's earnings to the family support channel. Taken together, a comparison of the effect of own parents' deaths vs. the effect of parents-in-law's deaths suggests that own parents' deaths affect men's labor market outcomes mainly through the mental health channel. In contrast, own parental death affects women's labor market outcomes through both the mental health and family support channels; whereas parents-in-law's deaths affect women's earnings mainly through the family support channel.

7.5 Preference change: Type of work and leisure

Parental death could also affect labor market outcomes by changing adult children's preferences for work. First, after parental death, adult children may switch to occupations that they enjoy more or find more meaningful but earn less money. In order to test if this channel is operative, we examine the impact of parental death on switching occupations and present the results in Figure A.11. We find no effect of parental death on occupational switching, which suggests that parental death does not affect labor market choice by changing their preferences for certain types of jobs.

Second, after losing a family member, people may value time spent with the rest of their families more, and thus, change their relative preference between the economic benefits from work and leisure. Without further data on preferences for leisure, we cannot rule this channel out directly. However, if this is the case, we would also expect that adult children would be more likely to form a family and have more children to enjoy the time spent with family. However, as described in Section 7.3, we do not find such an effect. Taken together, the evidence suggests that it is implausible that parental death could affect adult children's labor market outcomes through its impact on preferences for certain types of jobs or for leisure.

7.6 Health effect: Screening vs. non-screening

In the main analysis, we find that women and men visit hospitals and GPs more after parental death. However, they could visit hospitals for screening purposes because sudden parental death may induce people to be more cautious about their health (Fadlon and Nielsen, 2019). In this sense,

it is not actual health deterioration that drives the hospital and GP visits, but rather screening incentives. To examine if this is the case, we take advantage of our detailed hospital diagnosis data to distinguish the hospital visits due to self-screening v.s. non-screening purposes. In particular, self-screening hospital visits are defined as visits to hospitals to do tests and examinations without a definitive symptom or condition.

We examine the effect of parental death on hospital visits due to screening and non-screening purposes and report the effects in Figure A.12. Panel (a) and (b) show the effect of parental death on hospital visits due to screening and non-screening purposes, respectively. We find that the effect on visits to hospitals due to screening purposes is minimal and not statistically different from zero, but the effect on hospitals due to non-screening purposes is large and significant. This suggests that parental death has a negative impact on adult children's actual health, rather than health screening behavior.

7.7 Heterogeneity analysis

We also conduct a few heterogeneity analyses to examine the effect of parental death by whether parents and adult children live in the same region, by parental death reasons, and by parental age at death. We present the results in Figure A.13 and Table A.4.

We find that if parents and adult children are living in the same region before parental death, the effect of parental death on adult child earnings is larger, see Figure A.13. This could be driven by both the family support and mental health channels. In particular, parents are more likely to provide informal childcare if they live close to their adult children. In addition, living in the same region may suggest that parents and children have a better relationship, and thus, adult children may suffer more from mental health problems after parental death.

Further, we find that the effects of parental death are similar across different death causes, i.e., heart attack, stroke, car accident, etc., suggesting no heterogeneous effects conditional on sudden death, see Table A.4, Columns 1 and 2.

Finally, we find a larger impact of parental death if parents die at a relatively younger age, see Table A.4, Columns 3 and 4. This could also be due to family support and mental health channels:

parents are more likely to provide informal childcare when they are young and healthy, and adult children suffer more mental health problems when parents die unexpectedly at a relatively young age.

7.8 Alternative specifications

Our main empirical strategy adopts nearest-neighbor matching to find an observationally similar matched control for treated individuals. The matched control individual does not lose either of their parents during the observed window, but they lose their parents in the future. As a robustness check, we exactly follow Fadlon and Nielsen (2021) and use an alternative empirical strategy that uses future-treated individuals as the control group. We consider a time gap in the treatment of 6 years. For example, we use individuals whose first parents died out of sudden reasons in 2010 as the control for individuals who lost their parents in 2004. Then we compare the labor market trajectories of the two individuals over the period 2001 to 2009. We present the results in Figure A.14. Using this alternative specification, we find similar results to those from our main specification using matched nearest-neighbours as the control group.

8 Conclusion and policy implications

In this paper, we examine the labor market effects of an event that almost everyone experiences at some point in their lives: the death of a parent. Despite the widespread occurrence of parental death, the literature assessing its impact on the outcomes of adult children is scarce. To contribute to this literature, we utilize Danish register data from 1980 to 2019 and analyze all sudden, first parental deaths in Denmark between 1983 and 2014. The extensive sample of first parental deaths enables us to not only examine the overall impact of parental death on adult-child outcomes but also quantify the parent-child gender interaction effects, i.e., the differential effects of losing a mother v.s. a father on daughters v.s. sons. Our findings indicate that the mental health and family support channels are the primary drivers of the effects on labor market outcomes and gender inequalities resulting from the first parental death.

Using both event studies similar to Kleven *et al.* (2019) and a difference-in-differences approach with a control group of matched nearest-neighbors, we find that adult children experience substantial and enduring declines in earnings and employment following the first parental death. Moreover, we document parent-child gender interaction effects by demonstrating that the death of mothers has a significantly larger negative impact on women's earnings, while the deaths of fathers affect the earnings of both men and women to a similar extent.

Regarding the mechanisms driving our results, we first consider mental health. We observe that women are more likely to seek help from psychologists after losing a parent, whereas men exhibit a relatively larger increase in mental health-related prescriptions and opioid prescriptions. This suggests that mental health issues arising from parental death manifest differently for women and men. Additionally, when examining general health as measured by visits to general practitioners and hospital treatment, we find substantial effects of the first parental death, although not gender-specific effects.

Furthermore, we find that informal care for children plays a crucial role in explaining the gender difference in the effect of the first parental death. The death of a parent affects women and men without young children to a similar degree. However, if a young child is present in the family, women are significantly more affected, experiencing an average decline in wages of almost 10%.

Taking into account the parent-child gender interaction effects, we conclude that the first parental death contributes significantly to gender gaps in earnings and employment. The overall effect of first parental deaths accounts for 5% of the aggregate gender gap in earnings. However, when focusing on mothers' deaths, they account for 10% of the aggregate gender gap in earnings.

