

# GRANDMOTHERS AND THE GENDER GAP IN THE MEXICAN LABOR MARKET

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## Abstract

This paper estimates the effect of childcare availability on parents' employment probability using the timing of death of grandmothers — the main childcare provider in Mexico — as identifying variation. I use a triple-difference to disentangle the effect of grandmothers' deaths due to their impact on childcare from their effects due to alternative mechanisms. Through their impact on childcare, the deaths of grandmothers reduce mothers' employment rate by 12 percentage points (27 percent) and have no effect on fathers. Households substitute the grandmother-provided childcare with a private provider when it is affordable: a one standard deviation lower average cost of private daycare in the locality mitigates by 7 percentage points the negative effect of grandmothers' deaths on mothers' employment probability.

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The gender gap in employment rate is a core issue in labor markets. This gap widens when women bear children, reflecting the fact that motherhood plays a significant role in its formation (Angrist and Evans (1998); Waldfogel (1998); Bertrand, Goldin and Katz (2010); Kleven, Landais and Sogaard (2019)). Decision makers can more efficiently guide policy to reduce the gender gap when they understand the role of each motherhood-related mechanism affecting employment. These mechanisms include specialization (Becker, 1991), gender roles (O’Neill (2003); Dhar, Jain and Jayachandran (2019)), personal preferences (Daymont and Andrisani, 1984), and labor market discriminatory demand (Correll, Benard and Paik, 2007).

This paper focuses on the specific mechanism of childcare availability. Parental employment and the amount of nonparental-provided childcare are likely decided simultaneously; hence, estimating the causal relationship between childcare availability and employment is challenging. To overcome this challenge, I use a natural experiment based on the plausibly exogenous timing of death of grandmothers. I use a triple-difference to disentangle the effect grandmothers’ death due to its impact on childcare availability from its effect through alternative mechanisms. The first difference is a within individual comparison of employment status before and after the death. The second difference compares those who suffered the loss with those who did not. The third difference compares the double difference of parents who need more childcare with that of parents who need it less by comparing parents of young children with parents of older children. The third difference captures the effect that the grandmother’s death has through its impact on childcare. Other mechanisms that are present for both parents that suffered a death and those who did not (e.g. an economic recession) cancel out by the second difference, and the mechanisms that are present for both parents of young and older children, like inheritance, cancel out with the third difference. The comparison of the triple-differences across genders provides evidence of childcare availability contributing significantly to the gender gap in the Mexican labor market.

Grandmothers are the primary childcare providers in Mexico. They take care of almost 40 percent of children up to six years old - as many as schools and daycare combined.<sup>1</sup> The availability of grandmother-provided childcare and mothers’ employment are positively correlated. In three-generation households, the grandmother is more likely to provide childcare and the mother is more

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<sup>1</sup>See top of Figure A.1 of online appendix. All exhibits with the “A” prefix are in the online appendix.

likely to be employed.<sup>2</sup> This paper uses the timing of death of the grandmother to explore whether the relationship between grandmother-provided childcare and mother’s employment is causal.

While grandmothers are the primary childcare provider, grandfathers rarely provide it.<sup>3</sup> In contrast to the null effect of grandfathers’ deaths, grandmothers’ deaths, through their impact on childcare, reduce the mothers’ employment rate by 12 percentage points (27 percent) on average. This effect is not present for fathers. These findings suggest that it is not only differences across genders in dimensions that remain unchanged with the death of grandmothers (such as preferences, education, experience, or gender roles) that lead to the gender gap in employment.

The evidence suggests that after the grandmothers’ death, households replace grandmother-provided childcare with private daycare when it is affordable: a one standard deviation decrease in the average cost for private daycare in the locality mitigates the effect of grandmothers’ deaths by 7 percentage points. The evidence of this paper implies that even without reducing differences across genders in education, experience, or roles, the gender gap in employment can be significantly reduced by increasing daycare availability.

This paper documents mothers who would have continued to be employed if they had not received this negative shock to childcare availability. Mothers who leave the labor force after the grandmothers’ deaths worked full-time, contributed a significant share of household earned income, and left the labor force regardless of their educational attainment. Mothers working in both the formal and informal sector are affected, but those working informally are affected more.

This paper has several advantages over the existing literature that studies the relationship between childcare availability and parental employment: (i) it provides evidence of households substituting the grandmother-provided childcare with private daycare when it is affordable, (ii) requires a significantly weaker assumption for causal interpretation (the timing of death of the grandmother being as good as random), (iii) the panel structure of the data allows to control for both observed and unobserved time-invariant characteristics at the individual level, (iv) the triple-difference disentangles the effect through childcare from the effect through alternative mechanisms (e.g. inheritance or lost income), (v) documents that most of the reduction in earned income and hours worked for mothers is driven by a reduction on the extensive margin, and (vi) compares the

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<sup>2</sup>See bottom of Figure [A.1](#) and Table [A.1](#)

<sup>3</sup>See Figure [A.1](#)

effect on mothers and fathers. The related literature section discusses the existing literature and the contributions of this paper in more detail.

## 1 Related Literature

Abundant research documents the gender gap in employment and its relationship with motherhood.<sup>4</sup> There has also been progress in identifying the mechanisms through which the gender gap is formed, such as, employer discrimination (Correll, Benard and Paik, 2007) and marital status (Fernandez and Wong, 2014a); (Fernandez and Wong, 2014b). Within the papers that study the relationship between childcare availability and labor supply, this paper is closest to those that use the availability of grandparents as variation in childcare. Zanella (2017) contains a literature review on the relationship between grandparent-provided childcare and parental labor force participation, and concludes that some of the limitations of the existing literature are the lack of studies that are able to address causality and whether the results extend to developing countries. Moving forward, I first discuss the papers that use grandparent availability as an instrument for grandparent-provided childcare, then I proceed to those that estimate the relationship between grandparent availability and mother’s employment directly.

