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Abstract

We use high-quality administrative data from Austria to credibly identify the causal effect of parental death on daughters' fertility. To account for the endogeneity of parental death, we exploit the timing of deaths in a difference-in-differences research design. Parental death has no statistically significant effect on daughters' fertility, even in situations where the loss of informal childcare should be particularly pronounced. The absence of a fertility effect is strengthened by an extensive series of robustness checks and results on complementary outcomes, including labor market participation, place of residence, and mental health. Our findings suggest that women do not make significant adjustments to important life decisions after the loss of a parent.

JEL Classification: J13, J10, J20, I10

Keywords: Parental death, fertility, difference-in-differences

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1 Introduction

Almost all adults experience the death of their parents in their lifetime. One in four women in Austria has lost at least one parent before the age of 45, making it a common experience (see Figure A.1 in the Appendix). With a rising maternal age at birth, this number is expected to increase for future generations. During the same life stage, many individuals start planning a family, a decision that has profound implications for those involved.

In this study, we analyze the effect of parental death on adult children's fertility. The loss of a parent could affect fertility through different channels, with the expected effect being ambiguous ex-ante. Parental death might increase the cost of having children through a loss of informal childcare, which could reduce fertility. Deteriorating mental health due to bereavement and the loss of intergenerational income transfers from parents to children may have a similar effect. The loss of a parent could also increase fertility by easing the potential responsibility for elderly care and by increasing children's incomes through inheritance (Okun and Stecklov, 2021). However, it is also reasonable to expect that parental death does not change fertility decisions. If the benefits of having children significantly outweigh the costs, changes in costs may be negligible. This may be especially true in the long run, as the benefits of having children are large at older ages (e.g., Margolis and Myrskylä, 2011). In general, fertility may be insensitive to changes in external factors, as it is such a deeply personal decision.

We provide robust evidence that parental death does not have a statistically significant effect on daughters' fertility, utilizing a credible causal identification strategy. Estimating effects until five years after the first death of a parent, we do not find a change in either the overall probability of giving birth or in the probability of having a first, second, or third birth separately. Even in situations where the loss of informal childcare should be particularly pronounced, we find no effects. There is no statistically significant effect when the mother dies, a woman has no siblings, or lives in an area with a low supply of formal childcare. The absence of heterogeneity by the age of the daughter, the deceased parent, and the surviving parent further confirms the robustness of the zero effect. The result is independent of the choice of control variables and is robust to alternative definitions of the control group. Results on complementary outcomes further substantiate our main findings. One would expect changes in fertility to be reflected in changes in labor market outcomes. Consistent with the zero results on fertility, we find that parental death does not impact women's labor market participation. Moreover, there is no change in the daughters' place of residence, which could be affected by caregiving responsibilities for the surviving parent. Although we find a short-term deterioration of mental health, this does not seem to translate into changes in major life decisions, of which fertility is arguably one of the most important.

We utilize comprehensive administrative data from Austria and link daughters with their parents. The *Austrian Social Security Database* (Zweimüller et al., 2009) covers all private sector employees and includes information on live births and death years, which we use to define our main outcome and treatment variable. Additionally, it provides detailed information on socioeconomic characteristics, labor market histories, and earnings for both daughters and their parents. We link this with detailed health record data from the *Upper Austrian Health Insurance Fund*, which provides us with information on outpatient visits, prescribed medication, and hospital visits.

To identify the causal effect of parental death on daughters' fertility, we implement the quasi-experimental method developed by Fadlon and Nielsen (2019, 2021). This method constructs a counterfactual for daughters who experience their first parental death during reproductive age by pairing those who lose a parent in a given year with daughters who do so exactly a fixed number of years later. The estimation sample, therefore, only includes daughters who all experience the death of a parent. This results in greater similarity in observable and unobservable characteristics as well as expectations about their parent's demise between daughters in the treatment and control group. Under the parallel trends assumption, we can estimate the causal treatment effect in a difference-in-differences framework. To assess the plausibility of the parallel trends assumption, we estimate a dynamic difference-in-differences model to determine whether there already are statistically significant trends before the treatment. As a robustness check, we construct an alternative control group from the large potential pool of daughters who do not lose a parent during reproductive age through nearest-neighbor matching.

Evidence on the impact of parental death on adult children's fertility is rather limited, and existing studies are primarily correlational, providing mixed results.[1,2] While some studies find an increase in fertility (Beaujouan and Solaz, 2023; Rackin and Gibson-Davis, 2022), others find a decrease (Del Boca, 2002; Jensen and Zhang, 2023; Okun and Stecklov, 2021). Some find no impact or mixed results (Dahlberg, 2020; Kertzer et al., 2009). Most studies are based on survey data, often with small sample sizes, or cannot establish a causal effect of parental death on adult children's fertility. For the US, Rackin and Gibson-Davis (2022) find that maternal death is associated with a higher likelihood of first birth. For France, Beaujouan and Solaz (2023) show that a maternal death during childhood is associated with higher completed fertility of women. For Italy, Del Boca (2002) shows that women with living parents are likelier to have children. In contrast, Kertzer et al. (2009) find no association between parental death and the transition to first

[1]There additionally exists a strain of the literature that looks at fertility responses to increases in mortality caused by natural disasters, wars, or other crises to investigate the macro-level relationship between mortality and fertility (see e.g., Boberg-Fazlic et al., 2021; Caldwell, 2004; Nandi et al., 2018; Nobles et al., 2015; Rodgers et al., 2005). These studies find that aggregate fertility goes up after an increase in aggregate mortality.

[2]Some studies analyze the relationship between orphanhood and early childbearing (e.g., Bozzoli, 2016; Kidman and Anglewicz, 2014; Reneflot, 2011).

and second birth.[3]

The studies by Okun and Stecklov (2021), Dahlberg (2020), and Jensen and Zhang (2023) are most closely related to our work. They either use administrative data sources and/or employ a causal identification strategy.[4] Okun and Stecklov (2021) is based on census and administrative data from Israel. Using individual fixed effects, the authors find that parental death is associated with a reduction in the five-year birth probability by around five percentage points. The effects are larger when the parents live in the same locality as their children and if already existing grandchildren are under six years old. Dahlberg (2020) uses data from the Swedish population register and applies survival analysis to show that a parental death during reproductive age affects the probability of a first birth predominantly in the short run. While it increases for younger individuals, there is generally a negative effect for those older than 23. Parental death is also associated with a higher likelihood of being childless at age 45. Jensen and Zhang (2023) utilize administrative data from Denmark and nearest-neighbor matching combined with difference-in-differences to analyze the effect of parental death on adult children's employment and earnings. In their mechanism analysis, they additionally show the impact of parental death on the total number of children and find a slight reduction for both men and women within five years following death.

We contribute to the existing literature in four ways. First, we add additional evidence utilizing a credible identification strategy to estimate the causal effect of parental death on daughters' fertility. Previous studies have mainly used non-causal methods like simple linear regression with control variables (Beaujouan and Solaz, 2023), survival analysis (Dahlberg, 2020; Kertzer et al., 2009) or individual fixed effects regressions (Del Boca, 2002; Okun and Stecklov, 2021; Rackin and Gibson-Davis, 2022). Since the fertility trajectories of children with and without deceased parents tend to be different (see Figure 1), and other papers remain silent about these differences, their results are potentially biased. As we use women who experience parental death a few years apart as controls in a difference-in-differences setting, we are confident that our comparison involves women who are on similar fertility trends and have similar expectations about the death of their parents before the actual event. A recent exception from the use of non-causal empirical strategies is Jensen and Zhang (2023) which uses nearest-neighbor matching combined with difference-in-differences. Their main focus, however, is on labor market outcomes. We add by analyzing different fertility margins, providing effect heterogeneity and a detailed discussion of pre-trends.

[3] Utilizing one wave of US survey data, an undergraduate thesis suggests that parental death has a statistically insignificant effect on fertility (Chen, 2020).

[4] Persson and Rossin-Slater (2018) observe that women who experience the death of a relative during pregnancy are more likely to have additional children than mothers who experience the death shortly after giving birth. However, the authors consider a different research question. They do not focus on the effect of parental death per se but are mainly interested in the effects of in utero stress on child outcomes.

Second, we provide suggestive evidence against the informal childcare channel, which is one of the main mechanisms through which parental death could theoretically reduce fertility. Previous studies have emphasized the importance of informal childcare by grandparents (e.g., Okun and Stecklov, 2021; Rutigliano, 2023). Nevertheless, we demonstrate that the death of a parent has no effect on daughters' fertility, even in situations where the loss of informal childcare should be particularly pronounced.

Third, we strengthen the plausibility of our main result by analyzing the effect of parental death on relevant complementary outcomes. For this, we combine several high-quality administrative data sources, allowing us to consider additional outcomes that are related to fertility and/or the loss of a parent. These include labor supply, the place of residence, and mental health. Previous studies tend to use survey data (e.g., Beaujouan and Solaz, 2023; Rackin and Gibson-Davis, 2022) or administrative data for fertility only (e.g., Dahlberg, 2020; Okun and Stecklov, 2021).[5] We also focus on the fertility effect of parental death while additionally providing results on other important life decisions of women within a coherent empirical analysis.

Fourth, we add evidence for Austria to the literature, which has previously shown mixed results in countries with diverse institutional settings. We show that parental death does not affect fertility in a Central European country with rather conservative gender norms and limited availability of nurseries.

Our work also complements the literature on the effects of parental health events on other outcomes. Studies in this area have documented the health consequences of parental death (e.g., Appel et al., 2016; Böckerman et al., 2023; Fadlon and Nielsen, 2019; Frimmel et al., forthcoming; Glaser and Pruckner, 2023; Jensen and Zhang, 2023; Kristiansen, 2021; Leopold and Lechner, 2015; Marks et al., 2007) as well as the effects on labor market outcomes (e.g., Frimmel et al., forthcoming; Jensen and Zhang, 2023; Marcos, 2023; Norén, 2020; Rellstab et al., 2020). Negative effects of parental death have also been established for other outcomes, especially when parental death is experienced during childhood. These include worse educational outcomes (e.g., Kailaheimo-Lönnqvist and Erola, 2020; Kailaheimo-Lönnqvist and Kotimäki, 2020; Kristiansen, 2021), an increase in the likelihood to commit violent crimes (e.g., Berg et al., 2019; Wilcox et al., 2010) and higher mortality (e.g., Hiyoshi et al., 2021; Rostila and Saarela, 2011). Furthermore, our results also speak to the literature on the role of parental support in determining fertility (e.g., Aassve et al., 2012; Aparicio-Fenoll and Vidal-Fernandez, 2015; Battistin et al., 2014; Eibich and Siedler, 2020; Ilciukas, 2023; Pessin et al., 2022; Pink, 2018; Rutigliano, 2020, 2023).[6]

[5] Jensen and Zhang (2023) use administrative data sources on various outcomes variables including fertility, labor market measures and healthcare use, however their main focus is on the labor market effect of parental death.

[6] It has also been shown that daughters' fertility decision impact their parents (e.g., Frimmel, Halla, Schmidpeter and Winter-Ebmer, 2022) and that parental divorce increases the likelihood of teenage

The remainder of this paper is structured as follows. Section 2 describes the institutional setting and data sources used to construct our analysis sample. Section 3 outlines the empirical strategy and discusses the main identifying assumptions. Section 4 presents the results. Finally, Section 5 concludes the paper.

2 Institutional Setting and Data

2.1 Institutional Setting

Fertility: Fertility has fallen below the replacement rate in many developed countries (Okun and Stecklov, 2021). Austria is no exception to this trend. Panel (a) of Figure A.2 in the Appendix shows the total fertility rate for Austria since 1950. From 2.5 live births per woman in the mid-1960s, the rate has declined steadily ever since, leveling off at around 1.5. A similar pattern can be observed for other European countries and the United States, although in the latter, the fertility rate peaked earlier and has stabilized at a higher level.

At the same time, the average age at birth in Austria has increased (see Panel (b) of Figure A.2 in the Appendix). The average age at birth was 27.1 years in 1990 and 31.3 years in 2020. The increase in age at first birth is even greater. While women were, on average, 25 years old when they gave birth to their first child in 1990, they were on average 30 years in 2020. Subsequent generations of parents, therefore, become older as their children enter reproductive age. Meanwhile, the likelihood of losing a parent increases with the age of the children (see Figure A.1 in the Appendix). This implies that the experience of losing a parent during this important stage in an individual's life has become more common.

Social Security and Health Insurance: Austria's *Bismarckian* social security system provides universal access to high-quality healthcare as well as pension, disability and unemployment benefits for the entire population. Health insurance is offered by various funds, with more than 99 percent of the population covered. The association with one particular health insurance fund is determined by an individual's place of residence and occupation. The *Austrian Health Insurance Fund* (*Österreichische Gesundheitskasse*)[7] is the largest insurer, covering almost 75 percent of all private sector workers. Health insurance for children is provided through their parents, and spouses can be co-insured with their partners (Ahammer et al., 2021).

The mandatory health insurance covers all forms of healthcare, including visits to general practitioners (GPs) and specialists in the outpatient sector, inpatient care, and

pregnancy (e.g., Frimmel, Halla and Winter-Ebmer, 2022).

[7]This entity was preceded by nine provincial health insurance funds (*Gebietskrankenkassen.*). They were merged in 2020 to form the *Austrian Health Insurance Fund.*

prescription drugs, with little or no copayments.[8] The system is primarily financed by wage-based social security contributions from employers and employees. While expenditures in the outpatient sector (including medication) are mainly financed through these contributions, hospitalization costs are also partly covered by tax revenues. GPs provide primary care and can refer patients to specialists and/or a hospital if necessary. As the first point of access to the healthcare system, GPs traditionally function as gatekeepers (Ahammer et al., 2021; Glaser and Pruckner, 2023).

The social security system also provides paid maternity and parental leave. Paid maternity leave is compulsory and extends to eight weeks before and eight weeks after the birth of a child. The duration of subsequent parental leave depends on whether both parents take time off (35 weeks) or only one parent uses parental leave (28 weeks) (Ahammer et al., 2023).

Gender Norms and Formal Childcare: Regarding attitudes toward family and gender roles, Austria is a rather conservative country. Panel (c) of Figure A.2 supports this claim by showing data on gender norms from the *International Social Survey Programme*. One in five Austrians strongly agrees with the statement that preschool children suffer when their mother works. In a more egalitarian country like Denmark, the corresponding proportion is only 5 percent. Similarly, 18 percent of Austrians believe that family life as a whole suffers through a working mother. This share is significantly lower in other countries, ranging from 2 percent in Norway to 12 percent in France. These more conservative views are also reflected in a higher share of part-time work among Austrian women (33.1 percent) than among Danish women (23.1 percent) (Ahammer et al., 2023).

Compared to other EU countries, enrollment in formal childcare in Austria is relatively low, especially for children under three. According to data from Eurostat, about 23 percent of Austrian children under the age of three spend at least one hour per week in formal childcare. This is well below the EU-27 average of 35.8 percent. Apart from the rather conservative gender norms, this is also due to the limited availability of nurseries (especially in rural areas) (Ahammer et al., 2023). The situation is different for children between the ages of three and six. In this age group, only 8.1 percent of children in Austria are not in formal childcare, which is lower than the EU-27 average of 11.6 percent (see Eurostat). Nevertheless, grandparents are important providers of informal childcare in Austria. As Panel (d) of Figure A.2 shows, 60 percent of Austrians think that family members should be the primary providers of childcare. This share is well below 50 percent in other European countries, like France, Norway, Denmark, and Sweden.