Although parental death is ultimately unavoidable, this does not imply that policymakers cannot address its negative effects on children. Given the near-universal nature of parental death, the individual long-term adverse effects of such an event can also have a significant impact on the economy as a whole. Kleven et al. (2019) document earnings penalties around childbirth for women but not for men. In contrast, we demonstrate that parental death negatively affects both women and men. Consequently, a larger portion of the population is adversely affected by

parental death, which further amplifies its impact on the aggregate economy. Currently, policies aimed at assisting bereaved adult children are scarce, as parental death is typically managed without significant intervention from public authorities. Religious institutions, such as the church, typically play a role at death, e.g., by undertaking a funeral. However, with the increasing secularization of societies, public non-religious policies could be developed to address the negative effects of parental death. We propose that potential policies could draw inspiration from those implemented during childbirth, which represents another event with significant economic and emotional implications.

In Denmark, local authorities organize "mommy groups" to facilitate the interaction among mothers of newborns who share similar experiences and challenges. Similar support groups are also organized by charities or authorities in many other countries (see, e.g., Hanna *et al.*, 2002). In the context of parental death, the establishment of grief groups could offer comparable emotional support by connecting adult children who have recently lost a parent. This approach has the potential to address some of the significant negative mental health effects associated with parental death. Furthermore, just as the health of newborn children and their mothers is closely monitored after childbirth, a similar approach could be adopted in relation to parental death. For instance, authorities could automatically arrange consultations with psychologists for children following the loss of a parent.

While parents of newborns are entitled to parental leave, which helps manage time constraints surrounding childbirth, children have no legal entitlement to paid leave in Denmark in the context of parental death (although some employers offer paid leave on the day of the funeral of a close relative). Paradoxically, the death of a parent often imposes substantial legal and organizational burdens on children during a time of emotional distress. Therefore, we propose that offering paid leave in connection with parental death could alleviate time constraints and provide bereaved children with the necessary time to address administrative responsibilities and time to mourn. This could potentially mitigate the negative long-term effects of parental death.

In summary, we suggest that implementing support systems, such as grief groups and automatic consultations with psychologists for bereaved adult children, can address the emotional

impact of parental death. Additionally, offering paid leave in connection with parental death can alleviate time constraints and facilitate the management of administrative burdens while allowing for mourning and healing. Such measures could potentially address the negative consequences of parental death on individuals and on society as a whole.

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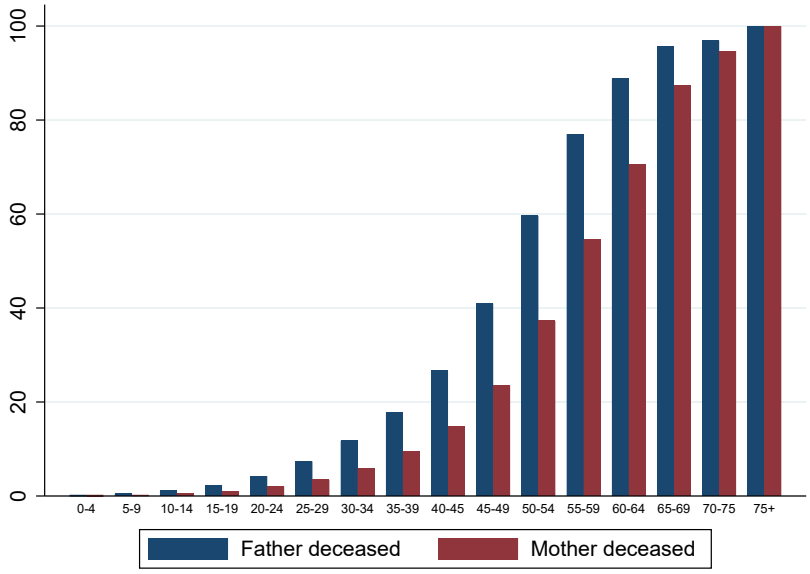
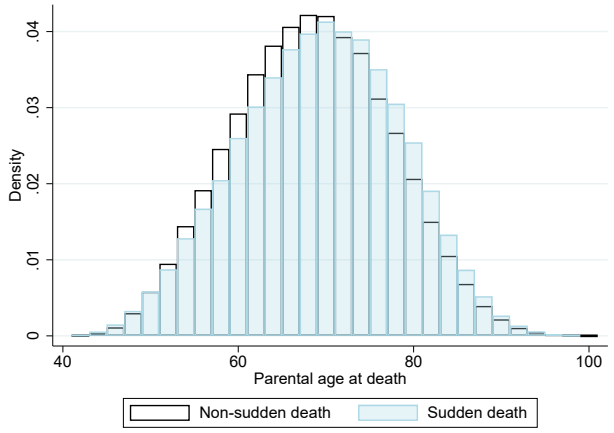
A Appendix

Figure A.1: Percentage of people with deceased parents by age: Denmark



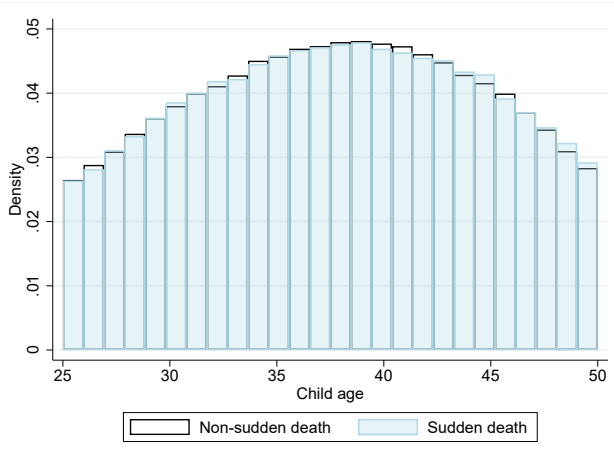
Notes: This figure shows the cumulative percentage of people who have lost their parents by age in 2014. The blue (red) bar shows the cumulative percentage of people losing their mother (father). We consider all causes of death for this figure. Source: Danish population registry, BEF, and the cause of death registers, DODSAARS/DODSAARG.

Figure A.2: Age of first deceased parent distribution



Notes: This figure plots the age distribution of the first deceased parent by sudden vs. nonsudden death. We include the first parental deaths occurring between 1983 and 2014 for children aged 25-50 in the year of first parental death and with two known parents. See Table 1 for sample sizes. Bars including fewer than 5 individuals are dropped due to data confidentiality restrictions. The sample consists of all unexpected, first parental deaths from 1983 to 2014 and their matched controls for children aged 25-50 in the year of first parental death and with two known parents. See Table A.2 for details on the sample.