Posadas and Vidal-Fernandez (2013) (PVF2013) and Arpino, Pronzato and Tavares (2014) (APT2014) use an instrumental variable (IV) based on whether the grandmother is alive or not, and Aparicio-Fenoll and Vidal-Fernandez (2015) (AFVF2015) and Aparicio Fenoll (2019) use retirement eligibility of grandmothers in Italy and in Europe to instrument for grandparent-provided childcare. The triple-difference estimation used in this paper presents an advantage over these IVs because (i) the use of individual fixed effects control for time-invariant characteristics at the individual and household level, (ii) if the death or the retirement of the grandmother affects mothers’ employment rate through a mechanism other than childcare (e.g. income effect from lost grandmother’s income), the exclusion restriction would be violated; instead, the triple-difference disentangles the effect through childcare by canceling out the effects that are present in both mothers of young and older children,<sup>5</sup> and (iii) it relies on a weaker identification assumption than PVF2013 and APT2014:

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<sup>4</sup>See, for example, Kühn, Horne and Yoon (2017); Bertrand, Goldin and Katz (2010); Waldfogel (1998); Kleven, Landais and Sogaard (2019); Cristia (2008); Agüero and Marks (2008); Jérôme, Dustmann and Stevens (2017); Angelov, Johansson and Lindahl (2016); Fernández-Kranz, Lacuesta and Rodríguez-Planas (2013))

<sup>5</sup>The second difference of the triple-difference compares the effect on mothers with young children to the effect on mothers with older children. Effects that are common for both groups, such as inheritance, cancel out.

while the IV requires the grandmother being alive or dead to be random, the DiD only requires the timing of death to be random.<sup>6</sup> PVF2013 also uses a fixed effects (FE) specification; the main advantage of the triple-difference in this paper over the FE in PVF2013 is that the interpretation of the triple-difference is causal while the interpretation of the FE is not.<sup>7</sup>

Bratti, Frattini and Scervini (2018) (BTS2018) further discusses disadvantages of using the IVs in PVF2013, APT2014, AFVF2015, and Maurer-Fazio et al. (2011)<sup>8</sup> to estimate the causal relationship between grandmother-provided childcare and parental employment. Instead, BTS2018 directly estimates the relationship between female labor force participation and availability of mothers, mothers-in-law, fathers, and fathers-in-law. While the exclusion restriction is not a concern for BTS2018, the triple-difference advantages (i) and (iii) over PVF2013, APT2014, AFVF2015, and AF2019 are also advantages over BTS2018. If any household characteristic such as education, habits (e.g. nutrition), or income affect both mother’s employment and grandmother’s longevity, the estimate would be biased. While BTS2018 requires longevity or retirement eligibility to be random,<sup>9</sup> this paper only requires the time of death to be random. Moreover, the effect captured by BTS2018 does not need to be through the childcare mechanism, while the triple-difference disentangles this mechanism. Compton and Pollak (2013) finds a positive correlation between geographical proximity to grandmothers and mothers’ labor supply in the U.S.. The timing of a death represents endogeneity of lesser concern than distance to grandparents: while households can choose where to live, they cannot choose the time of death of the grandmother.

This paper is also related to the broader literature on the relationship between childcare availability and labor supply. To estimate the effects of childcare availability on mothers’ employment, Jaumotte (2015) uses variation across OECD countries in childcare subsidies, Givord and Marbot

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<sup>6</sup>If household characteristics such as habits, income, or education affect the probability of the grandmother being dead (longevity) and any of these characteristics also affect mother’s employment probability, the IV estimate would be biased. For example, in PVF2013 sample, families with deceased maternal grandmothers seem to be more disadvantaged than their counterparts. On the other hand, the first difference of the triple-difference, compares the quarters before the death of the grandmother to the quarters after (within individual variation). Hence, only requiring the timing to be random.

<sup>7</sup>As PVF2013 mention, FE by themselves, cannot address reverse causality (whether the grandmother provides childcare because the daughter works or vice versa).

<sup>8</sup>They instrument the presence of grandparents using the mother’s and father’s age and provincial dummies. The exclusion restriction would be violated if the mother’s age affects her employment by a mechanism other than the presence of the grandmother in the household (e.g. experience being correlated with salary and age, and salary affecting labor force participation).

<sup>9</sup>The omitted category in the empirical estimation is when the potential provider is dead. Hence, for a causal interpretation of the coefficients, longevity would need to be random. For the difference in coefficients of (i) alive and eligible and (ii) alive and ineligible, randomness in eligibility is required for a causal interpretation.

(2015) uses the French reform in family allowance, and [Lefebvre and Merrigan \(2008\)](#) uses a new childcare policy implemented in Quebec. While policy changes create variation across time for all households simultaneously, grandmothers' deaths provide variation across time specific to the household that is improbably correlated with changes in societal values (or other trends).

The effects of childcare availability on mother's employment are of special interest in developing countries, where the severity of the gender gap is exacerbated due to less progressive attitudes about women in the labor force, gender-based violence, and women having less decision-making power ([Jayachandran, 2015](#)).<sup>10</sup> To estimate the effect of childcare availability on mothers' employment, [Barros et al. \(2013\)](#) use a lottery for city daycare in Rio de Janeiro, [Martínez A. and Perticará \(2017\)](#) use a randomization on offering after-school care in Chile, [Hojman and Lopez Boo \(2019\)](#) use random assignment of childcare centers across Nicaragua's poorest neighborhoods, and [Clark et al. \(2019\)](#) use randomization of subsidized daycare in a settlement in Nairobi. This paper further contributes to this literature by studying differences across genders, using variation in the main source of childcare, using a natural experiment on a national scale, and testing whether availability of daycare can mitigate the negative effect of the loss of family-provided childcare.