[8] Copayments include a prescription charge for medical drugs of €6.85 (2020) and a small deductible for hospital stays.

2.2 Data Sources and Sample Construction

Data Sources: To estimate the effect of parental death on the subsequent fertility of daughters, we need to link three generations. The first generation is the parents, the second generation is their daughters, and the third generation is the potential grandchildren.[9] We use comprehensive administrative data from Austria that allow us to link the generations. Information on live births of daughters and death years of parents can be obtained from the *Austrian Social Security Database (ASSD)*, which is available for all Austrian private sector employees and their dependents from 1972 to 2018 (Zweimüller et al., 2009). These data also provide information on socio-economic characteristics, labor market histories, and earnings.

The social security data can be linked to detailed health record data from the *Upper Austrian Health Insurance Fund (UAHIF)*, which covers more than one million private-sector employees and their dependents in Upper Austria[10] from 2005 to 2018. We can use detailed information on outpatient visits, prescribed medications, and hospital visits. In addition, the data provide information on the place of residence on the postal code level, which allows us to estimate effect heterogeneity depending on the driving distance between parents and their daughters. Based on the place of residence, we can also add information on the availability of formal childcare facilities, which has been obtained from Statistics Austria.[11]

Sample Construction: Using the data described above, we link all daughters included in the social security data to both of their parents and construct an unbalanced panel at the daughter-year level. The information on the parents includes their year of death, which allows us to identify the death of the first parent.[12] Since we are conditioning on the death of the first parent, we start with a sample of daughters whose parents are alive at the beginning of the sample period. We then assign to the treatment group those daughters who experienced their first parental death between the ages of 25 and 44. We use only this group of daughters for our main empirical specification, which is described in detail in Section 3. In a robustness check, we use daughters who do not experience parental death as controls to demonstrate that our results are independent of the control group.

[9]Due to data limitations, we are not able to analyze the impact of the death of parents-in-law on women's fertility. While, in principle, this analysis would strengthen the findings of our study, it has been shown that maternal grandparents tend to be more important than paternal grandparents for informal childcare (see e.g., Thomese and Liefbroer, 2013).

[10]Upper Austria is one of the nine federal provinces of Austria. Its more than 1.5 million inhabitants account for 16.73 percent of Austria's population (see Statistics Austria).

[11]Information on the availability of formal childcare facilities is available at the municipality level. Since we observe the daughters' place of residence on the postal code level, we convert the municipal information to the postal code level using the weights provided by Pennerstorfer (2021) before matching it to the administrative data.

[12]Note that our sample includes all death causes. The data only records the year of death but not the cause.

To obtain the set of observations relevant to answering the research question, we restrict the sample in the following ways: Since we are studying fertility, we restrict the sample to include only observations during reproductive age. Thus, we only include periods when daughters are between 20 and 44 years old. In addition, we only include parental deaths that occurred between 2000 and 2018.

2.3 Outcome Variables

Fertility: The main outcome examined in this study is a binary indicator that is one if a daughter had a live birth in a given year and zero otherwise. The binary indicator is based on the ASSD data, which records specific spells for live births (*Anzeige einer Lebendgeburt*).[13] Since we also observe children's birth years, we can define distinct indicators for first, second, and higher-order births. By adding up the binary indicator over time for each daughter, we can also examine the cumulative number of children as an outcome. To show that our results are not sensitive to the choice of the birth indicator based on the ASSD data, we use healthcare data to construct additional outcome variables that are expected to correlate with childbirth. First, we consider a binary indicator that is set to one if there has been a hospital diagnosis related to ICD-10 chapter XV (Pregnancy, childbirth, and the puerperium) diagnoses *O80* to *O84* (Delivery). Second, we use the amount of outpatient expenditures for gynecologists, as this measure should positively correlate with being pregnant and giving birth.

Additional Outcomes: This study also considers the effect of parental death on daughters' mental health, labor market outcomes, and living conditions. We use a binary indicator for antidepressant prescriptions (*N06A*) to measure changes in mental health. The labor market outcomes are based on the ASSD data. We selected the number of days in employment, the number of days in unemployment, and the yearly wage[14] as relevant outcome variables. Lastly, we also use the information on daughters' and parents' places of residence on the postal code level to study potential changes in living conditions. We compute the driving time between the postal code centroid of the daughter and the postal code centroid of the survivor to see whether the surviving parent lives closer to their daughter after the death. We also consider the daughters' probability of moving by looking at changes in the postal code between two subsequent years. Note that the mental health and location outcomes are based on the health record data, which is only available for Upper Austria.Therefore, we only analyze these outcomes for daughters residing in Upper

[13]It is important to note that the social security records only live births, and therefore, no information is available on abortions, miscarriages, and stillbirths.

[14]Note that annual wages are top-coded due to the maximum assessment basis for social security contributions.

Austria. Our main fertility outcome and the labor market outcomes are studied for all women in Austria.

3 Empirical Strategy

3.1 Main Estimation Strategy

The objective of this study is to estimate the causal effect of a parent's death on their daughters' fertility. Finding an appropriate control group to evaluate this effect is challenging. A naïve approach would be to simply compare the fertility of women who have lost a parent with those who have not. This approach is problematic because women who experience the death of their parents may have very different characteristics and fertility trajectories than women with living parents. Figure 1 demonstrates that this is indeed the case. Panel (a) displays the raw age trends of the annual birth probability of women with a parent dying and women without a parental death in our data. Compared to the latter group, women in the former group tend to give birth at a younger age (20 to 25 years) and are less likely to give birth in their late twenties and thirties. These differential fertility trajectories are also evident in Panel (b), where we display the probability of giving birth from five years before the parents' death to four years after. To obtain the necessary data structure for women without parental death, a placebo death year is randomly assigned.[15] Women who lose a parent are more likely to give birth in the years before parental death and less likely to do so afterward when compared with women who do not lose a parent. Additionally, the fertility trends between the two groups are completely different. Daughters with and without a parental death also differ substantially in other key characteristics. The comparison in Table A.1 shows that affected daughters are about 2.4 years older than unaffected daughters, earn about 1.4 thousand Euros more per year, and have higher hospital, outpatient, and medication expenditures.

To obtain an appropriate counterfactual for women who experience the death of a parent and to estimate the causal effect of parental death on daughters' subsequent fertility, we implement the quasi-experimental method suggested by Fadlon and Nielsen (2019, 2021). By using this method, we restrict the sample to daughters of childbearing age exposed to their first parental death[16] and then utilize the exact timing of the death in a dynamic difference-in-differences framework. Figure 2 illustrates the construction of the treatment and control group. Daughters who are affected by parental death in year

[15]The process of assigning placebo death years involves three steps: First, all daughters born in the same year are kept. Second, the empirical distribution of death years among treated daughters is obtained. Finally, death years are randomly assigned to daughters without parental death, ensuring that the distribution of placebo death years matches the distribution of actual death years. This process is performed for all birth years of treated daughters in the sample.

[16]Restricting the sample this way ensures that (i) daughters are in a life stage in which fertility decisions are made and (ii) their parents die at an age at which they would take on the role of an active grandparent.

d are paired with control daughters who experience the death exactly τ years later. In our baseline specification, we set $\tau = 5$, meaning that daughters in the control group are assigned a placebo death in year d, while their parent actually passes away in $d + 5$. This matching approach is repeated for each death year d for which valid control daughters are found within our sample period. To increase the power of the analysis, the same women may be in both the treatment and control group, but a woman never serves as a control for herself. By constructing our sample in this way, we can estimate treatment effects up to four years after parental death, as control daughters are themselves treated in $d + 5$.

After constructing the treatment and control group, we estimate the following model:

$$\begin{aligned} y_{itd} = \alpha + \beta Death_{id} &+ \sum_{l \neq -2;\, l=-5}^{4} \gamma_l \times \mathbf{1}(t - d = l) \\ &+ \sum_{l \neq -2;\, l=-5}^{4} \delta_l \times \mathbf{1}(t - d = l) \times Death_{id} + \boldsymbol{\theta}\mathbf{X}_{itd} + \epsilon_{itd} \end{aligned} \tag{1}$$

where y_{itd} is an indicator variable equal to one if daughter i has a live birth in calendar year t and experiences the (placebo) parental death in year d. d is the actual death year of the parent for daughters in the treatment group and five years before the actual parental death year for daughters in the control group. $Death_{id}$ is a binary indicator equal to one if the parent of daughter i dies in d and equal to zero if the parent of daughter i dies in d + 5. $1(\cdot)$ are a series of indicator variables for the individual years relative to the (placebo) parental death. δ_l denotes the treatment effects of interest relative to the reference period of two years before the (placebo) death. $\mathbf{X}_{itd}$ is a set of control variables that include fixed effects for daughters' age, the year of the (placebo) parental death, and the parental age at (placebo) death. In particular, these control variables account for the age trend in the outcome variable, which is important when analyzing fertility. The results in Table A.3 show that the inclusion of different control variables does not change the results. Since the death of a parent may affect multiple daughters of one family, we cluster the standard errors at the family level.

To identify the causal effect, it is necessary to assume that the fertility behavior of daughters in the treatment and the control group would have evolved in parallel in the absence of the death of their parent. Throughout this study, we use the dynamic DiD specification to inspect for non-differential pre-trends. A potential threat to the parallel trend assumption is a fertility adjustment in anticipation of parental death (e.g., due to a preceding deterioration in the parents' health). Constructing a control group as outlined by Fadlon and Nielsen (2019, 2021) has the main advantage that all daughters in the sample are ultimately affected by the death of a parent but are so only a few years apart. This implies that daughters' expectations about their parents' future health, for example, should be similar in both the treatment and control group. Generally, this method of constructing the control group results in greater similarity in expectations about the death of a parent between treated and control daughters compared to other event study methods that use daughters who do not lose a parent as a control group. In all our estimations, we set the baseline period to two years before the (placebo) parental death. This enables us to estimate treatment effects for the year prior to the parental death and examine the existence of anticipation effects. Lastly, we demonstrate the robustness of our findings by altering the value of τ. The identification strategy imposes a trade-off between the similarity in expectations of the experimental groups and the possible length of the analysis period. A smaller τ implies greater similarity in daughters' expectations, as well as observable and unobservable characteristics in both experimental groups. A larger τ allows us to analyze a longer time period, but daughters in the treatment and control group tend to become less comparable. The results for different levels of τ are presented in Panel (a) of Figure 13.

Table 1 presents descriptive statistics comparing the characteristics of daughters in the treatment and control group before the (placebo) death of the parent. Overall, the treatment and control group are well-balanced in terms of important characteristics, such as labor market and health outcomes. The daughters are approximately 30 years old at the time of the (placebo) parental death, work 247 days per year, and earn about 21 thousand Euros per year. Before the death of their parent, women in the treatment group had 0.015 more children compared to the control women, which is quantitatively insignificant. Treated women spend approximately 20 Euros more on medication per year. There are no statistically significant differences between the two groups for all other health-related variables. The similarity between both groups implies that the previously explained method successfully provides a suitable control group. This claim is further supported by Figure 3, which shows histograms of relevant variables by treatment status. The year of the (placebo) parental death is distributed similarly between treated and control women (Panel (a)), as are the distributions of the birth years of daughters (Panel (c)), the age of the daughters (Panel (d)), the birth years of the dying parents (Panel (e)) and the age of the parent at (placebo) death (Panel (f)). As implied by setting $\tau = 5$, the distribution of the years of the actual parental deaths is shifted by five years for the control group (Panel (b)).

3.2 Robustness Check: Propensity Score Matching

In our main empirical specification, we only analyze women who all lose a parent during the sample period. An alternative control group would be women without a parental death who are otherwise similar in key observable characteristics. For this, we use the large potential pool of daughters who do not lose a parent during reproductive age to construct a control group by applying nearest-neighbor matching. We perform the matching separately for each birth year of daughters to ensure that the age distribution is the same for treated and matched daughters. The propensity score is computed using several demographic and labor market characteristics of daughters[17] and their parents[18]. All variables are measured when the daughters are 24 years old.[19] Each treated daughter is matched with five nearest neighbors.[20] These nearest neighbors are then assigned the year of the parental death of the respective treated daughter to construct a placebo event time. Panels (a) and (b) of Figure A.3 show that there are only small differences between the propensity scores of treated and matched daughters, indicating very close matches. Table A.2 and Figure A.4 in the Appendix show descriptive statistics and histograms for the matched sample. All key observable characteristics are closely balanced for daughters in the treatment and the control group.

We then use this alternative sample to estimate the effect of parental death in the following dynamic difference-in-differences design:

$$\begin{aligned} y_{it} = \alpha + \beta Death_i + \sum_{l \neq -2;\, l=-5}^{4} \gamma_l \times \mathbf{1}(t-d=l) \\ + \sum_{l \neq -2;\, l=-5}^{4} \delta_l \times \mathbf{1}(t-d=l) \times Death_i + \boldsymbol{\theta}\mathbf{X}_{it} + \epsilon_{it} \end{aligned} \tag{2}$$

where y_{it} is an indicator variable equal to one if daughter i has a live birth in calendar year t. $Death_i$ is equal to one if the parent of daughter i loses a parent and equal to zero if both parents are alive during reproductive age. $1(\cdot)$ are indicator variables representing the individual years relative to the (placebo) parental death. δ_l denotes the treatment effects of interest relative to the reference period two years before the (placebo) parental death. $\mathbf{X}_{it}$ includes the same set of control variables as in Equation 1. Standard errors are again clustered on the family level.

In Figure 4 we compare the balancing of key observable characteristics[21] between the treatment and control group for the different ways of constructing the control group: our main empirical specification based on Fadlon and Nielsen (2019, 2021), the matched sample of daughters who do not experience a parental death and the naïve control group

[17]The variables include the first and last year of observation, a binary indicator for whether the daughter has siblings, the number of children, the yearly wage, and binary indicators for blue- and white-collar employment.

[18]The variables are: the birth year, the yearly wage and binary indicators for blue-collar employment, white-collar employment and retirement. All variables are included both for the mother and the father.

[19]Note that the earliest possible age when daughters in our treated group can experience a parental death is 25.

[20]Each daughter in the control pool can be matched with multiple treated daughters. However, as Panel (c) of Figure A.3 shows, around 40 percent of daughters in the control pool are used only once as a match.

[21]See Table 1 for the list of observable characteristics.

of all daughters without a parental death. The results show that the naïve control group has the worst balancing, while our preferred method performs similarly to the matched sample of women without parental death. However, using daughters who experience death exactly τ years in the future as controls has an additional advantage. This approach is more likely to balance both observable and unobservable characteristics, given that all daughters are treated only a few years apart.

4 Results

This section presents the findings of our study. First, we show in Section 4.1 how the death of the parents affects the fertility of their daughters. Section 4.2 discusses the absence of effect heterogeneity. We provide results on the effect of parental death on complementary outcomes in Section 4.3. Finally, Section 4.4 presents the results of several robustness checks.

4.1 Effect of Parental Death On Daughters' Fertility

Birth Probability: In a first step, we provide a descriptive analysis of the birth probability[22] in the treatment and control group of our main estimation sample. Figure 5 presents the unadjusted annual birth probability as a function of age in Panel (a) and as a function of the time relative to the parental death in Panel (b) (where zero represents the year of the parental death). The birth probability, including 95 percent confidence intervals, is plotted separately for women who experience the death of a parent (treatment) and for women who are affected $\tau = 5$ years later (control). The confidence intervals clearly overlap, indicating no statistically significant differences in fertility patterns between the two groups across the age distribution and no fertility differences before and after the parental death. This is the first indication that daughters do not adjust their fertility in response to the death of a parent.