Figure A.3: Adult children age distribution when first parent deceased



Notes: This figure plots the age distribution of adult children at the time of first parent death and by first parent sudden vs. nonsudden death. We include the first parental deaths occurring between 1983 and 2014 for children aged 25-50 in the year of first parental death and with two known parents. See Table 1 for sample sizes. Bars including fewer than 5 individuals are dropped due to data confidentiality restrictions.

Table A.1: Summary statistics for adult children at $t = -1$, split by gender and suddenness of first parental death

	First death mother		First death father	
	Sudden	Non-sudden	Sudden	Non-sudden
Age	37.48	36.53	36.56	36.84
Male	0.53	0.52	0.53	0.52
Share with college or above	0.20	0.22	0.21	0.22
Share with high school	0.49	0.52	0.51	0.52
Share without high school	0.31	0.27	0.28	0.26
Cohabitation	0.62	0.59	0.60	0.59
Number of children	1.43	1.36	1.37	1.38
Age of youngest child	8.38	7.65	7.73	7.75
Share with children under 6	0.32	0.34	0.34	0.34
Mother age	66.71	64.01	64.88	64.26
Father age	69.27	66.74	69.47	68.39
Mother married	0.83	0.80	0.86	0.82
Father married	0.87	0.85	0.85	0.81
First death age	67.71	65.01	70.47	69.39
Employment	0.83	0.84	0.84	0.84
Intensive margin	1015.83	1014.67	1011.80	1018.77
Annual earnings	294.65	302.77	298.99	307.79
N	48089	185272	167565	358243

Notes: This table shows the summary statistics for children in the calendar year preceding a sudden and first parental death, split by both parent gender and suddenness of parental death. We include the first parental deaths occurring between 1983 and 2014 for children aged 25-50 in the year of first parental death and with two known parents. All statistics are derived from Danish population-level register data; the specific datasets used for this exercise are described in Section 3.

Table A.2: Summary statistics for adult children at $t = -1$ for sudden, first parental deaths

	First death mother: Daughters	First death father: Daughters	First death mother: Sons	First death father: Sons
Age	37.44	36.53	37.52	36.59
Male	0.00	0.00	1.00	1.00
Share with college or above	0.24	0.26	0.16	0.16
Share with high school	0.44	0.46	0.53	0.55
Share without high school	0.31	0.28	0.31	0.28
Cohabitation	0.68	0.66	0.57	0.55
Number of children	1.56	1.50	1.30	1.25
Age of youngest child	8.97	8.30	7.76	7.14
Share with children aged 6 or less	0.32	0.35	0.32	0.34
Mother age	66.68	64.84	66.73	64.92
Father age	69.25	69.41	69.30	69.52
Mother married	0.83	0.85	0.83	0.86
Father married	0.87	0.85	0.88	0.86
First death age	67.68	70.41	67.73	70.51
Employment	0.83	0.84	0.83	0.84
Intensive margin	975.92	969.96	1051.37	1048.41
Annual earnings (1,000DKK)	241.63	244.55	342.17	346.86
N	22729	78402	25360	89163

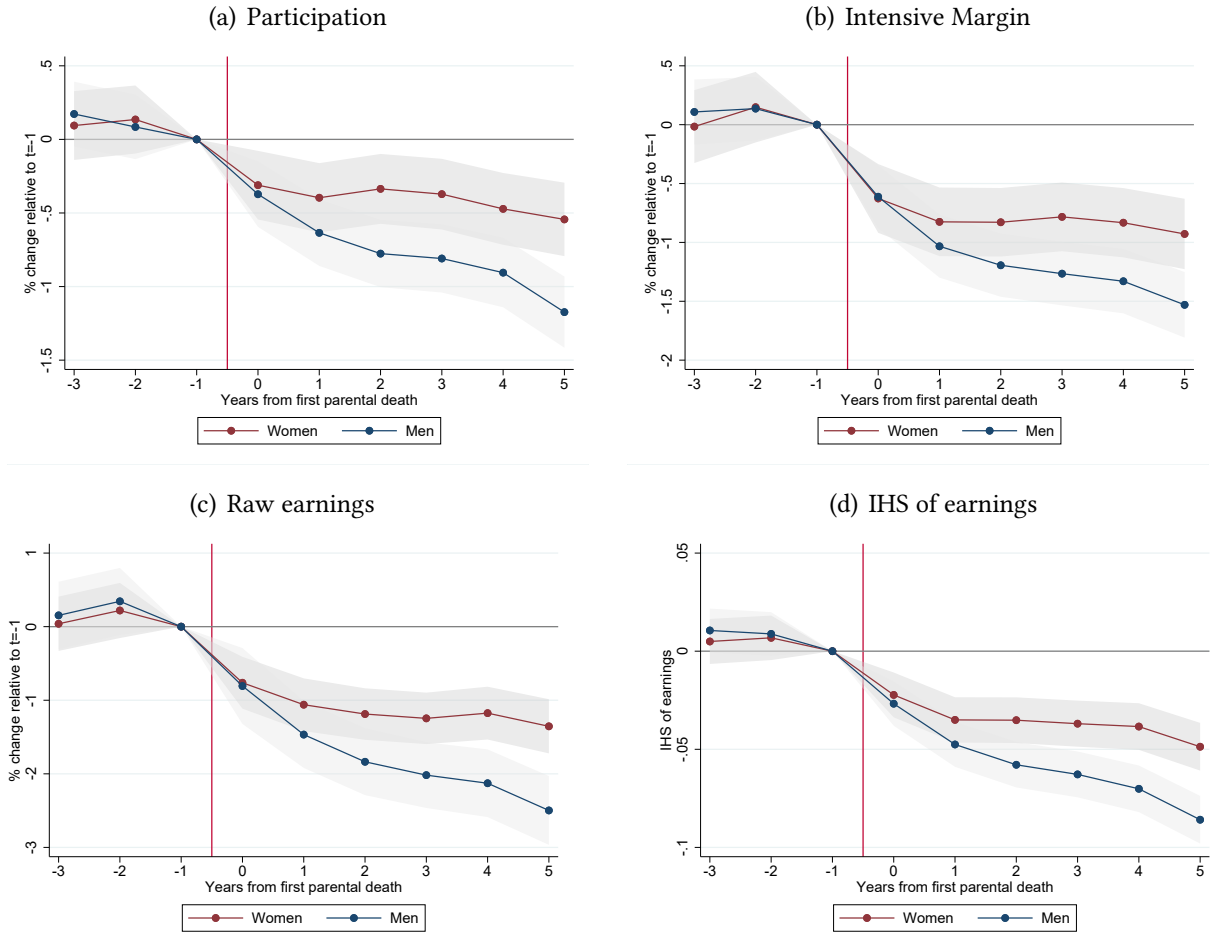
Notes: This table shows the summary statistics for children in the calendar year preceding a sudden and first parental death, split by both child and parent gender. We include the first parental deaths occurring between 1983 and 2014 for children aged 25-50 in the year of the first parental death and with two known parents. All statistics are derived from Danish population-level register data; the specific datasets used for this exercise are described in Section 3.