## 2 Data, the Gender Gap, and the Motherhood Penalty

The Mexican National Survey of Occupation and Employment (ENOE) and the National Survey of Employment and Social Security (ENESS) are the main data sources used. The ENOE is the largest household survey conducted in Mexico, and it is superior to administrative data in this context because it includes both the formal and informal sectors of the economy.<sup>11</sup> Its data collection occurs every quarter in a rotating panel format with five observations per household. The ENOE data used in this paper spans Q1 2005 to Q1 of 2020, a total of 63 surveys (one per quarter). Each survey visits approximately 120,000 households. The survey's demographics section includes information on every member of the household, such as their relationship to the head of

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<sup>10</sup>Moreover, gender inequality, by itself, is considered a barrier to development; in the words of Amartya Sen, "[t]he changing agency of women is one of the major mediators of economic and social change, and its determination as well as consequences closely relate to many of the central features of the development process" ([Sen, 1999](#), p. 202).

<sup>11</sup>Sixty percent of the workers in Mexico work in the informal sector ([OIT, 2014](#)). This paper uses the classification of informality used by the Mexican Statistical authority (INEGI): subordinate employees with pay belong to the informal sector if they do not have access to Mexican Social Security. Access to Social Security in Mexico is achieved by being affiliated with the Mexican Social Security Institute or an equivalent. This affiliation guarantees access to benefits, such as health care, disability insurance, housing credit, and a pension plan. [INEGI \(2014\)](#).

household, gender, children, education, marital status, reason for not living in the household any more (after first survey), access to health care, employment, income, and hours worked.<sup>12</sup>

I map households across surveys using the household id to create a panel with five observations per household. To map individuals across surveys and create an individual-level panel, I use the line number and validate using date of birth.<sup>13</sup> I focus on three-generation households, because the data provide grandparents' information only if they live in the same household.<sup>14</sup> Within three-generation households, the generation to which each individual belongs to is identified only in terms of their relationship to the household head, but not in terms of their relationship to other family members.<sup>15</sup> For women, mothers are identified by belonging to the second generation and having children. For men, fathers are identified by belonging to the second generation and being married or cohabiting with their partner.<sup>16</sup>

Three-generation households represent on average 27 million Mexicans and of 4.7 million households in Mexico — 23 percent of the total population and 15 percent of the households. In Mexico, mothers in three-generation households are not that different from mothers in two-generation households, specially conditional on being employed. Table A.1 in the Appendix explores their differences. Consistent with the findings of the papers discussed in the Related Literature section, the presence of grandparents is positively correlated with mother's employment: mothers in three-generation households are 11 percentage points (pp) more likely to be employed, but after adding simple controls like education, age, marital status and number of children, this difference is reduced to less than 3 pp. When comparing employed mothers, it is not clear if mothers in three-generation households are more or less educated: mothers in three-generation households have on average one more month of schooling, are 2 pp more likely to have a high-school degree, but are 2 pp less likely to have a college degree. The differences in income and hours worked are also economically small, mothers in three-generation households on average earn 3.7% less and work 1.4 more hours per

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<sup>12</sup>The head of household is the individual who is highest in the hierarchy due to being the main economic contributor, the eldest, or the main decision maker (INEGI, 1997).

<sup>13</sup>The line number is generally a within household identifier. Date of birth and line number match within household for 99.97% of individuals, the unmatched are not used in the analysis.

<sup>14</sup>I consider all first-generation individuals to be grandparents, although they are not necessarily grandparents. They could be, for example, siblings of the grandparents.

<sup>15</sup>For example, suppose the grandfather (first generation) is the head of the household. His children and their spouses are the second generation, and his grandchildren are the third generation. The relationships between the individuals in the second and third generations are not identified; a second generation individual could thus be either a father or an uncle of the third generation.

<sup>16</sup>There is no question on having children for men.

week.

I complement the data of ENOE with data from the ENESS. The Mexican National Statistics Institute (INEGI) has conducted the ENESS every four years since 1996 with the objective of providing statistical information regarding the coverage and characteristics of social security and health care services in Mexico. The ENESS asks households, among other questions, if they use childcare, what type of childcare they use, and how much they paid for it.

## 2.1 Grandparents, Children, and Child Care

In the ENOE, the death of a cohabiting grandparent is revealed whenever the respondent answers that the grandparent is not present because he or she passed away.<sup>17</sup> The ENESS asks households that are not using a public or private daycare service about their reason for not doing so.<sup>18</sup> Approximately 40 percent responded that they had no need for public or private daycare services, and almost 40 percent responded that either they had no access, they could not afford it, or it was not possible to take or pick up their child (see Figure A.4). Of those who did not need daycare, more than 90 percent relied on a family member to provide childcare; and specifically, more than 60 percent relied on grandmothers to provide childcare (see Figure A.6).

## 2.2 The Gender Gap and the Motherhood Penalty

The motherhood penalty in employment, the difference in employment rate between women with children and women without them, forms between the ages of twenty and thirty and remains thereafter.<sup>19</sup> Top of Figure 1 displays the motherhood penalty and gender gap in three-generation households (left) and in Mexico (right). The pattern is similar, but the gaps are narrower in three-generation households because of a higher employment rate of women with children between ages of twenty and forty. This is consistent with the findings discussed in the Related Literature section for other countries: the availability of the grandmother is positively correlated with mother's

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<sup>17</sup>Figure A.3 shows the frequency distribution of the grandparents' ages and Figure A.5 shows the frequency distribution of the age at which the grandparents died.