Expanding on this descriptive analysis, we estimate the dynamic causal effect of parental death on daughters' annual birth probability following Equation (1). The results are presented in Figure 6, which shows the point estimates for five years before and after the parental death together with 95 percent confidence intervals. The graph displays the treatment effects in relation to the two years preceding the death on the vertical axis. The horizontal axis marks the years relative to the death of the first parent. Again, zero indicates the year of death. There is no statistically significant effect over the entire five-year post-death period. Additionally, all estimated coefficients in the time period before the parental death are also statistically insignificant. This suggests that the parallel trend assumption is not violated. Overall, the difference-in-differences analysis confirms

[22]See Section 2.3 for the definition of the birth probability.

the descriptive result that women do not change their fertility behavior in response to the death of a parent.

Other Fertility Margins: As previously demonstrated, there is no evidence to suggest that the death of a parent affects a woman's probability of giving birth. However, the birth indicator used so far does not account for the number of children a woman already has, making it difficult to measure changes in birth probability by birth order. The death of a parent could potentially affect the extensive and intensive margin of fertility differently. Given that the decision to have any children at all is possibly one of the most important in an individual's life, the death of a parent might only have a small influence on this decision. However, it may have a larger effect on the decision to have additional children, which can be more dependent on external factors such as the availability of informal childcare by grandparents. To investigate whether the death of a parent has a varying impact on the extensive and intensive margins of fertility, Figure 7 displays the estimated coefficients for the effect of parental death on the probability of having a first, second, or third birth in Panels (a) to (c), as well as the cumulative number of children in Panel (d) and the probability of being childless in Panel (e). There is no statistically significant effect of parental death on the probability of having a first, second, or third child. The cumulative number of children decreases by a maximum of 0.0086 children (1.58 percent) in the year of the parental death. The coefficients in all other post-periods are not statistically significant. The probability of being childless increases by 0.59 to 0.86 percentage points (0.92 to 1.34 percent) in the years following the death of a parent. Although the treatment effects are statistically significant, they lack quantitative significance. Overall, these additional results suggest that parental death does not have a quantitatively significant impact on any of the fertility margins.

4.2 Effect Heterogeneity

We have shown that, on average, the death of a parent does not affect women's probability of giving birth. In this section, we show that this is the case even in settings where the loss of informal childcare should be particularly prominent. For this, we evaluate the effects separately based on the age of the daughter and parents at the time of death, whether the mother or the father dies, the presence of siblings, and the availability of formal childcare facilities. Additionally, this analysis strengthens the validity of our null result by presenting the robustness in different subgroups.

Age at Death: To assess the heterogeneity with respect to the age of the daughter at the time of the parental death, we estimate Equation (1) separately for ages at death ranging from 25 to 39 years. We then compute the average pre- and post-period coefficients and plot the results in Figure 8. Panel (a) shows that none of the average post-treatment coefficients are statistically significant. This suggests that women do not change their fertility behavior in response to parental death, regardless of their age. Panel (b) presents the corresponding average coefficients in the pre-period to verify the validity of the parallel trend assumption. We do not observe any statistically significant fertility effects in either age group in the years preceding the parental death. We perform a similar exercise by partitioning the sample based on the age at death of the parent (Figure A.5 in the Appendix) and by the age of the surviving parent at the time of the death of the other parent (Figure A.6 in the Appendix). None of the estimated average post-period coefficients are statistically significant.

Gender of Deceased Parent: We also estimate the dynamic effect of parental death on daughters' probability of giving birth by distinguishing between the gender of the deceased parent. Panel (a) of Figure 9 presents the results, which indicate that the estimated fertility effects are not statistically significant for either subgroup. This means that the effect of parental death on fertility does not depend on whether the mother or the father dies.

Siblings: Panel (b) of Figure 9 shows the treatment effects separately for women with and without siblings. Parental death does not have a statistically significant effect on the birth probability in any period after death for either group.

Formal Childcare: We also estimate the effect of parental death on daughters' birth probability separately for daughters located in areas with above and below median availability of formal childcare.[23] The results are presented in Panel (c) of Figure 9. As the place of residence is only available for women who are insured in Upper Austria, this analysis is limited to this subgroup. We find no statistically significant effects of parental death on the fertility of women with both high and low access to formal childcare.

Summary: Overall, the results of the heterogeneity analysis support our main finding that the death of a parent does not affect daughters' fertility. No significant treatment effects were found in any of the subgroups studied, which strengthens the validity of our null result. There are no effects observed for different age groups, whether the mother or father dies, whether a daughter has siblings or not, and whether formal childcare is readily available or not. Furthermore, these results offer suggestive evidence against one of the main ways in which parental death could theoretically decrease fertility, which is the absence of informal childcare provided by parents after their death. We do not observe a

[23] To measure the supply of formal childcare, we use the number of groups in formal childcare facilities (nurseries, kindergarten, and after-school care centers) per 1,000 inhabitants of a postal code area. The raw data were obtained from Statistics Austria and are available between 2005 and 2019. We convert the data from municipal to postal code level using the weights provided by Pennerstorfer (2021).

decrease in fertility in situations where the loss of informal childcare should be particularly pronounced: First, informal childcare is predominantly provided by grandmothers (see e.g., Hank and Buber, 2009), so one would expect to find a negative fertility effect when the mother dies. However, we do not find a fertility response in this case (see Panel (a) of Figure 9). Second, siblings could support mothers with the provision of childcare, so the birth probability would decline if one does not have siblings. However, the fertility of women without siblings is not affected, as shown in Panel (b) of Figure 9. Third, women living in areas with low availability of formal childcare facilities might find it difficult to compensate for the loss of informal childcare after parental death. However, we do not find a decline in fertility among women living in such areas (see Panel (c) of Figure 9).

4.3 Effect on Complementary Outcomes

So far, we have shown that parental death does not have a statistically significant effect on daughters' birth probability. This is the case even in situations in which the loss of informal childcare should be particularly prominent. To set the absence of a fertility effect into a broader context, we now analyze complementary outcomes that should be related to fertility and/or the death of a parent. These include labor market outcomes, place of residence, and mental health.

Several studies have shown a negative relationship between childbirth and women's labor supply (e.g., Angelov et al., 2016; Kleven et al., 2019). One would, therefore, expect that an increase in fertility would translate into a decrease in labor supply and vice versa. Our comprehensive administrative data provide the opportunity to study the impact of a parent's death on various labor market outcomes. Figure 10 displays the results of this analysis. Panel (a) shows the effect on yearly days of employment, Panel (b) shows yearly days of unemployment, and Panel (c) shows yearly wages. The results show that the death of a parent does not have a statistically significant effect on any of these outcomes. Given the existing evidence on the relationship between childbearing and women's labor supply, our finding of no fertility response to parental death is consistent with the absence of a labor market response.

Apart from labor supply, the place of residence is another essential decision. In addition, the death of a parent might induce changes in the daughters' place of residence to care for the surviving parent. To analyze this, we use the health record data, which also provide information on individuals' place of residence at the postal code level for women and surviving parents insured in Upper Austria. Panel (a) of Figure 11 illustrates the impact of parental death on the driving duration[24] between the home location of daughters

[24]To calculate the driving duration, we retrieve the postal codes of the daughter and surviving parent. We then use the R-package `opencage` to geocode the postal codes and obtain their coordinates. Finally, we utilize the R-package `osrm` to determine the driving duration in minutes between the postal code centroids.

and surviving parents in minutes. Panel (b) displays the probability that the distance is greater than ten minutes.[25] Panel (c) shows the probability of a daughter moving[26] in a given year. There are no statistically significant effects on distance measures and women's probability of moving. This suggests that parental death does not trigger a change in the place of residence (and labor supply), which makes the absence of an effect on an even more important life decision such as fertility plausible.

The lack of an impact on fertility and other life decisions could also be because the death of the parents has no disruptive effect on women. We investigate this claim by estimating the dynamic treatment effect of parental death on the use of antidepressants for the subsample of women insured in Upper Austria. The results are presented in Figure 12. The probability of receiving an antidepressant prescription increases sharply by 1.9 percentage points in the year of the parent's death. The effect is statistically significant at the five percent level. The increase in antidepressant use is around 36 percent compared to the average pre-period prescription probability of 5.3 percent. The effect remains similar in the year after the death and then disappears in the following years. This finding indicates that the death of a parent leads to a short-term deterioration in mental health, implying that parental death indeed affects daughters. However, this does not translate into changes in important life decisions, such as labor supply, place of residence, and ultimately fertility.

4.4 Robustness

The main result is robust to (i) the inclusion of different control variables, (ii) the choice of different levels of τ in the construction of the control group in our main estimation method, (iii) using an alternative control group of matched daughters who did not experience the death of a parent, and (iv) the use of other outcomes that correlate with childbirth. We discuss each robustness check in detail below.

Firstly, we estimate the dynamic treatment effect of parental death on the birth probability using various sets of control variables. The results are presented in Table A.3 in the Appendix. Column (1) shows the results without any additional control variables, while Columns (2) to (4) gradually include the main control variables. In Column (5), we control for the age at death of both mothers and fathers separately instead of only controlling for the age at death of the deceased parent. We add a calendar year fixed effect in Column (6) and control flexibly for daughters' age at death in Column (7). As a last alternative specification in Column (8), we estimate a standard two-way fixed effects

[25] Note that the driving duration can only be computed if both the daughter and the surviving parent reside in Upper Austria. The maximum driving duration is limited due to the small size of Upper Austria. This is evident from the average driving duration of only 14.80 minutes between daughters and surviving parents in the period preceding the parental death.

[26] A change in the postal code between two subsequent years is classified as a move. However, changes in home location within the same postal code area cannot be identified.

model[27], controlling for daughters' age. Regardless of the chosen control variables, we do not find any statistically significant treatment effect in the post-death period in any of the eight specifications.

Secondly, we assess the sensitivity of our results to the choice of τ in constructing the control group. The selection of τ represents a trade-off between the number of follow-up periods that can be analyzed and the similarity between the treatment and control group. A larger τ allows for more years in the post-treatment period, while a smaller τ results in greater similarity between the groups. In our baseline specification, we set $\tau = 5$. Panel (a) of Figure 13 demonstrates the robustness of our main finding to different levels of τ. The estimated coefficients remain similar in magnitude and statistical significance when τ is set to three, five, or seven. Furthermore, the null effect persists even up to six years after the parental death.

Thirdly, we demonstrate that our results are robust to the choice of the control group. So far, we have only considered daughters who all experience the death of a parent during reproductive age and have exploited the different timing of these deaths to construct the control group. An alternative control group would be those daughters who do not lose a parent during their reproductive age. To ensure the comparability between these two groups of daughters, we match them on key observable characteristics as outlined in Section 3. We then estimate the dynamic treatment effect using Equation (2). The estimates for the effect of parental death on the birth probability are shown in Panel (b) of Figure 13. Again, we find no statistically significant effects over the entire period after the parental death. The insignificant coefficients in the pre-period also indicate that the parallel trend assumption is not violated. A similar pattern is observed for the other fertility margins (see Figure A.7 in the Appendix).

Finally, the results are also robust to the use of alternative variables that indicate whether a birth occurs in a given year. Table A.4 in the Appendix displays the effect of parental death on the probability of a hospital birth diagnosis and spending on gynecological visits for the subset of women insured in Upper Austria. There are no statistically significant effects for either outcome variable in the years following parental death.

5 Discussion and Conclusions

Based on high-quality administrative data from Austria, we implement a credible identification strategy exploiting the timing of deaths in a difference-in-differences design to estimate the causal effect of parental death on daughters' fertility. We demonstrate that parental death has no statistically significant effect on daughters' probability of giving birth. This result is consistent along several dimensions. First, it is robust to the inclu-

[27] As one daughter can appear both in the treated and the control group, the usual individual fixed effect is defined as an individual-times-treated fixed effect.

sion of different control variables and the use of alternative control groups. Second, it holds for several subgroups and situations where the loss of informal childcare should be particularly pronounced. We find no statistically significant effect even when the mother dies, a woman has no siblings or lives in an area with a low supply of formal childcare. Lastly, the analysis of complementary outcomes strengthens our main findings. In line with the absence of a fertility effect, the death does not trigger reactions in the labor supply. Nor does it change daughters' decisions about where to live, which could be affected by caregiving responsibilities for the surviving parent. However, women are not completely unaffected by the loss of a parent. We do find a short-term deterioration of mental health, but this does not translate into changes in major life decisions, of which fertility is arguably one of the most important. Our results are consistent with the idea that fertility is insensitive to changes in external factors. Also, changes in the costs of having children associated with the loss of a parent may be negligible if the benefits significantly exceed the costs.

Other studies investigating the impact of parental death on children's fertility have produced mixed results. Apart from differences in institutional settings among the studied countries, we believe the differences in implemented empirical strategies to be particularly important. Existing studies are mainly correlational, using survival analysis, individual fixed effects, or simple linear regressions, comparing children who do and do not lose a parent. However, fertility trends before death differ between these two groups in our setting (see Figure 1). We implement a credible causal identification strategy based on the timing of deaths, using only daughters who ultimately lose a parent during reproductive age. Compared to the majority of existing studies, our approach is designed to result in greater similarity in terms of (un)observed characteristics and expectations about parental death between treatment and control groups.[28] On top of this, we provide a series of robustness checks, including alternative control groups. We are confident that our results have an advantage in terms of credibility compared to previous studies.

Fertility rates have declined below replacement rates in many developed economies (Panel (a) of Figure A.2). This development is likely to pose significant financial challenges for welfare systems in the future. Hence, designing appropriate policy measures to promote fertility is vital from an economic perspective. Our findings demonstrate that the decision to have children is not affected by the death of parents. Therefore, focusing on intergenerational family aspects as a policymaker may not be the best choice to promote fertility. Other policies, like expanding childcare or financial incentives, might be more appropriate in this context (Hart et al., 2023).

[28] Our results are also comparable to the findings of Jensen and Zhang (2023), who also use a causal identification strategy. They find that parental death reduces the total number of children by 0.003 to 0.012, which is in line with our finding that the cumulative number of children decreases by a quantitatively insignificant amount of no more than 0.0086 after the death of a parent.