Table A.3: Matched control: Parental net assets and earnings

	Dependent variable: IHS of earnings			
	(1)	(2)	(3)	(4)
	Mother		Father	
	Men	Women	Men	Women
Treat × Parental wealth	0.002	-0.001	0.001	0.001
	(0.002)	(0.003)	(0.002)	(0.002)
Treatment	-0.047	-0.054	-0.049	-0.056
	(0.013)	(0.014)	(0.008)	(0.008)
N. of obs.	566,742	507,672	1,924,582	1,692,110
Control mean	5.823	5.378	5.864	5.439

Notes: This table shows the interaction effect of parental wealth and parental death on adult children's earnings by gender. Parental wealth includes savings, stocks, etc., as well as the value of any properties owned net of the debt in the property. The value of assets is inflated to 2020 levels.

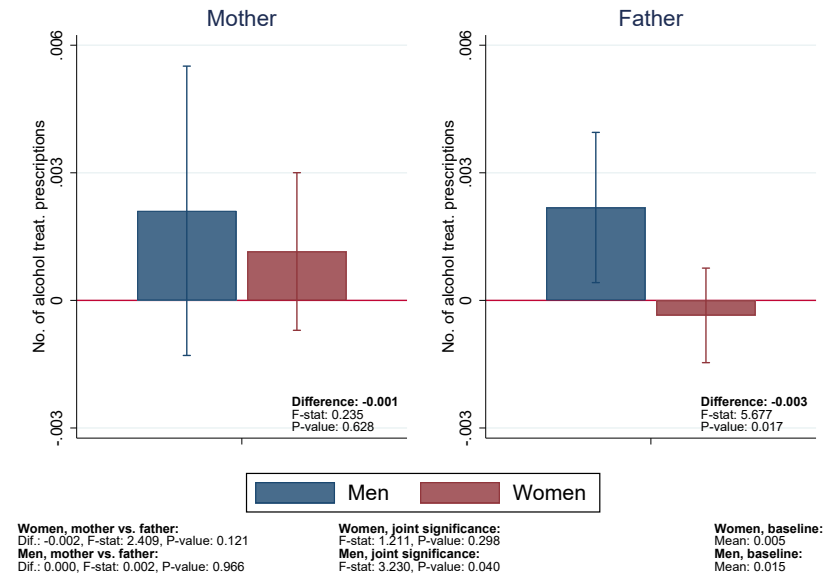
Figure A.4: Descriptives: Effect of non-sudden parental death



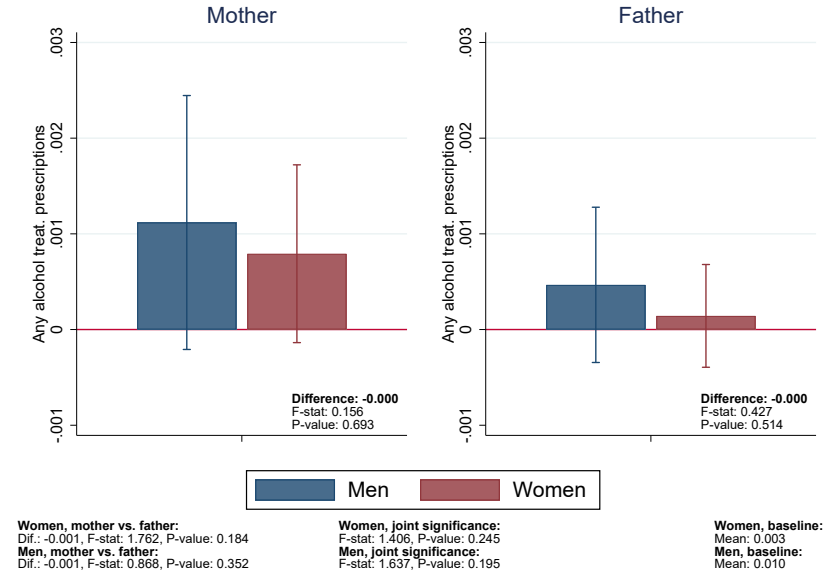
Notes: This figure plots the estimated coefficients from Equation 1 for men's and women's labor market outcomes, but focusing on non-sudden deaths only. For panel (a)-(c), we follow Kleven *et al.* (2019, p. 188) and convert the estimated coefficients into percentage change relative to the baseline. Participation is measured as strictly positive ATP contributions. The intensive margin is based on ATP contributions, similar to Kleven *et al.* (2019). ATP-pension contributions are paid proportionally to hours worked. Earnings are inflated to 2020 levels and include earnings from both employment and self-employment. The sample consists of all non-sudden, first parental deaths from 1983 to 2014 for children aged 25-50 in the year of first parental death and with two known parents. See Table 1 for details on the sample. 95%-confidence interval indicated.

Figure A.5: Matched control: Treatment of alcohol addiction, mothers' vs. fathers' deaths

(a) No. of prescriptions



(b) Any prescriptions



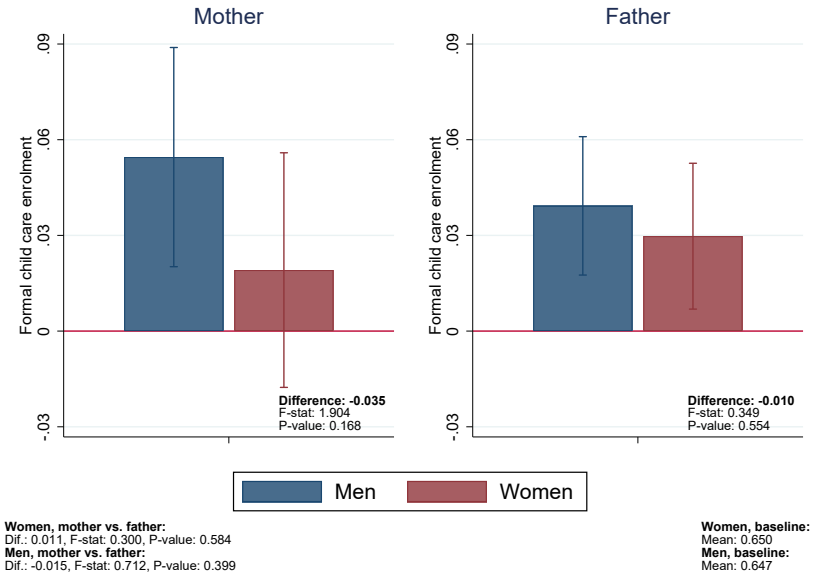
Notes: This figure plots the estimated coefficients from Equation 4 for men's and women's mental health and opioid prescriptions. All medical prescriptions are classified into ATC codes. We classify ATC-codes N07BB as prescriptions related to the treatment of alcohol addiction. The prescription data are available from 1995, leaving a balanced panel of 113,006 women and 123,560 men. Half of the individuals are treated, and the other half are matched controls. Effects are within 5 years after the first parental death. 95%-confidence interval indicated.