<sup>18</sup>The question limits the respondent to one answer.

<sup>19</sup>The ENOE classifies the employed into four categories: (i) subordinate workers with pay, (ii) employers, (iii) self-employed, and (iv) workers without pay. This paper considers an individual as employed if he or she is a subordinate worker with pay. The robustness section repeats the main analyses considering working as any of the three first categories; the findings are consistent.



employment. The next section explains how the triple-difference estimation addresses whether this correlation is causal.

### 3 Empirical Strategy

The timing of death of grandmothers provides variation to childcare availability that identifies its effect on mothers' labor supply. The first empirical specification is a triple-difference. The first difference compares mothers' employment status before and after the death of the grandmother. The second difference compares mothers that suffered a loss to those who did not. Since the death of the grandmother may affect the labor supply through several mechanisms, the third difference disentangles the effect of the death due to its impact on childcare from its effect through alternative mechanisms by comparing the the double-difference effect for mothers with young children with that of mothers of older children. Childcare is scarcer and needed more for young children; the triple-difference captures the effect that the death of the grandmother has on mothers of young children but not on mothers of older children, the childcare mechanism.

I use individual fixed effects to control for both observable and unobservable mother-grandmother-household time invariant characteristics that could correlate with both the timing of death of the grandmother and the mother's labor supply. Locality-year-quarter fixed effects control for locality-specific shocks to the labor market, for example a city-specific boost in government spending. Young child-year-quarter fixed effects control for shocks that are specific to children's age, for example, a nationwide education reform or a new public daycare policy. Grandmother died-year-quarter fixed effects control for pre-existing differences between households where the grandmother will die during the survey period and those where she will not. Ten alternative specifications with different combinations of fixed effects are estimated and results are also reported in Table 1. Equation 1 is the main specification, where  $\beta_2$ , the triple-difference effect, is the estimate of interest:

$$\begin{aligned}
 Employed_{i,l,t} = & \beta_1 Post_{i,l,t} \times Death_{i,l}^{GM} + \beta_2 Post_{i,l,t} \times Death_{i,l}^{GM} \times YoungChild_{i,l} \\
 & + \phi_i + \zeta_{l,t} + \gamma_{t,YoungChild} + \eta_{t,DeathGM} + \varepsilon_{i,l,t}
 \end{aligned} \tag{1}$$

Where  $Employed_{i,l,t}$  takes the value of 1 if mother  $i$  living in locality  $l$  is employed at time (year-quarter)  $t$  and 0 otherwise,  $Death_{i,l}^{GM}$  is a dummy variable that takes the value of 1 if the

mother suffered the death of the grandmother at any point through the span of the surveys and 0 otherwise,  $Post_{i,l,t}$  takes the value of 1 for every period after the death of the grandmother and 0 otherwise,  $YoungChild_{i,l}$  indicates that the oldest child in the household is young,  $\phi_i$  is the individual fixed effect,  $\zeta_{l,t}$  is the year-quarter-locality fixed effect,  $\gamma_{t,YoungChild}$  is the year-quarter-young child fixed effect,  $\eta_{t,DeathGM}$  is the year-quarter-grandmother died fixed effect. All the lower level interactions are captured by the fixed effects.

The main specification uses an age cutoff of at most 5 years old to be considered a young child.<sup>20</sup> The three main reasons to use the 5-years-old cutoff are that: (i) it exploits a discontinuity of childcare availability by separating children that can, and by law should, attend primary schools from younger children, (ii) it is consistent with governmental classification of children by age, and (iii) it presents an advantage over using a cutoff at a younger age by increasing the size of the treatment group.<sup>21</sup>

One possible concern with the use of death as source of variation is inheritance. For example, the income effect of inheritance may increase leisure consumption. As long as after the death of the grandmother, mothers of young and older children are as likely to receive an inheritance, then the effect of inheritance will cancel out with the third difference.

Another possible concern is sickness. If the mother left her job to take care of the grandmother, the death of the grandmother would allow the mother to go back to work leading to an underestimate of the negative effect. On the other hand, sickness could be expensive, and the mother might need to work to cover the expenses. Once the grandmother dies, the mother does not need to keep working. As long as sickness of the grandmother is present for both mothers with young and older children, the effect would cancel out.

However, there are concerns that this framework cannot rule out. Specifically, time-varying variables that affect mothers and that correlate with all three: the age of the oldest child, the time of death of the grandmother and employment. For example, suppose that the grandmother owns a firm and hires the mother if and only if children in the household are young. Additionally, assume that these mothers are not be able to work elsewhere. In this example, only mothers living

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<sup>20</sup>An alternative cutoff could be at most 1 year, because many childcare facilities do not accept children younger than 2 (Profeco, 2004). This cutoff reduces the number of observation too much, see Figure A.8 and Figure A.7.

<sup>21</sup>In governmental classification, 0-2 years is initial education and 3-5 is preschool (Profeco, 2004). Figure A.8 and A.7 show the frequency distribution of individuals of the second generation in three-generation households where a grandparent has died, by age of the oldest child.

in households with young children will lose their job after the death of the grandmother, but this effect would not be because of childcare, but because the grandmothers' firms closing.