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6 Figures (to be placed in the article)

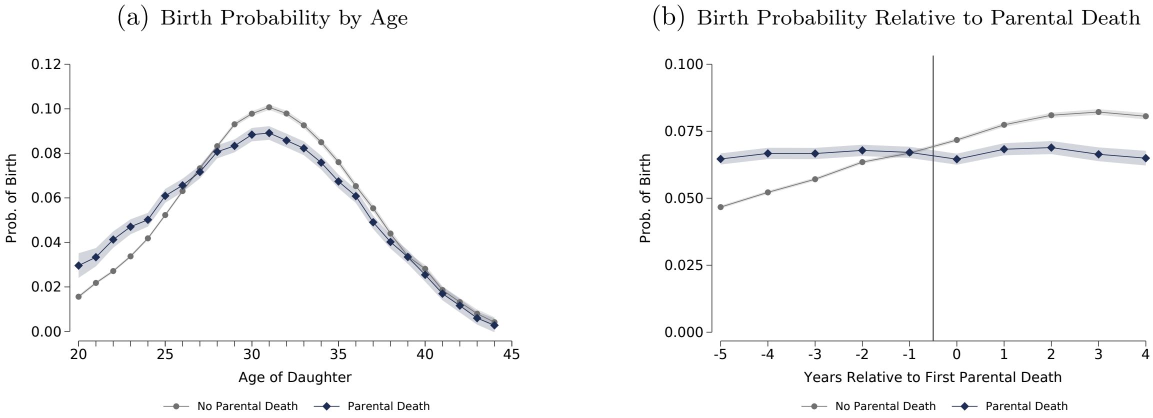

Figure 1 — Comparing Fertility Trends of Daughters With and Without Parental Death

Note — This figure compares the annual probability of giving birth between daughters who experience the first death of a parent during reproductive age (treatment) and those who do not (control). Panel (a) plots the birth probability as a function of age. Panel (b) compares the average birth probability for five years before and four years after the parental death. Zero indicates the year of the parental death. To obtain the necessary data structure for the control group in this figure, we randomly assign death years of parents to daughters who do not lose a parent. Section 3 explains the procedure in more detail. The shaded areas represent 95 percent confidence intervals.

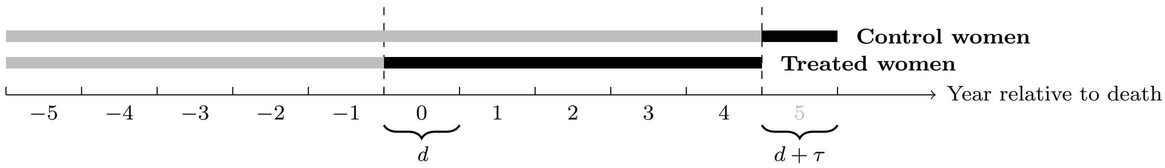

Figure 2 — Illustration of the Empirical Strategy

Note — This figure illustrates the construction of the treatment and control group for our main empirical specification, which is described in detail in Section 3. It is a slightly modified version of Figure 1 in Glaser and Pruckner (2023).

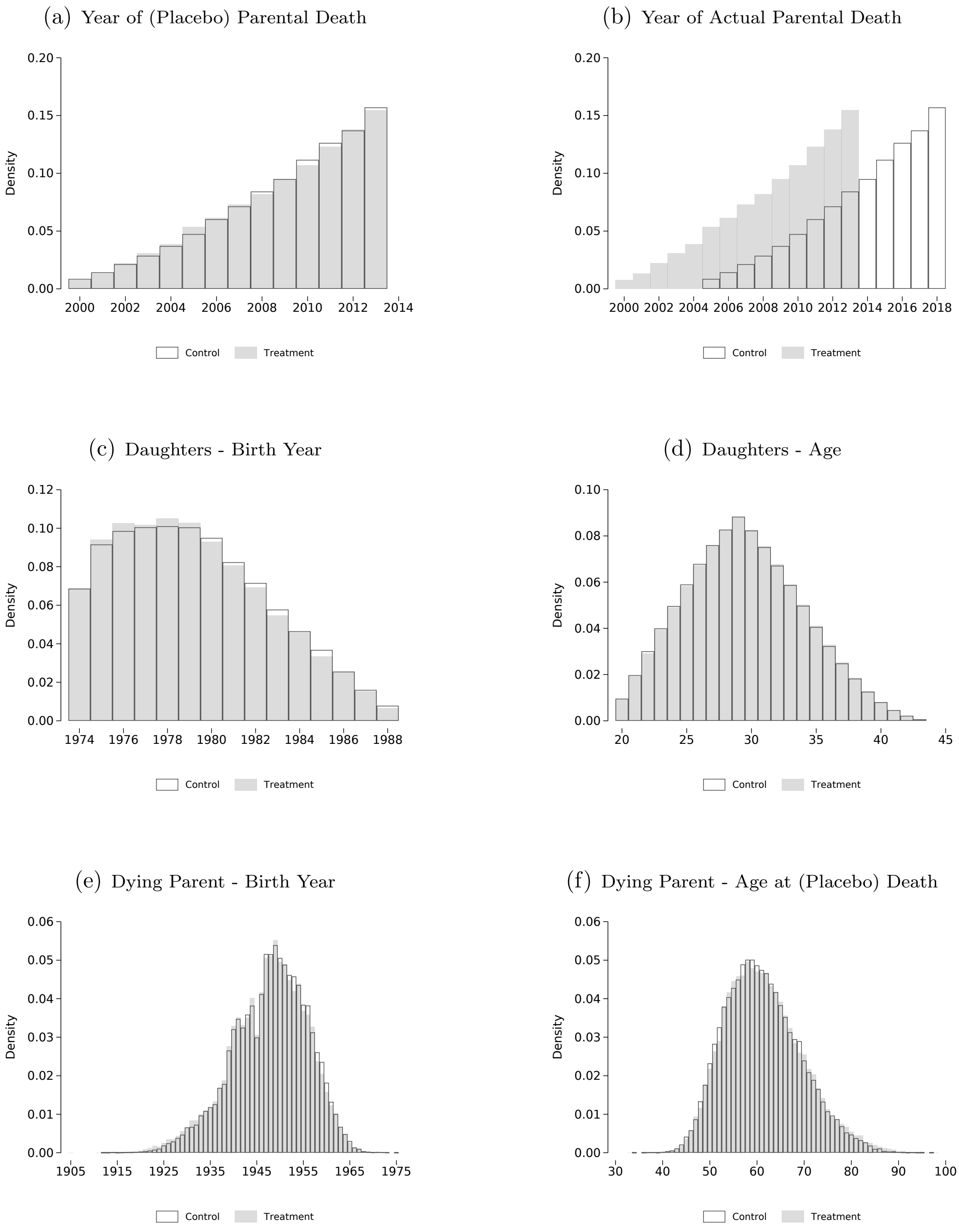

Figure 3 — Histograms

Note — This figure shows histograms of selected discrete variables for daughters in our main estimation sample. The distributions are plotted separately for daughters in the treatment group (gray bars) and the control group (hollow black bars). Detailed information on the construction of the treatment and control group is provided in Section 3. Panel (a) shows the distribution of the year of the first parental death for treated daughters and the assigned placebo death year for control daughters. The actual years of the first parental death are shown in Panel (b). The distributions of the daughters' birth years and age are shown in Panels (c) and (d). Panels (e) and (f) show the distribution of the birth years and the age at the (placebo) death of the dying parent.

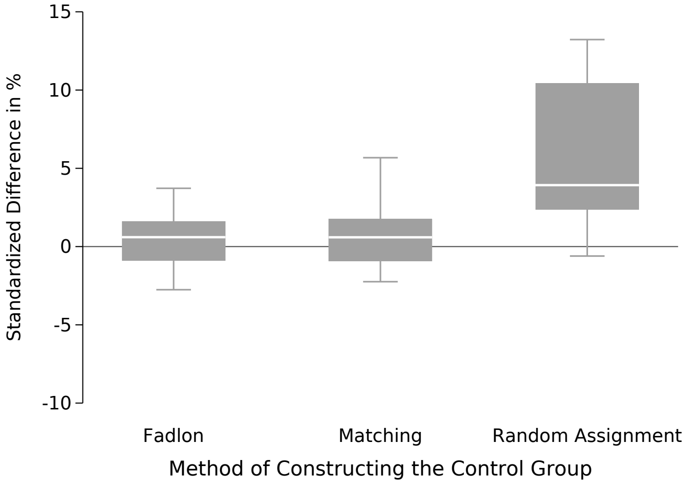

Figure 4 — Comparing Variable Balancing Across Methods

Note — This figure compares the balancing of different observable characteristics for three possible methods of constructing the control group. These methods are described in detail in Section 3. The box plots illustrate the distribution of the standardized differences (measured in percent) reported in Column (5) of Tables 1, A.2 and A.1. The standardized difference is defined as the difference in means between the treated and control group for a given variable ($\mu_{treated} - \mu_{control}$) divided by the average standard deviation$\left(\sqrt{0.5 \cdot (\sigma^2_{treated} + \sigma^2_{control})}\right)$ and multiplied by 100. All box plots exclude values that lie 1.5 times the interquartile range below the first quartile or 1.5 times the interquartile range above the third quartile (i.e., outside values).

(a) Birth Probability by Age (b) Birth Probability Relative to Parental Death

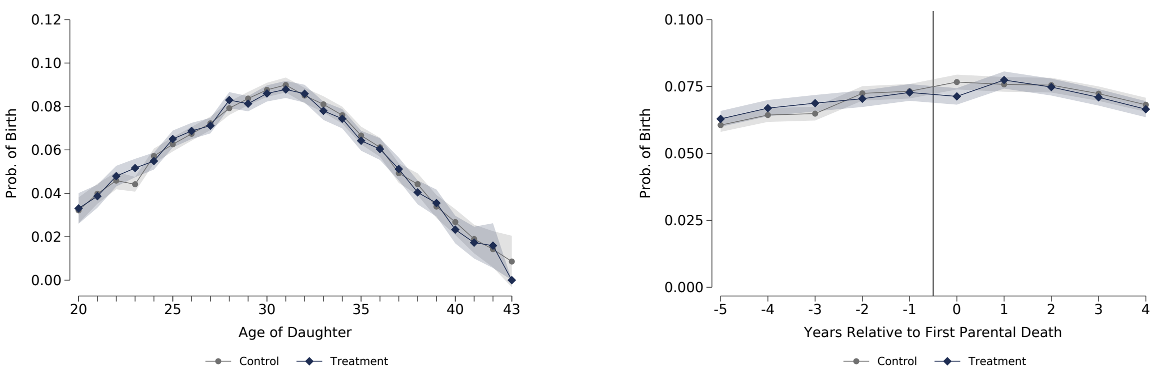

Figure 5 — Comparing Fertility Trends of Daughters in the Treatment and Control Group

Note — This figure shows the annual probability of giving birth for daughters included in our main estimation sample. The birth probabilities are plotted separately for daughters in the treatment group (blue diamonds) and the control group (gray dots). The definition of the treatment and control group is described in Section 3. Panel (a) plots the birth probability as a function of age. Panel (b) compares the average birth probability for five years before and four years after the parental death. Zero indicates the year of the parental death. The shaded areas represent 95 percent confidence intervals.

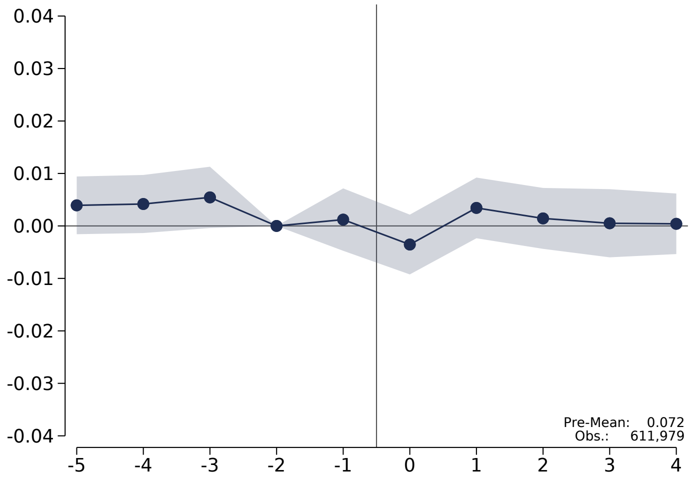

Figure 6 — Dynamic Effect of Parental Death on Daughters' Birth Probability

Note — The figure shows the estimated coefficients with 95 percent confidence intervals for the effect of parental death on daughters' birth probability. The estimates are based on Equation (1). The estimates can be interpreted as the percentage point change in the annual birth probability. Estimates are shown for five years before and five years (including the year of the parental death) after the parental death. Zero indicates the year of the parental death. The relative period -2 has been chosen as a reference period. The number of observations and the mean of the outcome variable for treated daughters in the reference period are reported in the bottom right corner. Standard errors are clustered on the family level.

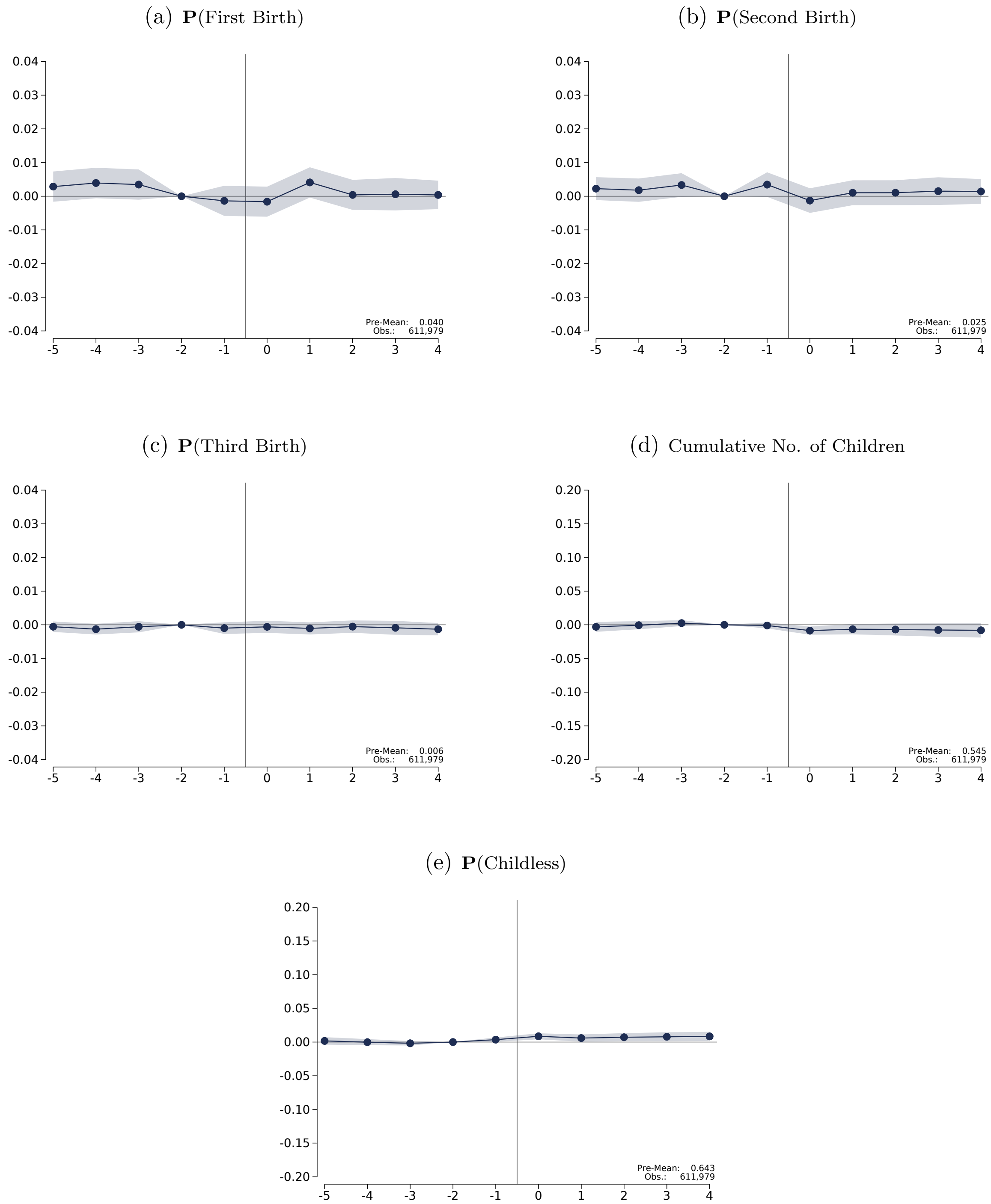

Figure 7 — Dynamic Effect of Parental Death on Daughters' Other Fertility Margins

Note — The figure shows the estimated coefficients with 95 percent confidence intervals for the effect of parental death on different fertility margins. All estimates are based on Equation (1). For the results in Panels (a), (b), and (c), we defined three separate binary indicators that are one if a daughter had a first, second, or third birth in a given year. The estimates in these panels can thus be interpreted as the percentage point change in the annual probability of having a first, second, or third birth, respectively. Panel (d) shows the change in the cumulative number of children. Panel (d) uses a binary indicator that is one if the cumulative number of children is zero in a given year and zero otherwise as an outcome. The estimates can thus be interpreted as the percentage point change in the probability of being childless in a given year. Estimates are shown for five years before and five years (including the year of the parental death) after the parental death. Zero indicates the year of the parental death. The relative period -2 has been chosen as a reference period. The number of observations and the mean of the outcome variable for treated daughters in the reference period are reported in the bottom right corner. Standard errors are clustered on the family level.