Table A.4: Matched control: Heterogeneity in treatment effect by parental cause of death and age

	Dependent variable: IHS of earnings			
	(1)	(2)	(3)	(4)
	Men	Women	Men	Women
Treat., heart	-0.033***	-0.043***		
	(0.006)	(0.006)		
Treat., stroke	-0.025***	-0.042***		
	(0.008)	(0.008)		
Treat., respiratory	-0.099	-0.043		
	(0.098)	(0.084)		
Treat., accident	-0.034**	-0.046***		
	(0.016)	(0.017)		
Treat., parent young			-0.045***	-0.063***
			(0.007)	(0.007)
Treat., parent old			-0.016**	-0.021***
			(0.007)	(0.007)
Observations	2,491,324	2,199,782	2,491,324	2,199,782
R-squared	0.660	0.693	0.660	0.693
Control mean	5.854	5.425	5.854	5.425

Notes: This table shows heterogeneity in treatment effect by parental cause of death and age. IHS of earnings refers to the inverse hyperbolic sine transformation of earnings inflated to 2020 levels and includes earnings from both employment and self-employment. The sample consists of all unexpected, first parental deaths from 1983 to 2014 and their matched controls for children aged 25-50 in the year of first parental death and with two known parents. See Table A.2 for details on the sample. Effects are within 5 years after the first parental death. "Old" refers to parents older than 71 at the time of parental death, 71 years old is the median age of parental death. Standard errors clustered at the individual-by-match ID level in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$

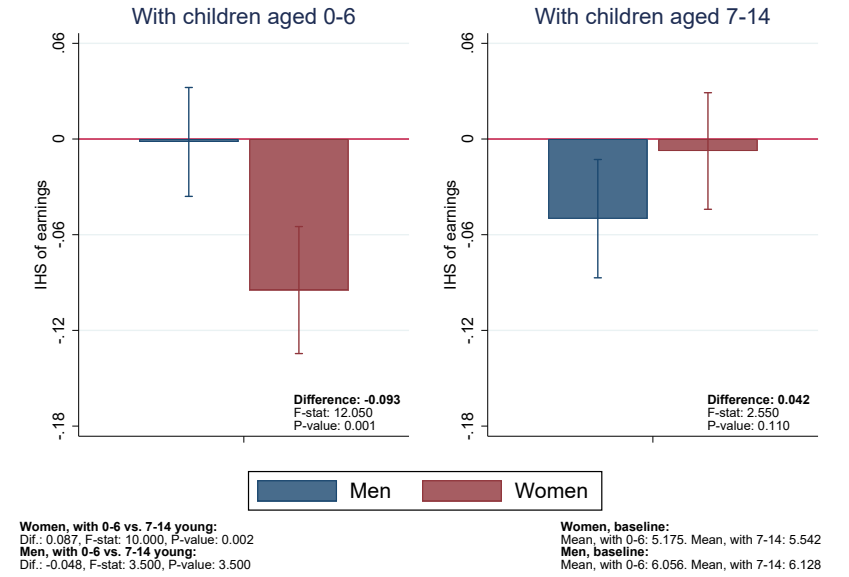
Figure A.6: Matched controls: Formal childcare, mothers' vs. fathers' deaths



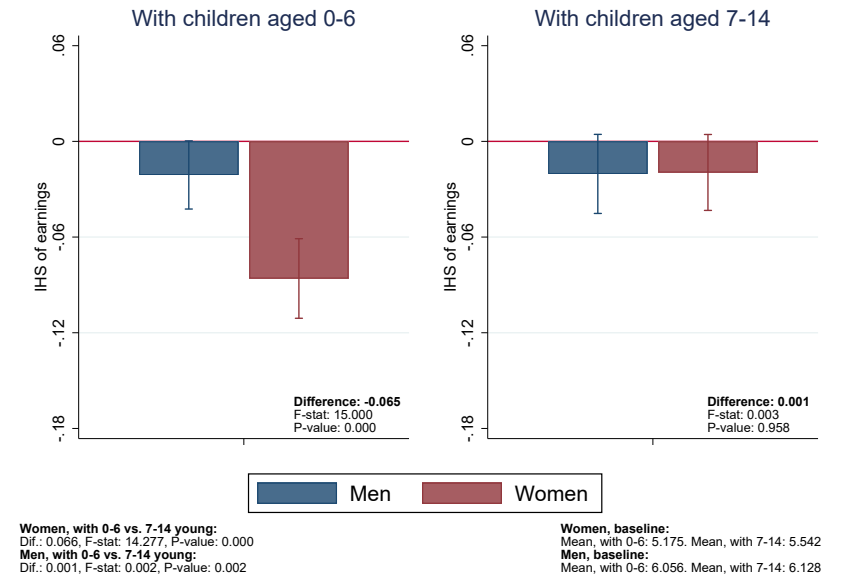
Notes: This figure plots the estimated coefficients from Equation 4 for men's and women's uptake of formal childcare. The data on formal childcare have low coverage before 2005, so we only include data from 2005-2019, we also only include individuals with children aged 6 or younger. This leaves a balanced panel of 7,662 women and 8,780 men. Half of the individuals are treated, the other half are matched controls. Effects are within 5 years after the first parental death. 95%-confidence interval indicated.