I estimate the triple-difference effect by age bracket of the oldest child to test the validity of using an age cutoff before and after elementary school becomes compulsory. In this specification, the dummy variable for having a young child in the household,  $YoungChild_i$ , is replaced by 3 dummy variables indicating the age bracket of the oldest child in the household: (i) at most 3 years old,  $YoungChild_{i,l,1}$ , (ii) between 4-5,  $YoungChild_{i,l,2}$ , (iii) between 6-10,  $YoungChild_{i,l,3}$ . The omitted category is when the oldest grandchild is older than 10 and it is captured by  $\beta_1$ . The estimated equation is:

$$\begin{aligned}
Employed_{i,l,t} = & \beta_1 Post_{i,l,t} \times Death_{i,l}^{GM} + \sum_{k=1}^{k=3} \beta_{2,k} Post_{i,l,t} \times Death_{i,l}^{GM} \times YoungChild_{i,l,k} \\
& + \phi_i + \zeta_{l,t} + \gamma_{t,YoungChild} + \eta_{t,DeathGM} + \varepsilon_{i,l,t}
\end{aligned} \tag{2}$$

I use an event study design to test for common trends in employment prior to the grandmother's death in households with young children and in households with older children. This design also measures the persistence of the effect by including an estimate for each period after the death. The event study equation is built from Equation 1, but adds a time index  $s$ , which is the time relative to the death of the grandmother. Since each individual is observed for five periods,  $s \in \{-4, -3, -2, -1, 1, 2, 3, 4\}$ . The period  $s = -1$  is the omitted category. The estimated equation is the following:

$$\begin{aligned}
Employed_{i,l,t,s} = & \sum_{s=-4}^{s=4} \left( \beta_{1,s} Post_{i,l,t,s} \times Death_{i,l}^{GM} + \beta_{2,s} Post_{i,l,t,s} \times Death_{i,l}^{GM} \times YoungChild_{i,l} \right) \\
& + \phi_i + \zeta_{l,t} + \gamma_{t,YoungChild} + \eta_{t,DeathGM} + \varepsilon_{i,l,t}
\end{aligned} \tag{3}$$

If childcare availability and gender roles jointly contribute to the formation and persistence of the gender gap, the triple-difference negative effect on employment probability would be larger for mothers than for fathers. Equations 1 and 3 are modified to include a quadruple difference resulting on equations 4 and 5, where  $Mother_{i,l}$ , takes a value of 1 if the second generation individual is a mother. All fixed effects, except individual, are interacted with gender.

$$\begin{aligned}
Employed_{i,l,t} &= \beta_1 Post_{i,l,t} \times Death_{i,l}^{GM} + \beta_2 Post_{i,l,t} \times Death_{i,l}^{GM} \times YoungChild_{i,l} \\
&+ \beta_3 Post_{i,l,t} \times Death_{i,l}^{GM} \times Mother_{i,l} + \beta_4 Post_{i,l,t} \times Death_{i,l}^{GM} \times YoungChild_{i,l} \times Mother_{i,l} \\
&+ \phi_i + \zeta_{l,t,Gender} + \gamma_{t,YoungChild,Gender} + \eta_{t,DeathGM,Gender} + \varepsilon_{i,l,t}
\end{aligned} \tag{4}$$

$$\begin{aligned}
Employed_{i,l,t,s} &= \sum_{s=-4}^{s=4} (\beta_{1,s} Post_{i,l,t,s} \times Death_{i,l}^{GM} + \beta_{2,s} Post_{i,l,t,s} \times Death_{i,l}^{GM} \times YoungChild_{i,l} + \\
&\beta_{3,s} Post_{i,l,t,s} \times Death_{i,l}^{GM} \times Mother_{i,l} + \beta_{4,s} Post_{i,l,t,s} \times Death_{i,l}^{GM} \times YoungChild_{i,l} \times Mother_{i,l}) \\
&+ \phi_i + \zeta_{l,t,Gender} + \gamma_{t,YoungChild,Gender} + \eta_{t,DeathGM,Gender} + \varepsilon_{i,l,t,s}
\end{aligned} \tag{5}$$

Grandfathers are significantly less likely to provide childcare than grandmothers. While grandmothers provide almost 40 percent of total childcare, grandfathers are not even an explicit option in the ENES and fall on the category of other family members. Other family members provide in total close to 20 percent of childcare (see Figure A.1). The death of a grandfather is used as a placebo in the robustness section, where the specifications described in this section for the death of the grandmother are estimated for the death of a grandfather. If the triple-difference is indeed capturing the childcare availability mechanism, the triple-difference effect should not be present (or be smaller) when a grandfather dies, because a grandfather does not provide childcare as much nor as often as the grandmother.

## 4 Results

This section has three subsections. The first subsection presents the estimates for the sample of mothers belonging to the second generation in three-generation households. This section documents that (i) the death of the grandmother, through its impact on childcare (second difference), reduces the probability of being employed of mothers by 12 percentage points (27%), (ii) the effect is economically and statistically significant as long as the oldest child is not old enough to attend elementary school, (iii) the effect is persistent for at least 4 quarters after the death, (iv) mothers' income decreases 53% and hours worked decrease 30% — driven mostly by a reduction in the

extensive margin, and (v) the death of the grandmother, through its impact on childcare (second difference), reduces the probability of being employed for mothers by 15 percentage points more than for fathers (quadruple difference).

The second subsection documents that household substitute the grandmother-provided childcare after the grandmother’s death with a private daycare alternative if it is affordable. A one standard deviation lower private daycare cost in the locality mitigates the negative effect that the grandmother’s death has through childcare by 7 percentage points.

The third subsection documents that mothers who leave the labor force after the death of the grandmother: (i) worked full-time, (ii) contributed a significant share of household earned income, (iii) left the labor force regardless of their educational attainment, and (iv) were more affected if working in the informal sector.