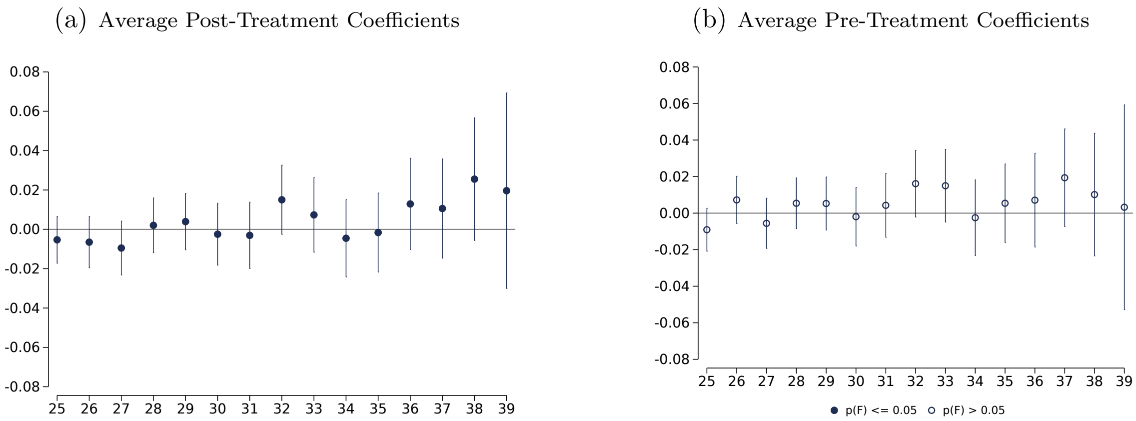

Figure 8 — Effect of Parental Death on Daughters' Birth Probability by Daughter's Age at (Placebo) Death

Note — The figure shows the estimated average coefficients with 95 percent confidence intervals for the effect of parental death on daughters' birth probability by daughters' age at the (placebo) parental death. We estimate Equation (1) separately for each age at (placebo) death and then compute the arithmetic mean of coefficients. Panel (a) shows the average coefficients for the years after parental death (relative periods 0 to 4). Panel (b) shows the average coefficients for the years preceding the parental death (relative periods -5 to -1, excluding the baseline period -2), where hollow (full) circles indicate that the p-value of the F-test for the joint significance of all pre-treatment coefficients is above (below) 0.05. The estimates can be interpreted as the average percentage point change in the annual birth probability. The estimation sample includes five years before and five years (including the year of the parental death) after the parental death. The relative period -2 has been chosen as a reference period. Standard errors are clustered on the family level.

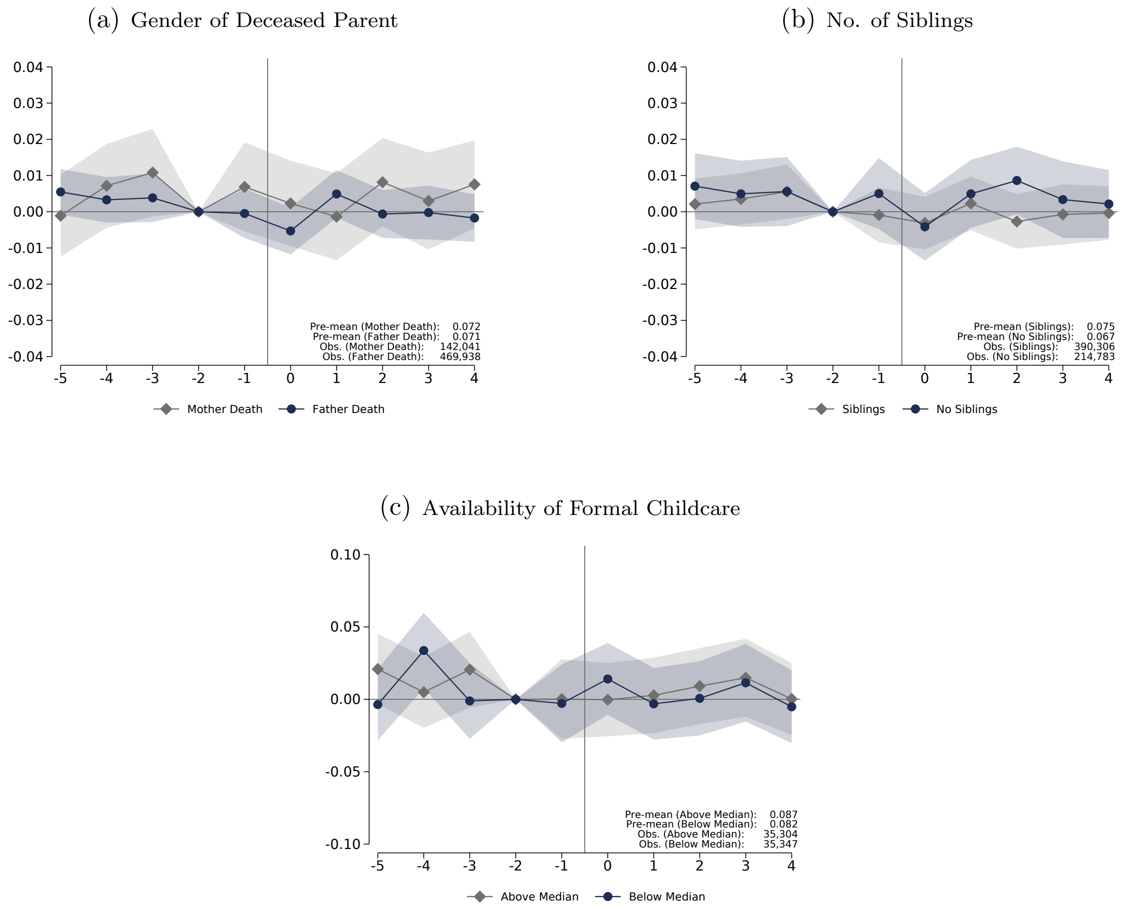

Figure 9 — Dynamic Effect of Parental Death on Daughters' Birth Probability by Intensity of the Loss of Informal Childcare

Note — The figure compares the estimated coefficients with 95 percent confidence intervals for the effect of parental death on daughters' birth probability for different subgroups with varying intensity of the loss of informal childcare. Estimates are based on Equation (1). Panel (a) shows the effects separately for daughters whose mothers die (gray diamonds) and for daughters whose fathers die (blue circles). Panel (b) differentiates between daughters with siblings (gray diamonds) and without siblings (blue circles). In Panel (c), we estimated the effects separately for daughters living in postal code areas with above-median (gray diamonds) and below-median (blue circles) availability of formal childcare. The estimates can be interpreted as the percentage point change in the annual birth probability. Estimates are shown for five years before and five years (including the year of the parental death) after the parental death. Zero indicates the year of the parental death. The relative period -2 has been chosen as a reference period. The number of observations and the mean of the outcome variable for treated daughters in the reference period are reported in the bottom right corner. Standard errors are clustered on the family level.

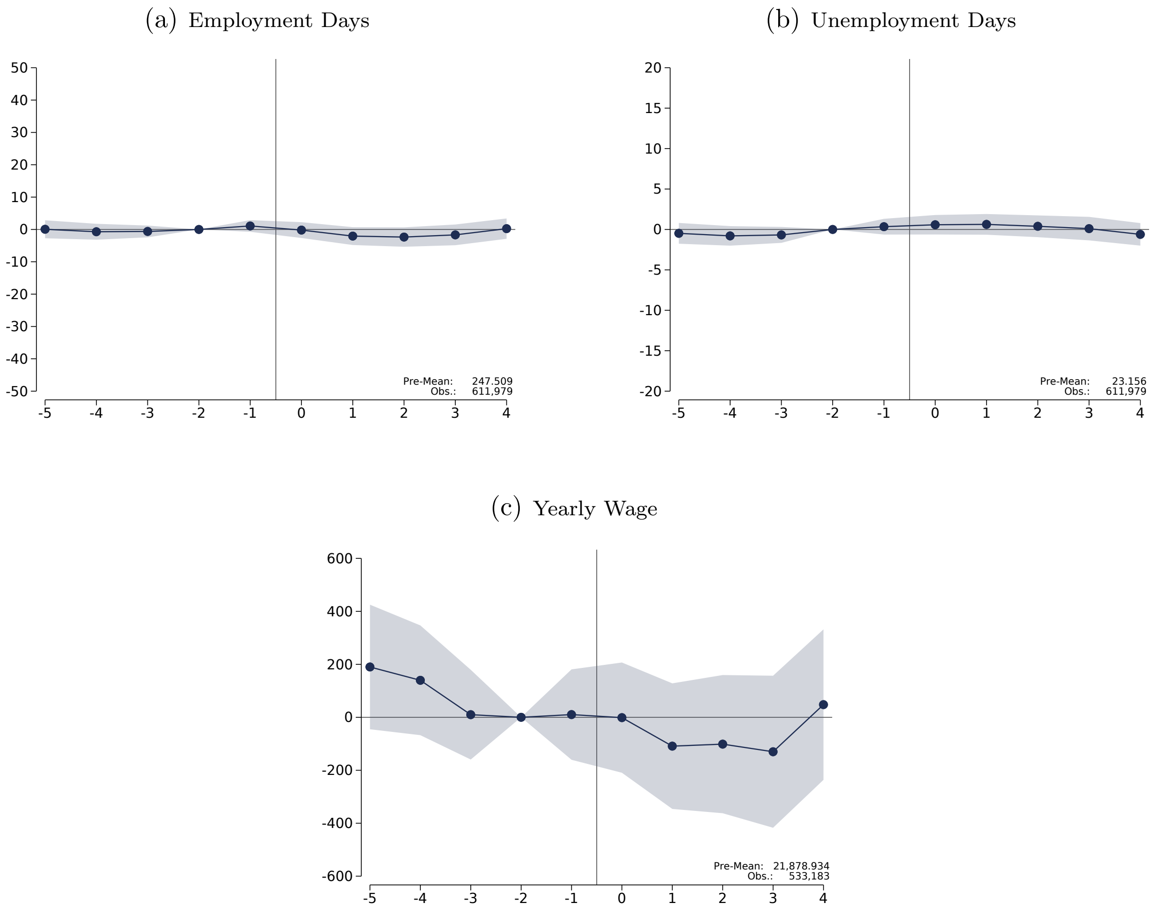

Figure 10 — Dynamic Effect of Parental Death on Daughters' Labor Market Outcomes

Note — The figure shows the estimated coefficients with 95 percent confidence intervals for the effect of parental death on selected labor market outcomes of daughters. The estimates are based on Equation (1). Panel (a) shows the effects on the annual number of employment days, and Panel (b) on the number of unemployment days. Panel (c) shows the impact on the yearly wage. The yearly wage is based on the social security contribution basis. Estimates are shown for five years before and five years (including the year of the parental death) after the parental death. Zero indicates the year of the parental death. The relative period -2 has been chosen as a reference period. The number of observations and the mean of the outcome variable for treated daughters in the reference period are reported in the bottom right corner. Standard errors are clustered on the family level.

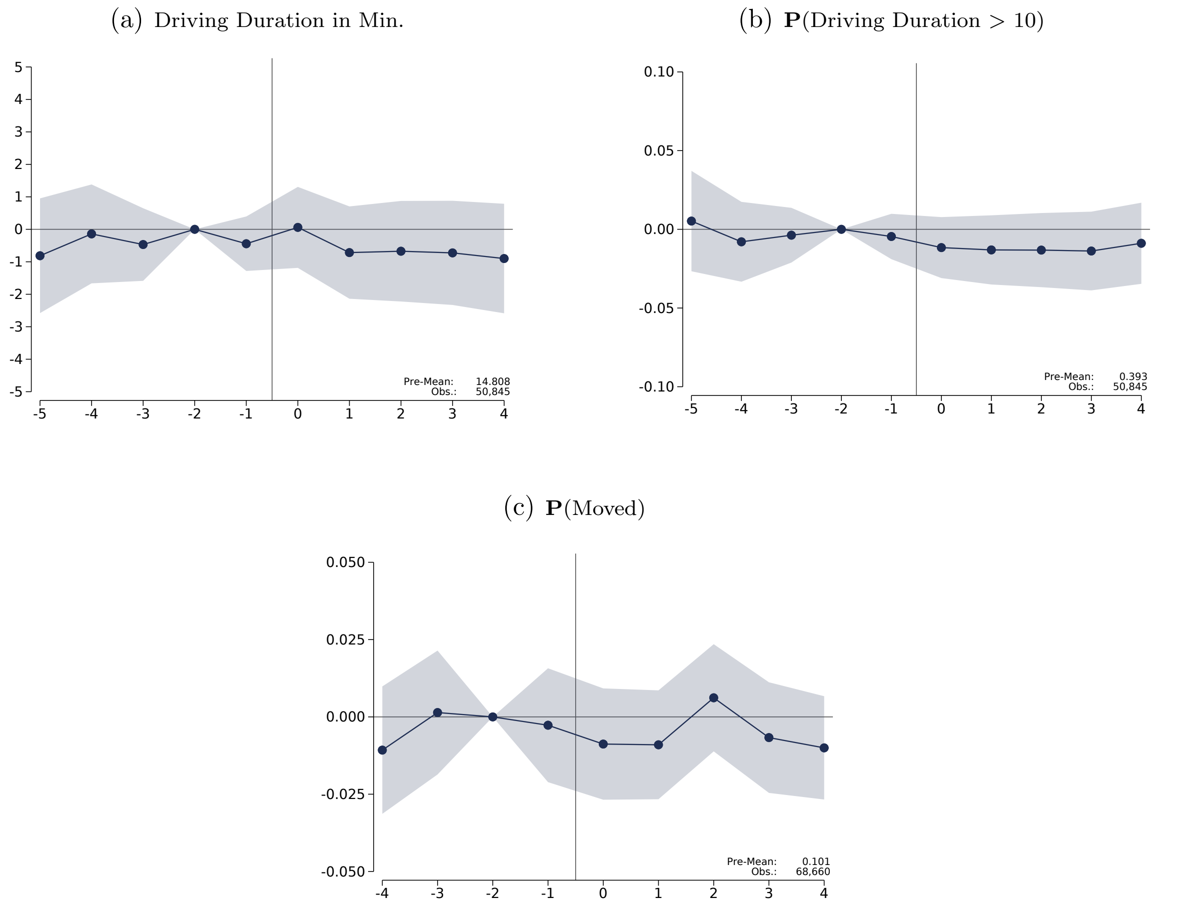

Figure 11 — Dynamic Effect of Parental Death on Distance Between Daughter and Survivor

Note — The figure shows the estimated coefficients with 95 percent confidence intervals for the effect of parental death on the geographical distance between daughters and surviving parents. The estimates are based on Equation (1). Panel (a) shows the effects on the average driving duration between daughters and parents in minutes, and Panel (b) shows the probability that this duration is above 10 minutes. For these outcome variables, we used information on daughters' and parents' place of residence on the postal code level. We first geocoded the postal codes with the help of the R-package `opencage` to obtain the coordinates of the respective postal code centroids. The driving duration between the postal code centroids has been computed using the R-package `osrm`. Panel (c) shows the effect on the probability that a daughter moves residence. The results are based on a binary indicator that is one if a daughter's postal code observed in year t is different from the one observed in $t-1$. Estimates are shown for five years before and five years (including the year of the parental death) after the parental death. Zero indicates the year of the parental death. The relative period -2 has been chosen as a reference period. The number of observations and the mean of the outcome variable for treated daughters in the reference period are reported in the bottom right corner. Standard errors are clustered on the family level.