Figure A.7: Matched control: Earnings by child age group, mothers' vs. fathers' deaths

(a) Mothers' deaths

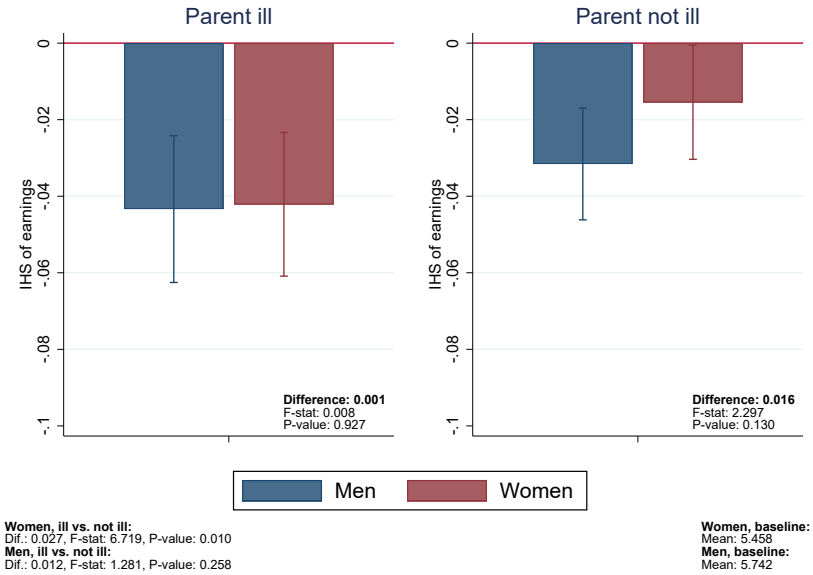


(b) Fathers' deaths



Notes: This figure plots the estimated coefficients from Equation 4 for men's and women's earnings, but where the sampled is divided depending on whether individuals' youngest child is aged 6 or younger, or 7 to 14 years. IHS of earnings refers to the inverse hyperbolic sine transformation of earnings inflated to 2020 levels and includes earnings from both employment and self-employment. The sample consists of all unexpected, first parental deaths from 1983 to 2014 if the individual experiencing parental loss has a child aged 14 or younger, leaving a balanced panel of 123,678 women and 129,202 men. Half of the individuals are treated, and the other half are matched controls. Effects are within 5 years after the first parental death. 95%-confidence interval indicated.

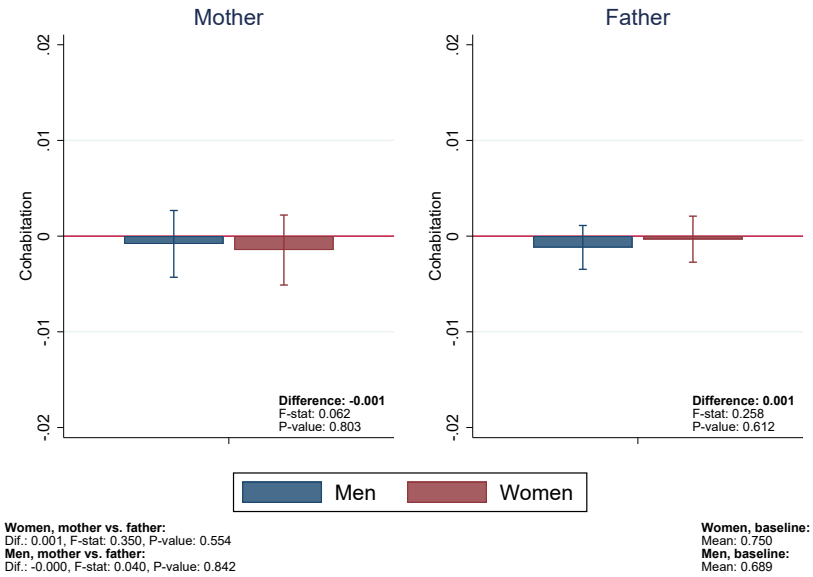
Figure A.8: Matched control: Surviving parent ill or not



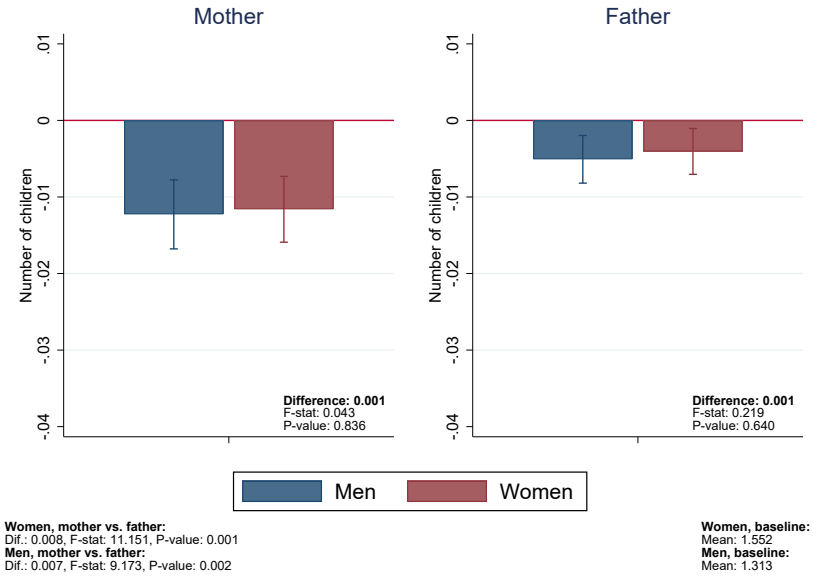
Notes: This figure plots the estimated coefficients from Equation 4 for men's and women's earnings. IHS of earnings refers to the inverse hyperbolic sine transformation of earnings inflated to 2020 levels and includes earnings from both employment and self-employment. We divide the sample by the surviving parents' health status, based on their hospital visits. Hospital visits include in- and outpatient visits at non-psychiatric hospital wards. These data are available from 1994-2018, leaving a balanced panel of 115,906 women and 127,770 men. Half of the individuals are treated, and the other half are matched controls. Effects are within 5 years after the first parental death. 95%-confidence interval indicated.