#### 4.1 The Effect on Employment, Hours Worked, and Earned Income

The estimates of equation 1 are displayed in Panel A of Table 1. The results of the main specification, with individual, locality-year-quarter, young child-year-quarter, and grandmother died-year-quarter fixed effects (FE), are in column one: the death of the grandmother, through its impact on childcare, reduces mothers’ employment rate by 12.4 pp (p-value = .00005). Columns 2-11 display alternative specifications with different combinations of FE including household, age, gender, household composition, income, and education. The triple-difference estimates of the reduction in employment rate with the different combinations of FE range between 7.5 and 12.4 pp.

For the four quarters before the death of the grandmother, both mothers of children at most five years old and mothers of children older than five have a similar flat trend in their employment rate, which is not statistically different from its level in the quarter just before the grandmother’s death (see bottom of Figure 2). After the death of the grandmother, while there is no effect on mothers of older children, the employment rate of mothers of children five years old or younger declines between 11 and 17 percentage points for the next four quarters after the death. The difference between these two groups of mothers — the triple-difference effect — is statistically significant for the four periods after the death of the grandmother (see top of Figure 2). In the triple-difference figure (top of Figure 2), the omitted category is  $t = -1$ , hence this coefficient is not estimated. Similarly, plotting the two double differences (bottom of Figure 2),  $t = -1$  is the omitted category

and there is one additional coefficient for the older children households that is captured by the grandmother died-year-quarter fixed effect.<sup>22</sup> To not drop an additional estimate, an alternative is to replace the grandmother died-year-quarter fixed effect with grandmother died-year fixed effect. This estimation is plotted in Figure A.13 of the Online Appendix with almost identical results.

Relative to mothers of children older than 10 years, the death of the grandmother, through its impact on childcare, reduces the probability of being employed for mothers whose oldest child is at most 3 years old or between 4 and 5 years old by 15 and 12 percentage points, respectively (see Figure 3). The negative effect of the death of the grandmother fades away if the oldest child is old enough to attend elementary school or older. This exercise further validates the use of the oldest child being at most 5-years-old cutoff.

The shock to childcare availability also affects hours worked and earned income. The grandmother's death, through its impact on childcare, reduces weekly hours worked for mothers by 30% and earned income by 53% (see columns 1 and 2 of Table 2). These effects include both the intensive and extensive margin effect. The extensive margin is from mothers that went from employed to unemployed, and the intensive margin is from mothers that were always employed. Columns 3 and 4 of Table 2 display the results for the intensive margin – restricting to the sample of mothers with strictly positive income and hours worked. The effect through the intensive margin is a reduction in hours worked by 12% and in earned income by 26%, but both of these effects are not statistically significant. The results are consistent with a lack of flexibility in the labor market and mothers being pushed out of the labor market when losing the grandmother-provided childcare.

The motherhood penalty in Mexico, the difference in employment rate between women with children and without children, is 17, 22, and 14 percentage points at ages of twenties, thirties and forties, respectively (see top of Figure 1). This section's estimate of the effect of the grandmother's death, through its impact on childcare, is a 12 percentage points reduction in employment rate. Keeping preferences, socioeconomic constraints, gender roles, and discriminatory demand fixed, a reduction to childcare availability results in a reduction of mothers' employment by a magnitude larger than half the entire motherhood penalty.

If a lack of childcare availability and a parent-gender component are jointly contributing to the

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<sup>22</sup>If the triple-difference was not staggered (if all grandmothers had died in the same quarter), all the coefficients for the older children households would be captured by the grandmother died-year-quarter fixed effect (instead of one of them, when it is staggered).

formation of the gender gap in employment, the death of the grandmother, through its impact on childcare, would have a larger negative effect on mothers' employment than on fathers'. Panel B of Table 1 compares the triple-difference effect for fathers to that of mothers using a quadruple difference. The effect of the grandmother's death, through the childcare mechanism, is 14.7 pp larger reduction in employment rate for mothers than for fathers. Columns 2-11 contain estimates using different combinations of fixed effects; the results are consistent across specifications and the quadruple difference estimate ranges between 7.4 and 14.8 pp. For the four quarters before the death of the grandmother, the employment rate of each of the four subgroups (men and women in households with young and with older children) has a flat trend and is not statistically different from its level in the last period before the death, see Figure 4). After the death of the grandmother, only mothers in households where the oldest child is less than five years have an economically and statistically significant drop in employment rate. To not drop an additional estimate for the group of mothers and fathers in households with older children, an alternative is to replace the grandmother died-year-quarter fixed effect with grandmother died-year fixed effect. This estimation is plotted in Figure A.14 of the Online Appendix with almost identical results.

The findings are consistent with mothers having a greater share of the responsibility for childcare provision. The Mexican National Bureau of Statistics implicitly acknowledged these asymmetries. For example, in the ENESS, question 22 reads, “[w]hen the mother of [name of infant] goes to work, the infant stays with?” There is no equivalent question for when the father goes to work. Moreover, for the possible answers to this question, the grandmother is an explicit option, but it was not until the 2013 survey that the father was included as an explicit possible answer. Grandfathers have never been included as an explicit option (INEGI, 2009), (INEGI, 2013).

The gender gap in employment in Mexico, the difference in employment rate between women and men, is at its maximum size during ages twenties, thirties, and forties, ranging between 24 and 30 percentage points (see Figure 1). This section's estimate of the differential effect on employment across genders of the grandmother's death, through its impact on childcare, is 15 percentage points. The evidence suggest that more than half of the gender gap in employment in the Mexican status quo is driven by the availability of childcare. The next section investigates if households substitute grandmother-provided childcare with alternative childcare after the death of the grandmother.