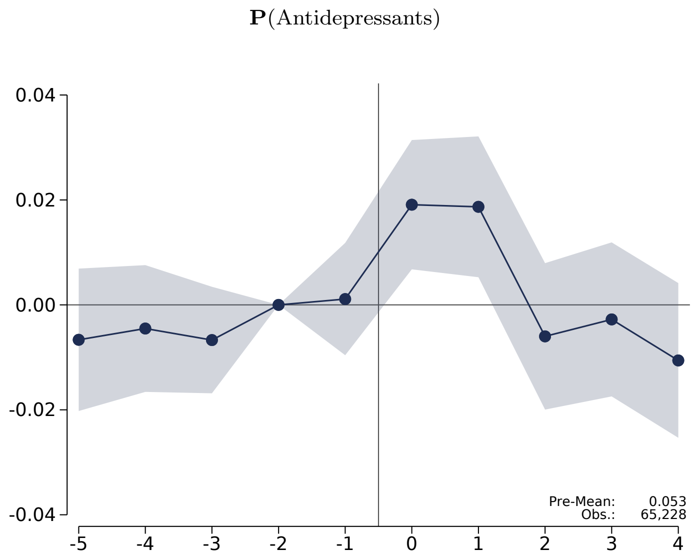

Figure 12 — Dynamic Effect of Parental Death on Daughters' Mental Health

Note — The figure shows the estimated coefficients with 95 percent confidence intervals for the effect of parental death on the prescription probability for antidepressants (ATC N06A) of daughters insured in Upper Austria. The estimates are based on Equation (1). Estimates are shown for five years before and five years (including the year of the parental death) after the parental death. Zero indicates the year of the parental death. The relative period -2 has been chosen as a reference period. The number of observations and the mean of the outcome variable for treated daughters in the reference period are reported in the bottom right corner. Standard errors are clustered on the family level.

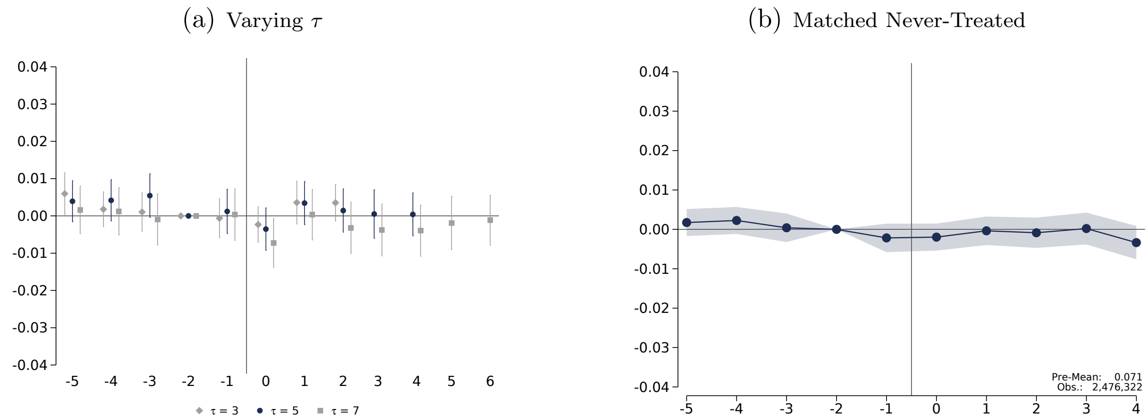

Figure 13 — Robustness: Alternative Control Groups

Note — The figure shows the estimated coefficients with 95 percent confidence intervals for the effect of parental death on daughters' birth probability. Panel (a) shows the estimates from Equation (1) for different specifications of τ in the construction of the control group. Panel (b) shows the estimates from Equation 2. In this specification, daughters who do not lose a parent are paired with daughters who do so based on nearest-neighbor matching (see Section 3 for details). All estimates can be interpreted as the percentage point change in the annual birth probability. Estimates are shown for five years before and up to seven years (including the year of the parental death) after the parental death in Panel (a) and for five years after the parental death in Panel (b). Zero indicates the year of the parental death. The relative period -2 has been chosen as a reference period. The number of observations and the mean of the outcome variable for treated daughters in the reference period are reported in the bottom right corner. Standard errors are clustered on the family level.

7 Tables (to be placed in the article)

Table 1 — Characteristics of Daughters in the Period Preceding the Parental Death

	(1) Ø Full	(2) Ø Treated	(3) Ø Control	(4) Diff.	(5) Stand. Diff. in %	(6) N
Demographic Characteristics						
Birth Year	1,979.220	1,979.166	1,979.260	−0.095***	−2.76	611,979
Age at (Placebo) Death	29.936	29.961	29.918	0.043***	1.21	611,979
Austrian Citizenship	0.979	0.980	0.978	0.002***	1.61	589,977
Actual GP Death	0.429	1.000	0.000	1.000***	0	611,979
Fertility Outcomes						
Num. of Children Before (Placebo) Death	0.621	0.629	0.614	0.015***	1.70	610,306
Birth Before (Placebo) Death	0.397	0.401	0.394	0.007***	1.36	610,306
Labor Market Outcomes						
Employment Days	247.090	246.334	247.656	−1.322**	−0.89	303,796
Blue Collar Employment Days	41.817	41.648	41.944	−0.296	−0.28	303,796
White Collar Employment Days	176.986	176.390	177.433	−1.042*	−0.62	303,796
Sick Leave Days	1.058	1.091	1.034	0.057*	0.72	251,991
Unemployment Days	23.760	23.986	23.592	0.394	0.60	303,796
Retirment Days	1.229	1.270	1.198	0.072	0.36	303,796
Days in Other Qualification	99.207	100.743	98.057	2.685***	1.76	303,796
Apprenticeship	0.368	0.375	0.363	0.012***	2.46	303,796
Yearly Wage (Thou.)	21.124	21.050	21.179	−0.129**	−0.98	261,715
Daily Wage	57.874	57.671	58.025	−0.354**	−0.98	261,715
Health Outcomes						
Hospital Days	0.962	0.929	0.989	−0.060	−1.35	31,884
LKF Turnover	450.599	436.601	461.406	−24.806	−1.44	31,884
Outpatient Expenditure	264.581	267.796	262.099	5.696	1.84	31,884
Medication Expenditure	84.698	96.244	75.784	20.459***	3.72	31,884
Prescription of Psycholeptics	0.017	0.017	0.017	0.000	0.28	32,029
Prescription of Antidepressants	0.053	0.055	0.051	0.003	1.54	32,029

Note — The table reports descriptive statistics for demographic, fertility, labor market, and health characteristics of daughters included in our main estimation sample. The definition of the treatment and control group is described in Section 3. The sample period comprises the five years preceding the (placebo) parental death. Note that health characteristics can only be observed for daughters insured in Upper Austria. Column (1) reports the mean for the full sample. The means for treated and control daughters are reported in Columns (2) and (3). Column (4) reports the difference in means between the treatment and control group. Column (5) reports the standardized difference in means. The standardized difference is defined as the difference in means between the treated and control group for a given variable ($\mu_{treated} - \mu_{control}$) divided by the average standard deviation $\left(\sqrt{0.5 \cdot (\sigma^2_{treated} + \sigma^2_{control})}\right)$ and multiplied by 100. The number of observations is given in Column (6). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Web Appendix

This Web Appendix provides additional material discussed in the unpublished manuscript "Life After Loss: The Causal Effect of Parental Death on Daughters' Fertility" by Felix Glaser and Rene Wiesinger.

A Additional Figures and Tables

A.1 Additional Figures

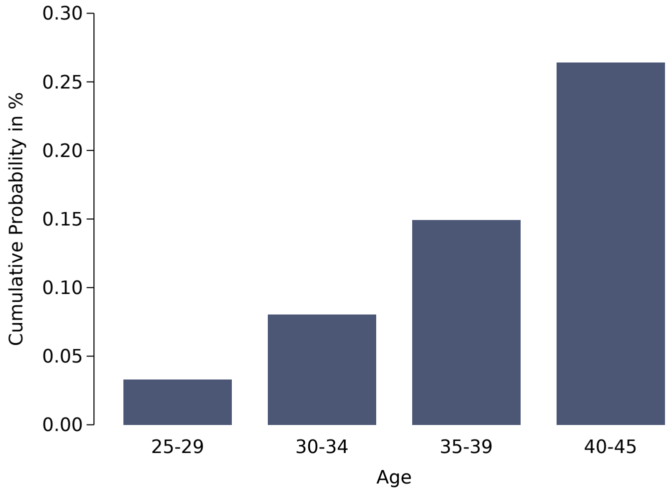

Figure A.1 — Cumulative Probability of Parental Death by Age

Note — This figure shows the cumulative probability that a woman in Austria experiences the death of a parent for four different age groups. The values are based on our own calculations, using the data described in Section 2.2. The probabilities depicted are conditional on a woman's parents being alive at the age of 24.

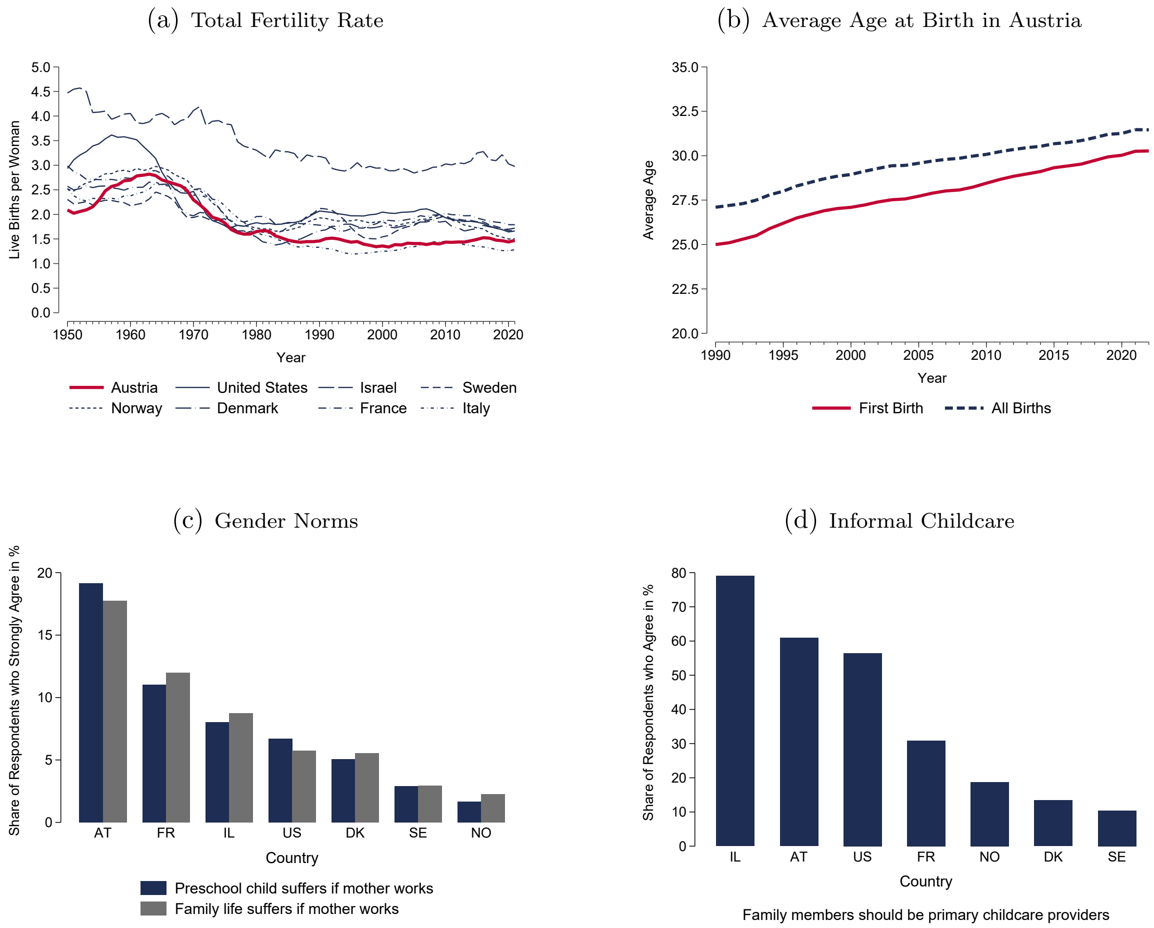

Figure A.2 — Institutions

Note — This figure shows stylized facts for different institutional details for Austria and other countries. Panel (a) shows the development of the total fertility rate for Austria, the United States, Israel, Sweden, Norway, Denmark, France, and Italy between 1950 and 2021. The figure is based on data from Our World in Data (2023-04-12). Panel (b) is based on data from Statistics Austria. It shows the development of the average age at first birth (solid line) and the average age at any birth (dashed line) for Austria between 1990 and 2022. Panels (c) and (d) use data from the *International Social Survey Programme* for Austria, the United States, Israel, Sweden, Norway, Denmark, and France for the year 2012. Panel (c) plots the share of respondents in percentages who strongly agree with either of the following questions: "A preschool child is likely to suffer if his or her mother works." (blue bars) and "All in all, family life suffers when the woman has a full-time job." (gray bars). Panel (d) plots the share of respondents who answer the question "People have different views on childcare for children under school age. Who do you think should primarily provide childcare?" with "Family members".