Figure A.9: Matched control: Other outcomes, mothers' vs. fathers' deaths

(a) Cohabitation

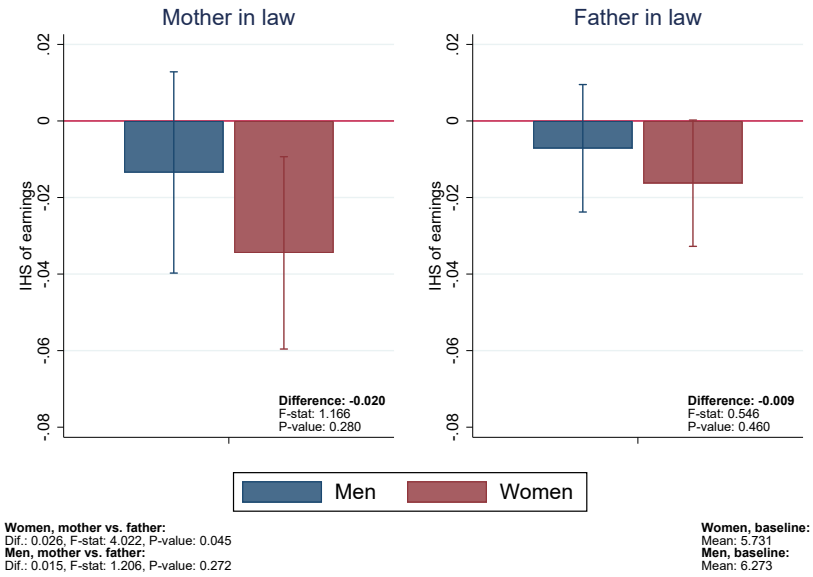


(b) Fertility



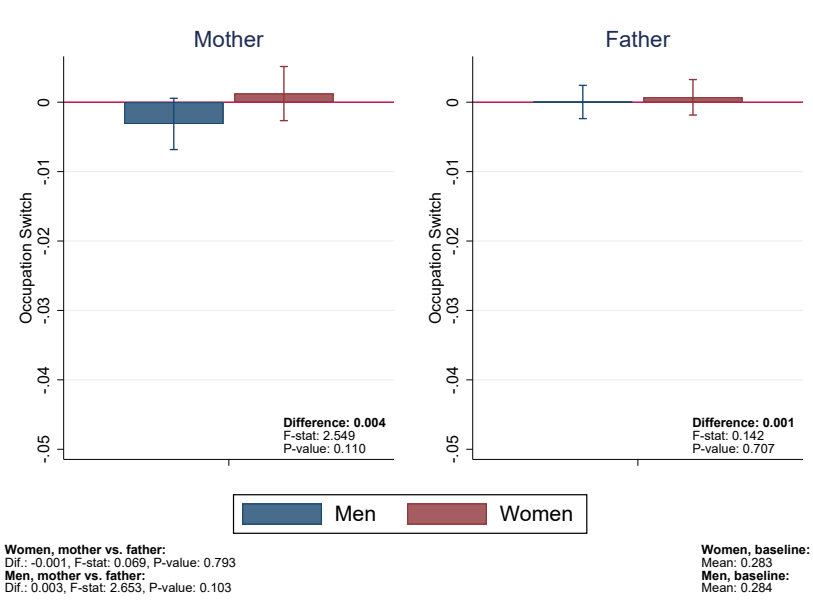
Notes: This figure plots the estimated coefficients from Equation 4 for men's and women's cohabitation rates and the number of children. The sample consists of all unexpected, first parental deaths from 1983 to 2014 and their matched controls, see Table A.2 for details on the sample. Effects are within 5 years after the first parental death. 95%-confidence interval indicated.

Figure A.10: Matched controls: Earnings by deaths of parents-in-law



Notes: This figure plots the estimated coefficients from Equation 4 for men's and women's earnings, but considering the death of a parent-in-law instead. IHS of earnings refers to the inverse hyperbolic sine transformation of earnings inflated to 2020 levels and includes earnings from both employment and self-employment. Because we condition on having a spouse at the time of parental death, we have a balanced panel of 109,525 women and 110,461 men. Half of the individuals are treated, and the other half are matched controls. Effects are within 5 years after the first parental death. 95%-confidence interval indicated. Standard errors are clustered at the individual-by-match ID level.

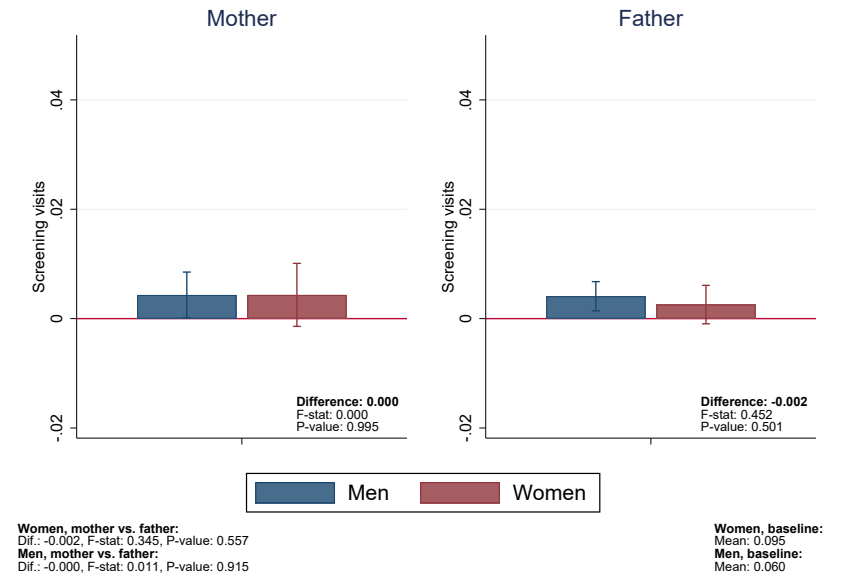
Figure A.11: Matched control: Occupational switches



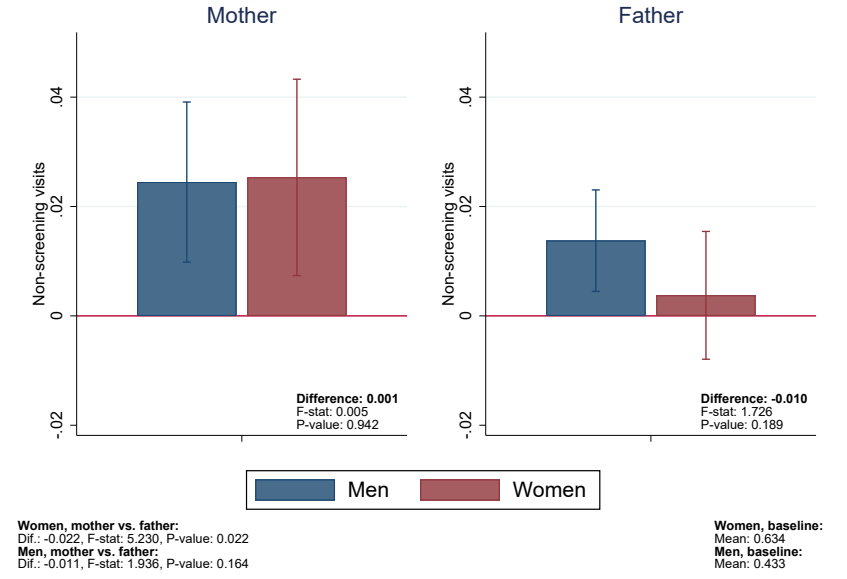
Notes: This figure plots the estimated coefficients from Equation 4 on an indicator of whether or not women and men change their occupations in a given year. We drop individuals with no defined occupation, leaving a balanced panel of 222,643 women and 253,844 men. Half of the individuals are treated, and the other half are matched controls. Effects are within 5 years after the first parental death. 95%-confidence interval indicated.