## 4.2 Substituting Grandmother’s Childcare

This section documents that households replace the lost grandmother-provided childcare with a private alternative when it is affordable. To create a measure of daycare affordability, I average the hourly cost and total cost of daycare in the locality using data from the ENESS.<sup>23</sup> If the cost of daycare is strongly correlated with other variables, such as income, there is a risk that instead capturing heterogeneity by daycare cost, I capture heterogeneity by income. To address this concern, this section introduces a measure of daycare cost that is not driven by the average income, size, or share of working mothers of the locality.

To construct this measure, I regress the locality,  $l$ , average cost of daycare (either public or private) on the locality’s average income, share of employed mothers, and size, using the following estimating equation:<sup>24</sup>

$$Cost_l = \beta_0 + \beta_1 AverageIncome_l + \beta_2 ShareEmployedMothers_l + Size_l + \epsilon_l \quad (6)$$

The residual of the previous estimation is the measure daycare cost that is not explained by income, mothers’ employment rate, and locality size.

There are two issues with the public daycare cost measure: lack of price variation and capacity constraints (no vacancies) (Huerta, 2011). Public daycare is mostly free: more than one fourth of the localities have an average cost of 0, and 96 percent of them have an hourly average cost below 0.33 USD.<sup>25</sup> Moreover, even if there was price variation for public daycare, it might not necessarily be a measure of how accessible it is because of there being no vacancies. On the other hand, private daycare price has more variation because it is unregulated.<sup>26</sup>

To test whether households replace grandmothers’ childcare with public or private daycare, the interactions of Equation 1 are multiplied by the standardized measure of childcare cost. The estimating equation is the following:

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<sup>23</sup>A locality in Mexico is any place in the country with one or more dwellings, inhabited or not, this place must be recognized by a name given by law or custom (INEGI, 2018). According to the 2010 Population Census, there are 3,647 urban localities (more than 2,500 inhabitants), with an average number of inhabitants of 23,656.

<sup>24</sup>Public daycare is provided by governmental institutions: IMSS, ISSSTE, SEDESOL, and DIF. Locality size is captured by 3 dummy variables. The ENOE splits the locality in four groups by population size: less than 2,500, between 2,500 and 14,999, between 15,000 and 99,999, and 100,000+.

<sup>25</sup>The exchange rate used to calculate is: 1USD = 15 MXN

<sup>26</sup>There were less than 8 percent of localities with an average private daycare cost of 0, and 70 percent have average hourly cost above 0.33 USD.



$$\begin{aligned}
Employed_{i,l,t} = & \beta_1 Post_{i,l,t} \times Death_{i,l}^{GM} + \beta_2 Post_{i,l,t} \times Death_{i,l}^{GM} \times YoungChild_{i,l} \\
& + \beta_3 Post_{i,l,t} \times Death_{i,l}^{GM} \times ChildcareCost_l \\
& + \beta_4 Post_{i,l,t} \times Death_{i,l}^{GM} \times YoungChild_{i,l} \times ChildcareCost_l \\
& + \phi_i + \zeta_{l,t} + \gamma_{t,YoungChild} + \eta_{t,DeathGM} + \varepsilon_{i,l,t}
\end{aligned} \tag{7}$$

Where all the variables are the same as in Equation 1, and  $ChildcareCost_l$  is the standardized average cost of private or public daycare in locality  $l$  (which could be the observed or the residual cost). Table 3 presents the estimates of equation 7. Columns 1-4 use the observed measure of childcare cost; columns 5-8 use the residual measure of childcare cost. Columns 1, 3, 5, and 7 use private daycare cost, and columns 2, 4, 6, and 8 use public daycare cost. Columns 1, 2, 5, and 6 use the hourly cost, and columns 3, 4, 7, and 8 use the total cost.

The results are consistent with households, after the death of the grandmother, replacing grandmother-provided childcare with private daycare if it is affordable: a one standard deviation lower average private daycare cost in the locality's average mitigates the negative effect on employment of the death of the grandmother by 7 percentage points. The results are robust to using the actual and the residual cost measure. The result is also robust to using the hourly cost and the total cost. There is no equivalent effect for public daycare. Across the eight columns, the effect of the death of the grandmother, through its impact on childcare, on mothers' employment rate is very close to the main estimate in Table 1, where the cost of daycare is not included. As expected, the hourly cost of daycare has no effect on mothers' employment after the grandmother died when the oldest child in the household is older than 5. Increasing daycare availability, specially low cost or for free, can, as a stand alone policy, increase female employment and contribute to closing the gender gap.

### 4.3 The Mothers who left the labor force

This section describes the mothers who left the labor force due to the shock in childcare availability caused by the death of the grandmother. The mothers who stopped working were mostly working full-time, between 40 and 60 hours per week (see Figure 5). This is consistent with a labor market

that lacks flexibility: mothers that were employed full-time left their jobs instead of switching to part-time employment.

Mothers leave the labor force irrespective of their education level. Overall, more educated mothers are more likely to be employed, but the probability of being employed after the grandmother dies is reduced for both mothers with and without high school education (see top of Figure A.10) and with and without college education (see bottom of Figure A.10). The mothers who left the labor force were mostly earning between 10 and 60 percent of the household’s income, but 25% of the mothers who left the labor force were earning more than 90% of the total earned household income before the grandmothers died (see Figure A.12).<sup>27</sup> This finding displays how binding childcare availability can be in a context of strong gender roles.