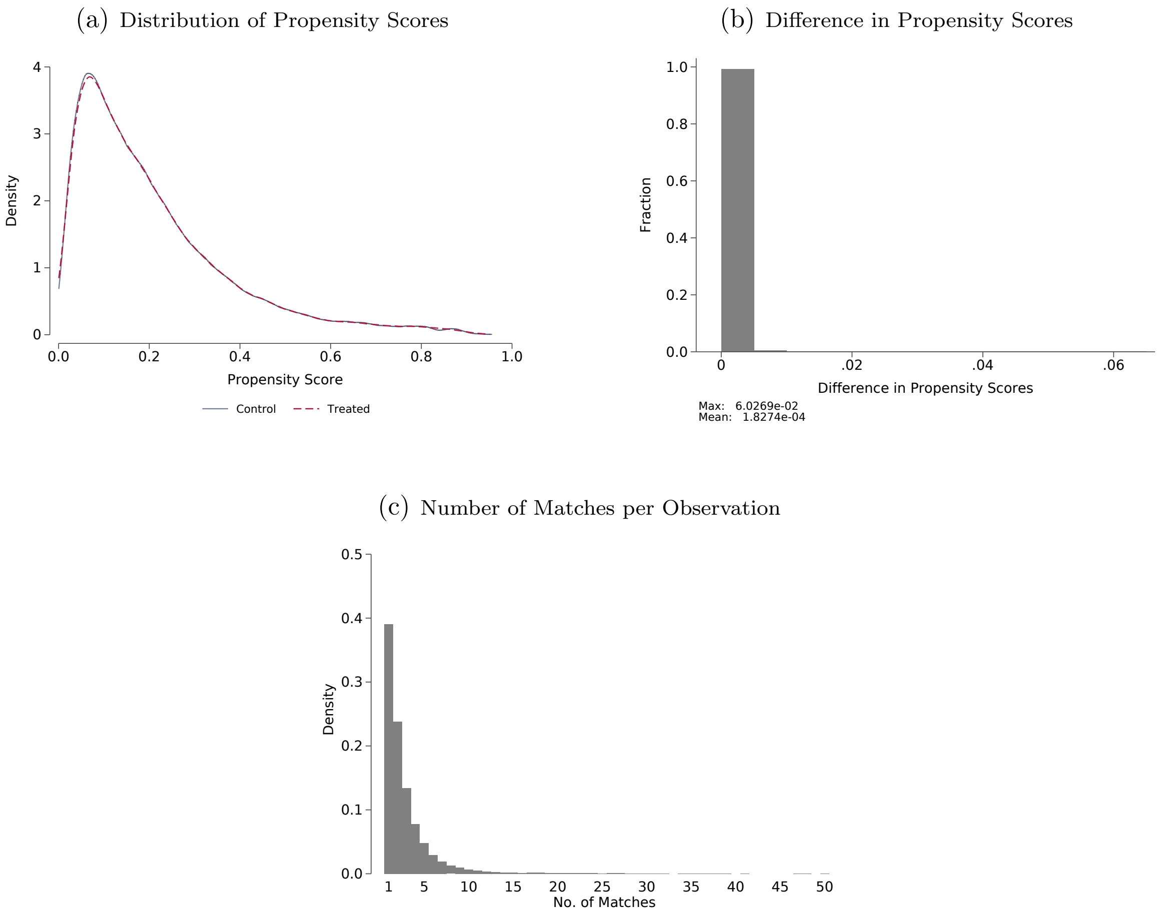

Figure A.3 — Matched Control Group: Propensity Score Diagnostics

Note — This figure shows several diagnostics for the propensity score matching described in Section 3. Panel (a) shows the distribution of propensity scores separately for treated daughters (red dashed line) and the matched control daughters (blue solid line). Panel (b) shows the distribution of the difference in propensity scores between daughters in the treatment and matched control group. Panel (c) shows the distribution of the number of times a daughter who does not experience the death of a parent is used as the nearest neighbor in the construction of the control group.

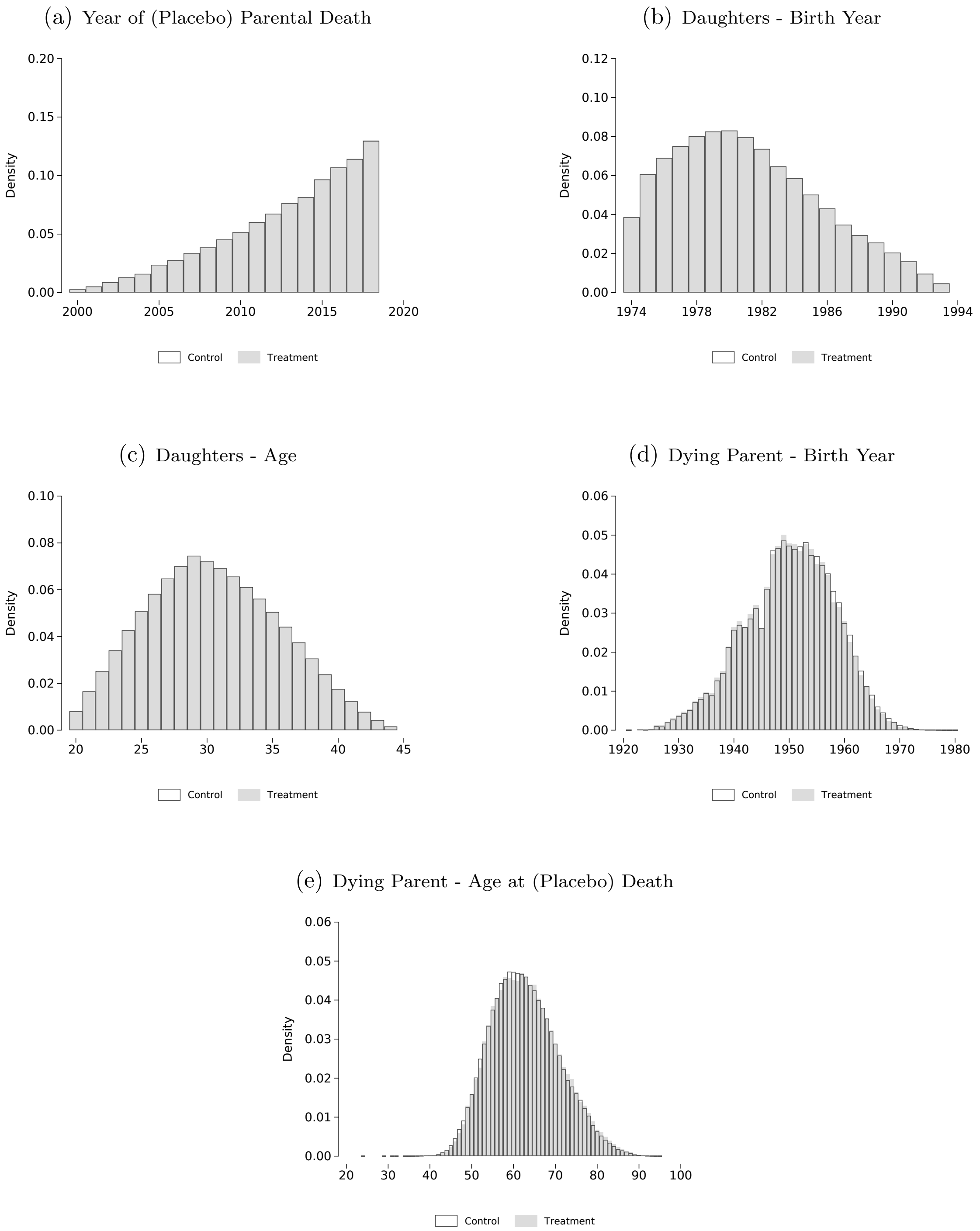

Figure A.4 — Matched Control Group: Histograms

Note — This figure shows histograms of selected discrete variables for daughters. The distributions are plotted separately for daughters in the treatment group (gray bars) and the control group (hollow black bars). The treatment group includes all daughters who experienced the death of a parent during reproductive age. The control group is constructed by propensity score nearest-neighbor matching, using all daughters who do not lose a parent as the donor pool. The matching procedure is described in Section 3. Panel (a) shows the distribution of the year of the first parental death for treated daughters and the assigned placebo death year for control daughters. The distributions of the daughters' birth years and age are shown in Panels (b) and (c). Panels (d) and (e) show the distribution of the birth years and the age at the (placebo) death of the dying parent.

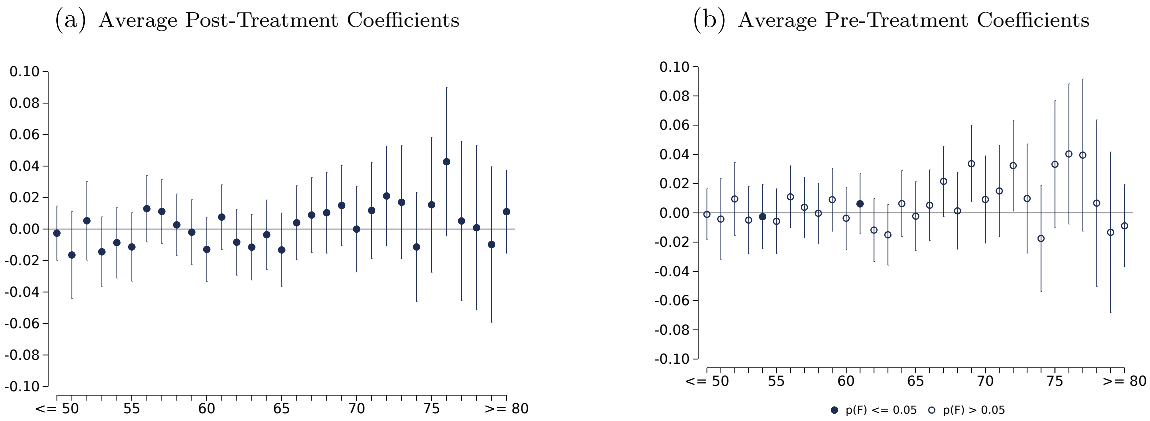

Figure A.5 — Dynamic Effect of Parental Death on Daughters' Birth Probability by Parent's Age at (Placebo) Death

Note — The figure shows the estimated average coefficients with 95 percent confidence intervals for the effect of parental death on daughters' birth probability by the age of the parent responsible for the (placebo) parental death at the time of (placebo) parental death. We estimate Equation (1) separately for each age at (placebo) death and then compute the arithmetic mean of coefficients. Panel (a) shows the average coefficients for the years after parental death (relative periods 0 to 4). Panel (b) shows the average coefficients for the years preceding the parental death (relative periods -5 to -1, excluding the baseline period -2), where hollow (full) circles indicate that the p-value of the F-test for the joint significance of all pre-treatment coefficients is above (below) 0.05. The estimates can be interpreted as the average percentage point change in the annual birth probability. The estimation sample includes five years before and five years (including the year of the parental death) after the parental death. The relative period -2 has been chosen as a reference period. Standard errors are clustered on the family level.

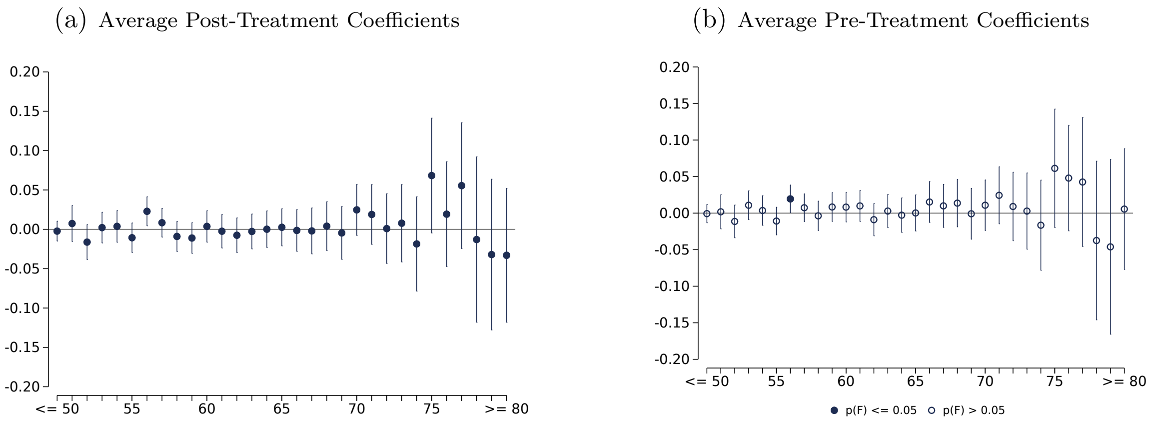

Figure A.6 — Dynamic Effect of Parental Death on Daughters' Birth Probability by Survivor's Age at (Placebo) Death

Note — The figure shows the estimated average coefficients with 95 percent confidence intervals for the effect of parental death on daughters' birth probability by the age of the surviving parent at the time of (placebo) death of the other parent. We estimate Equation (1) separately for each age at (placebo) death and then compute the arithmetic mean of coefficients. Panel (a) shows the average coefficients for the years after parental death (relative periods 0 to 4). Panel (b) shows the average coefficients for the years preceding the parental death (relative periods -5 to -1, excluding the baseline period -2), where hollow (full) circles indicate that the p-value of the F-test for the joint significance of all pre-treatment coefficients is above (below) 0.05. The estimates can be interpreted as the average percentage point change in the annual birth probability. The estimation sample includes five years before and five years (including the year of the parental death) after the parental death. The relative period -2 has been chosen as a reference period. Standard errors are clustered on the family level.

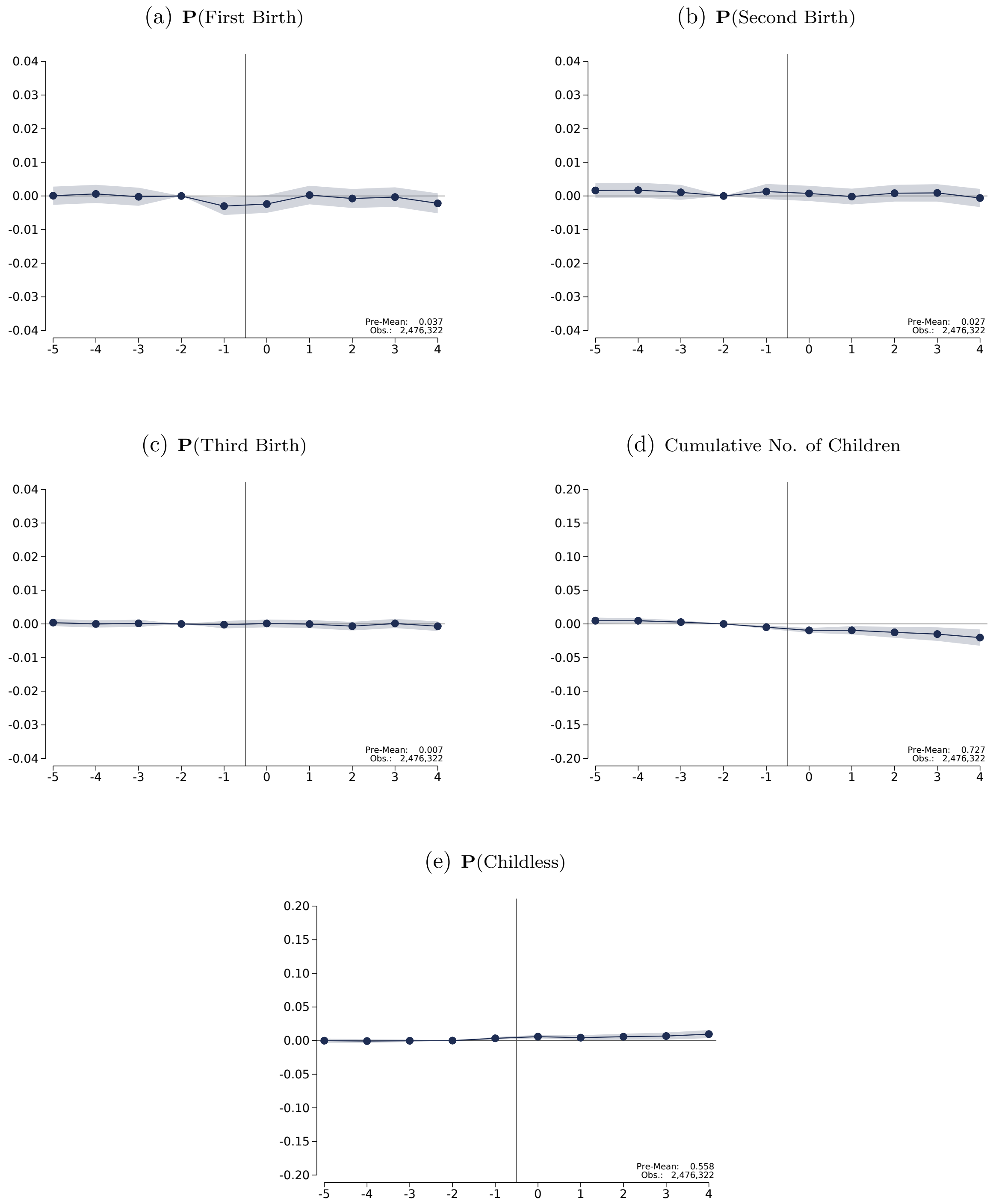

Figure A.7 — Matched Control Group: Dynamic Effect of Parental Death on Daughters' Other Fertility Margins