Figure A.12: Matched controls: Screening vs. non-screening, mothers' vs. fathers' deaths

(a) Screening related hospital visits

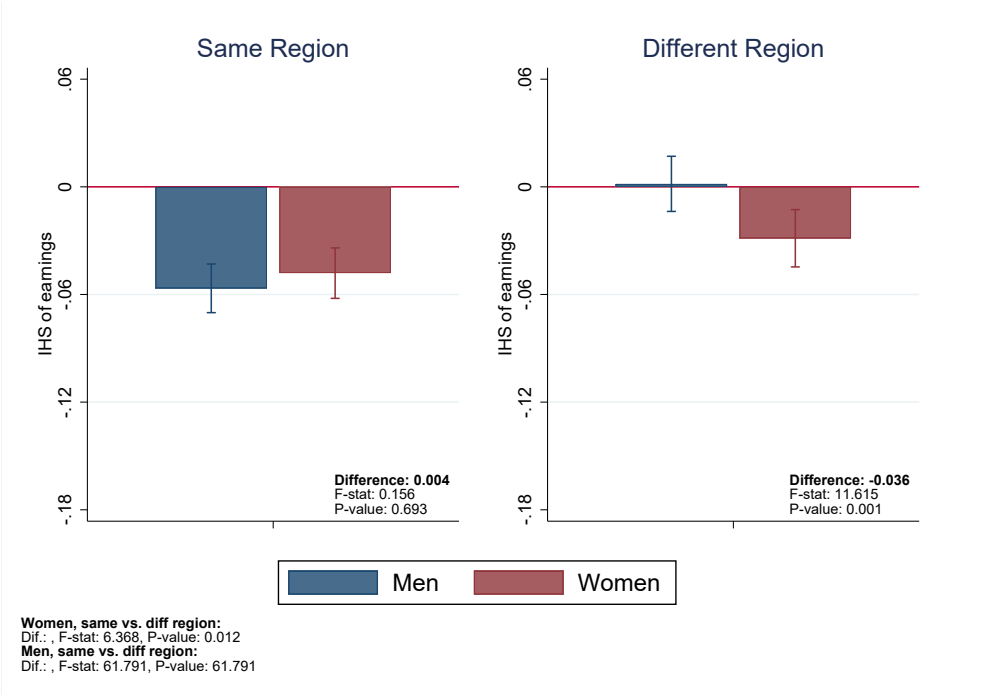


(b) Non-screening related hosital visits



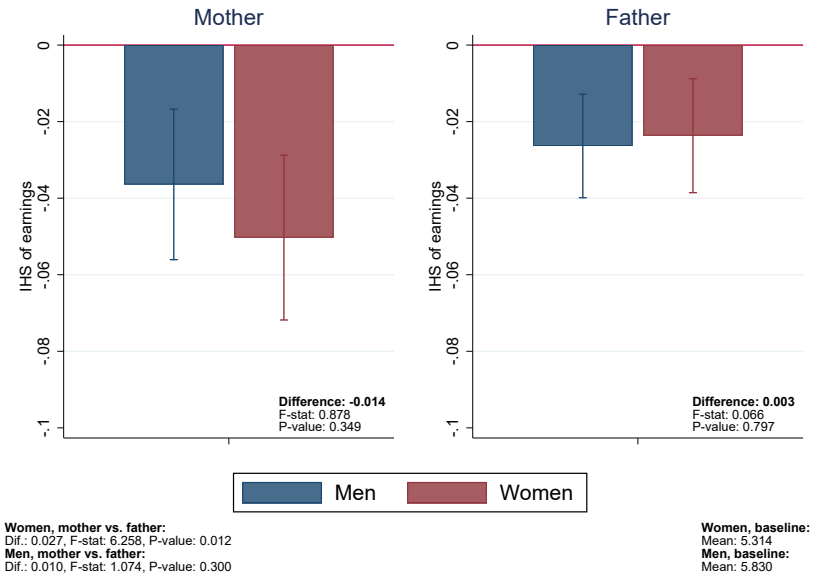
Notes: This figure plots the estimated coefficients from Equation 4 for men's and women's hospital visits, divided by screening and non-screening diagnoses. Hospital visits include both in- and outpatient visits at non-psychiatric hospital wards, these data are available from 1994-2018, leaving a balanced panel of 115,906 women and 127,770 men. Half of the individuals are treated, and the other half are matched controls. Effects are within 5 years after the first parental death. 95%-confidence interval indicated.

Figure A.13: Matched control: Heterogeneity in treatment effect on earnings by home region



Notes: This figure plots the estimated coefficients from Equation 3 for men's and women's earnings, but where we split the sample depending on whether or not the children live in the same region as their deceased parent. There are 5 regions in Denmark. IHS of earnings refers to the inverse hyperbolic sine transformation of earnings inflated to 2020 levels and includes earnings from both employment and self-employment. The sample consists of all unexpected, first parental deaths from 1983 to 2014 and their matched controls for children aged 25-50 in the year of first parental death and with two known parents. See Table A.2 for details on the sample. Effects are within 5 years after the first parental death. 95%-confidence interval indicated.

Figure A.14: Alternatively specification: Earnings, mothers' vs. fathers' deaths



Notes: This figure plots the estimated coefficients from Equation 4 for men's and women's earnings. IHS of earnings refers to the inverse hyperbolic sine transformation of earnings inflated to 2020 levels and includes earnings from both employment and self-employment. To construct an alternative control group, we follow Fadlon and Nielsen (2021) and use individuals who are treated 6 years later as controls for those treated in any given year, leaving a balanced panel of 99,340 women and 114,727 men in the treatment group and 96,684 women and 108,607 men in the control group. Effects are within 5 years after the first parental death. 95%-confidence interval indicated.