Note — The figure shows the estimated coefficients with 95 percent confidence intervals for the effect of parental death on different fertility margins. All estimates are based on Equation (1). The sample includes all daughters who experienced the death of a parent during reproductive age as a treated group. The control group is constructed by propensity score nearest-neighbor matching, using all daughters who do not lose a parent as the donor pool. The matching procedure is described in Section 3. For the results in Panels (a), (b), and (c), we defined three separate binary indicators that are one if a daughter had a first, second, or third birth in a given year. The estimates in these panels can thus be interpreted as the percentage point change in the annual probability of having a first, second, or third birth, respectively. Panel (d) shows the change in the cumulative number of children. Panel (d) uses a binary indicator that is one if the cumulative number of children is zero in a given year and zero otherwise as an outcome. The estimates can thus be interpreted as the percentage point change in the probability of being childless in a given year. Estimates are shown for five years before and five years (including the year of the parental death) after the parental death. The relative period -2 has been chosen as a reference period. The number of observations and the mean of the outcome variable for treated daughters in the reference period are reported in the bottom right corner. Standard errors are clustered on the family level.

A.2 Additional Tables

Table A.1 — Randomized Death Years: Characteristics of Daughters in the Period Preceding the Parental Death

	(1) Ø Full	(2) Ø Death	(3) Ø No Death	(4) Diff.	(5) Stand. Diff. in %	(6) N
Demographic Characteristics						
Birth Year	1,984.217	1,980.448	1,984.630	−4.182***	−86.98	4,873,865
Age at (Placebo) Death	29.626	31.786	29.389	2.397***	54.36	4,873,865
Austrian Citizenship	0.977	0.982	0.977	0.005***	3.40	4,765,582
Actual GP Death	0.099	1.000	0.000	1.000***	0	4,873,865
Fertility Outcomes						
Num. of Children Before (Placebo) Death	0.542	0.746	0.519	0.227***	25.37	4,870,189
Birth Before (Placebo) Death	0.347	0.456	0.335	0.121***	24.94	4,870,189
Labor Market Outcomes						
Employment Days	247.818	246.999	247.901	−0.902***	−0.60	2,951,606
Blue Collar Employment Days	35.972	39.584	35.606	3.977***	3.93	2,951,606
White Collar Employment Days	179.302	180.617	179.169	1.448***	0.86	2,951,606
Sick Leave Days	1.354	1.339	1.356	−0.017	−0.18	2,493,769
Unemployment Days	22.697	25.078	22.457	2.621***	3.89	2,951,606
Retirment Days	0.712	1.309	0.651	0.657***	3.70	2,951,606
Days in Other Qualification	97.630	116.221	95.750	20.471***	13.23	2,951,606
Apprenticeship	0.335	0.373	0.331	0.042***	8.80	2,951,606
Yearly Wage (Thou.)	20.703	21.989	20.572	1.417***	10.43	2,574,599
Daily Wage	56.720	60.245	56.363	3.882***	10.43	2,574,599
Health Outcomes						
Hospital Days	0.880	1.005	0.869	0.136***	2.98	433,006
LKF Turnover	516.161	566.187	511.942	54.245***	2.37	433,006
Outpatient Expenditure	286.686	305.590	285.092	20.499***	6.01	433,006
Medication Expenditure	97.841	115.293	96.369	18.924***	1.63	433,006
Prescription of Psycholeptics	0.014	0.020	0.013	0.007***	5.48	434,156
Prescription of Antidepressants	0.047	0.064	0.045	0.019***	8.19	434,156

Note — The table reports descriptive statistics for demographic, fertility, labor market, and health characteristics of daughters. The sample includes all daughters who experience the death of a parent during reproductive age and all daughters who do not. To obtain the necessary data structure, we randomly assign parental death years to daughters in the latter group as described in Section 3. The sample period comprises the five years preceding the (placebo) parental death. Note that health characteristics can only be observed for daughters insured in Upper Austria. Column (1) reports the mean for the full sample. The means for daughters with and without a parental death are reported in Columns (2) and (3). Column (4) reports the difference in means between daughters who experience the death of a parent and those who do not. Column (5) reports the standardized difference in means. The standardized difference is defined as the difference in means between the treated and control group for a given variable ($\mu_{treated} - \mu_{control}$) divided by the average standard deviation $\left(\sqrt{0.5 \cdot (\sigma^2_{treated} + \sigma^2_{control})}\right)$ and multiplied by 100. The number of observations is given in Column (6). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.2 — Matched Control Group: Characteristics of Daughters in the Period Preceding the Parental Death

	(1)	(2)	(3)	(4)	(5)	(6)
	Ø Full	Ø Treated	Ø Control	Diff.	Stand. Diff. in %	N
Demographic Characteristics						
Birth Year	1,980.904	1,980.904	1,980.904	0.000	−0.01	2,476,322
Age at (Placebo) Death	31.474	31.485	31.472	0.013*	0.30	2,476,322
Austrian Citizenship	0.979	0.981	0.979	0.002***	1.75	2,411,435
Actual GP Death	0.167	1.000	0.000	1.000***	0	2,476,322
Fertility Outcomes						
Num. of Children Before (Placebo) Death	0.782	0.772	0.784	−0.012***	−1.22	2,476,322
Birth Before (Placebo) Death	0.472	0.470	0.472	−0.002**	−0.41	2,476,322
Labor Market Outcomes						
Employment Days	251.280	250.114	251.513	−1.399***	−0.94	1,405,213
Blue Collar Employment Days	40.109	42.702	39.590	3.112***	2.93	1,405,213
White Collar Employment Days	184.633	181.741	185.213	−3.472***	−2.04	1,405,213
Sick Leave Days	1.327	1.415	1.309	0.106***	1.10	1,166,243
Unemployment Days	22.314	25.502	21.675	3.827***	5.68	1,405,213
Retirment Days	1.128	1.319	1.090	0.229***	1.15	1,405,213
Days in Other Qualification	117.549	114.558	118.148	−3.590***	−2.24	1,405,213
Apprenticeship	0.375	0.406	0.369	0.037***	7.59	1,405,213
Yearly Wage (Thou.)	21.857	21.648	21.899	−0.251***	−1.86	1,233,592
Daily Wage	59.882	59.309	59.997	−0.689***	−1.86	1,233,592
Health Outcomes						
Hospital Days	0.970	0.996	0.965	0.031	0.70	184,942
LKF Turnover	552.749	563.955	550.539	13.416	0.59	184,942
Outpatient Expenditure	310.530	308.640	310.903	−2.263	−0.64	184,942
Medication Expenditure	107.145	115.855	105.428	10.427**	1.28	184,942
Prescription of Psycholeptics	0.017	0.020	0.016	0.004***	2.88	185,486
Prescription of Antidepressants	0.057	0.064	0.056	0.008***	3.57	185,486

Note — The table reports descriptive statistics for demographic, fertility, labor market, and health characteristics of daughters. The sample includes all daughters who experience the death of a parent during reproductive age as a treated group. The control group is constructed by propensity score nearest-neighbor matching, using all daughters who do not lose a parent as the donor pool. The matching procedure is described in Section 3. The sample period comprises the five years preceding the (placebo) parental death. Note that health characteristics can only be observed for daughters insured in Upper Austria. Column (1) reports the mean for the full sample. The means for treated and control daughters are reported in Columns (2) and (3). Column (4) reports the difference in means between the treatment and control group. Column (5) reports the standardized difference in means. The standardized difference is defined as the difference in means between the treated and control group for a given variable ($\mu_{treated} - \mu_{control}$) divided by the average standard deviation $\left(\sqrt{0.5 \cdot (\sigma^2_{treated} + \sigma^2_{control})}\right)$ and multiplied by 100. The number of observations is given in Column (6). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.3 — Dynamic Effect of Parental Death on Daughters' Birth Probability – Alternative Control Variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
−5 × Treated	0.0040	0.0039	0.0039	0.0039	0.0039	0.0039	0.0040	0.0039
	(0.0028)	(0.0028)	(0.0028)	(0.0028)	(0.0028)	(0.0028)	(0.0028)	(0.0028)
−4 × Treated	0.0043	0.0042	0.0042	0.0042	0.0042	0.0042	0.0042	0.0045
	(0.0028)	(0.0028)	(0.0028)	(0.0028)	(0.0028)	(0.0028)	(0.0028)	(0.0028)
−3 × Treated	0.0055*	0.0054*	0.0054*	0.0054*	0.0054*	0.0054*	0.0054*	0.0055*
	(0.0030)	(0.0030)	(0.0030)	(0.0030)	(0.0030)	(0.0030)	(0.0030)	(0.0030)
−2 × Treated								
−1 × Treated	0.0011	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0013
	(0.0030)	(0.0030)	(0.0030)	(0.0030)	(0.0030)	(0.0030)	(0.0030)	(0.0030)
0 × Treated	-0.0037	-0.0035	-0.0036	-0.0035	-0.0035	-0.0035	-0.0035	-0.0031
	(0.0029)	(0.0029)	(0.0029)	(0.0029)	(0.0029)	(0.0029)	(0.0029)	(0.0029)
1 × Treated	0.0032	0.0034	0.0034	0.0034	0.0034	0.0035	0.0035	0.0038
	(0.0030)	(0.0029)	(0.0029)	(0.0029)	(0.0029)	(0.0030)	(0.0030)	(0.0030)
2 × Treated	0.0012	0.0014	0.0014	0.0014	0.0014	0.0016	0.0016	0.0018
	(0.0030)	(0.0030)	(0.0030)	(0.0030)	(0.0030)	(0.0030)	(0.0030)	(0.0030)
3 × Treated	0.0002	0.0005	0.0005	0.0005	0.0005	0.0007	0.0007	0.0008
	(0.0033)	(0.0033)	(0.0033)	(0.0033)	(0.0033)	(0.0033)	(0.0033)	(0.0033)
4 × Treated	0.0000	0.0004	0.0004	0.0004	0.0004	0.0005	0.0005	0.0006
	(0.0030)	(0.0029)	(0.0029)	(0.0029)	(0.0029)	(0.0029)	(0.0029)	(0.0029)
Daughter Age FE		✓	✓	✓	✓	✓	✓	✓
Year of (Placebo) Death FE			✓	✓	✓	✓	✓	
Parent Age at (Placebo) Death FE				✓		✓	✓	
Mother Age at (Placebo) Death FE					✓			
Father Age at (Placebo) Death FE					✓			
Calendar Year FE						✓	✓	✓
Daugther Age at (Placebo) Death FE							✓	
Individual × Treated FE								✓
N	611,979	611,979	611,979	611,979	611,979	611,979	611,979	611,979
# Clusters	42,014	42,014	42,014	42,014	42,014	42,014	42,014	42,014
p-Value of Pre-Coefficients	0.248	0.274	0.274	0.272	0.277	0.272	0.272	0.255
Outcome Mean	0.0716	0.0716	0.0716	0.0716	0.0716	0.0716	0.0716	0.0716

Note — The table reports the estimated coefficients for the effect of parental death on daughters' birth probability for different specifications of control variables. The results are based on Equation 1. Column (1) shows the results without any additional control variables, while Columns (2) to (4) gradually include the main control variables. In Column (5), we control for the age of death of both mothers and fathers separately instead of only controlling for the age at death of the parent responsible for the parental death. We add a calendar year fixed effect in Column (6) and control flexibly for daughters' age at death in Column (7). As a last alternative specification in Column (8), we estimate a standard two-way fixed effects model, controlling for daughters' age. As one daughter can appear both in the treated and the control group, the usual individual fixed effect is defined as an individual-times-treated fixed effect. The estimates can be interpreted as the average percentage point change in the annual birth probability. Estimates are reported for five years before and five years (including the year of the parental death) after parental death. Zero indicates the year of the parental death. The relative period -2 has been chosen as the reference period. The number of observations, the number of clusters, the p-value of an F-test for the joint significance of all pre-treatment coefficients, and the mean of the outcome variable in the reference period are reported at the bottom of the table. Standard errors are clustered on the family level and reported in parentheses below the coefficients. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$, † $p < 0.001$.

Table A.4 — Dynamic Effect of Parental Death on Daughters' Alternative Birth Outcomes

	(1) **P**(ICD-10 Birth Diag.)	(2) Gynecology Exp.
−5 × Treated	0.0086	2.0501
	(0.0097)	(2.5174)
−4 × Treated	0.0180*	3.1103
	(0.0097)	(2.4990)
−3 × Treated	0.0103	-0.2850
	(0.0098)	(2.2010)
−2 × Treated		
−1 × Treated	0.0004	1.2765
	(0.0100)	(2.2284)
0 × Treated	0.0088	2.0214
	(0.0092)	(2.3997)
1 × Treated	0.0011	2.8608
	(0.0094)	(2.4563)
2 × Treated	0.0080	0.8952
	(0.0094)	(2.4686)
3 × Treated	0.0136	2.8168
	(0.0100)	(2.7616)
4 × Treated	0.0020	0.9895
	(0.0091)	(2.5409)
Daughter Age FE	✓	✓
Year of (Placebo) Death FE	✓	✓
Parent Age at (Placebo) Death FE	✓	✓
N	64,986	73,185
# Clusters	6,912	7,787
p-Value of Pre-Coefficients	0.259	0.602
Outcome Mean	0.0866	50.1677

Note — The table reports the estimated coefficients for the effect of parental death on daughters' alternative birth outcomes. The results are based on Equation 1. As the alternative birth outcomes are based on healthcare data, the results are based on the subsample of daughters insured in Upper Austria. For Column (1), we used information on the daughters' hospital diagnosis to construct a binary indicator that is one if a daughter had a delivery diagnosis (ICD-10 chapter XV, diagnoses *O80* to *O84*). Column (2) reports the result for the amount of outpatient expenditures for gynecologists in Euros. Estimates are reported for five years before and five years (including the year of the parental death) after parental death. Zero indicates the year of the parental death. The relative period -2 has been chosen as the reference period. The number of observations, the number of clusters, the p-value of an F-test for the joint significance of all pre-treatment coefficients, and the mean of the outcome variable in the reference period are reported at the bottom of the table. Standard errors are clustered on the family level and reported in parentheses below the coefficients. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$, † $p < 0.001$.