The negative effect for mothers working in the informal sector is greater than for those in the formal sector (see Figure A.11).<sup>28</sup> The result could be driven by mothers in the informal sector relying more on grandmother-provided childcare, or by mothers in the formal sector having additional childcare alternatives that allow them to substitute to after the death of the grandmother. In Mexico, being employed in the formal sector allows mothers to use the daycare facilities of the Mexican Social Security Institute, but due to capacity constraints, it is often the case that there are no vacancies for children.

## 5 Robustness

This section is divided in two subsections: (i) alternative specifications, and (ii) a grandfather’s death. The first subsection includes variations to the main specification: estimating a double-difference only with the sample of parents who lived in a household where the grandmother died, using only the deaths of young grandmothers, broadening the definition of employment, using an unbalanced panel, not restricting the maximum number of grandparents in a household, using the age of the youngest child instead of the oldest, and not restricting the maximum number of grandparents in a household. The results are robust to all these alternative specifications. Since a grandfather is significantly less likely to provide childcare, the effect of a grandfather’s death,

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<sup>27</sup>The earned household income is weakly lower than total income. It does not include, for example, transfers from family members or government

<sup>28</sup>This paper uses the definition of formality used by the Mexican Statistical Agency (INEGI), see footnote 11 for definition.

through its impact on childcare, should be smaller (if any); this is documented empirically in the second subsection.

## 5.1 Alternative Specifications

Table 4 contains the main specification and nine alternative specifications. The results are robust to all these alternative specifications. The triple difference effect for the death of the grandmother on mothers, through childcare, ranges between a reduction of 8.7 to 16.3 percentage points in the employment rate, and the quadruple difference effect (the additional effect on mothers relative to fathers) ranges between an additional reduction of 6.0 to 21.2 percentage points.<sup>29</sup> Column 2 replicates the main estimation but removes the restriction of observing the household five times. Instead of only including households with at most one grandmother and one grandfather, Column 3 allows for any number of first-generation individuals. Instead of only including households with at most one mother and one father, Column 4 allows for any number of fathers and mothers in the household. Column 5 broadens the definition of employed to also include employers, working on your own, and unpaid jobs. Column 6 broadens the definition of employed to also include employers and working on your own.

To disentangle the effect that the grandmother’s death has through its impact on childcare from alternative mechanisms, the empirical strategy splits parents by the age of the oldest child. Alternatively, it is possible to use the age of the youngest child. One disadvantage of using the age of the youngest child is that the analysis would not restrict the presence of older children, who could provide childcare. Column 7 replicates the analysis but using the age of the youngest child instead of the oldest. The results are robust to using the oldest or youngest child’s age, but as expected, since the specification of the youngest child allows for an additional childcare alternative (siblings), the effects are smaller.

Throughout the paper, all the observed deaths of grandmothers are used to identify the effect of childcare availability on parents employment rate. Alternatively, I could use only the deaths of young grandmothers, whose death might be more unexpected. Columns 7 and 8 replicate the main estimation but using only the deaths of grandmothers at most 60 and 70 years old.

One of the three differences used in the triple-difference estimation, is comparing parents in

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<sup>29</sup>The ranges are for all specifications where the age of the oldest child is used as cutoff.

households where the grandmother died vs households where she did not. Alternatively, I could estimate a double-difference in the sample where the grandmother died (before vs after the death and young vs old children). A disadvantage of this alternative is the loss of precision from not estimating as precisely the time effects. Column 10 contains the double-difference estimations; the results are consistent with the estimates from the main specification.

## 5.2 The Grandfather's Death

Since a grandfather is less likely to provide childcare, the effect of the death of a grandfather, through its impact on childcare, should be smaller, if any. Top of Figure 6 displays the triple-difference estimates of Equation 3, but using a grandfather's death instead of the grandmother's. The death of a grandfather has no effect, through the childcare mechanism, on the employment rate of mothers.

## 6 Conclusion

Reducing the gender gap and the motherhood penalty in employment is a critical challenge in labor markets across the globe. Even though the gaps and their relationship with motherhood are well documented, we know less about the relative importance of each mechanism and its causal effect on employment. Innovative identification strategies, including natural experiments, allow researchers to disentangle the role of individual mechanisms in the formation of the gender gap.

This paper uses panel data, a natural experiment, and both a triple and a quadruple difference to estimate the effect of childcare availability on parents' employment rate. The evidence is consistent with the main driver of the gender gap and the motherhood penalty in labor force participation in Mexico being the combination of the lack of childcare availability and gender-asymmetric responsibility for childcare provision. A grandmother's death, through its impact on childcare availability, reduces the employment rate by 15 percentage points more for mothers than for fathers. This magnitude accounts for more than a half of the gender gap in employment in Mexico. Moreover, the death of the grandmother, through its impact on childcare, reduces the employment rate of mothers by 12 percentage points (27 percent); the effect accounts for more than half the entire motherhood penalty in Mexico. Even without changing preferences, socioeconomic constraints, and gender roles, increasing childcare availability can drastically reduce both the motherhood penalty

and the gender gap.

In the short term, increasing the availability of childcare can have a significant effect on increasing mothers' labor force participation, which in turn can contribute to reshaping gender roles in the long term. Working women today can increase the opportunities for working women tomorrow by changing societal gender attitudes and perceptions, and by increasing the aspirations and educational attainment for girls.<sup>30</sup>

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<sup>30</sup>[Beaman et al. \(2009\)](#) finds that exposure to a female chief councilor improves perceptions of female effectiveness as leaders and weakens gender-roles stereotypes in the public and domestic spheres. [Beaman et al. \(2012\)](#) finds that female leadership in village councils raises the aspirations and educational attainment for girls in India.

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## 7 FIGURES

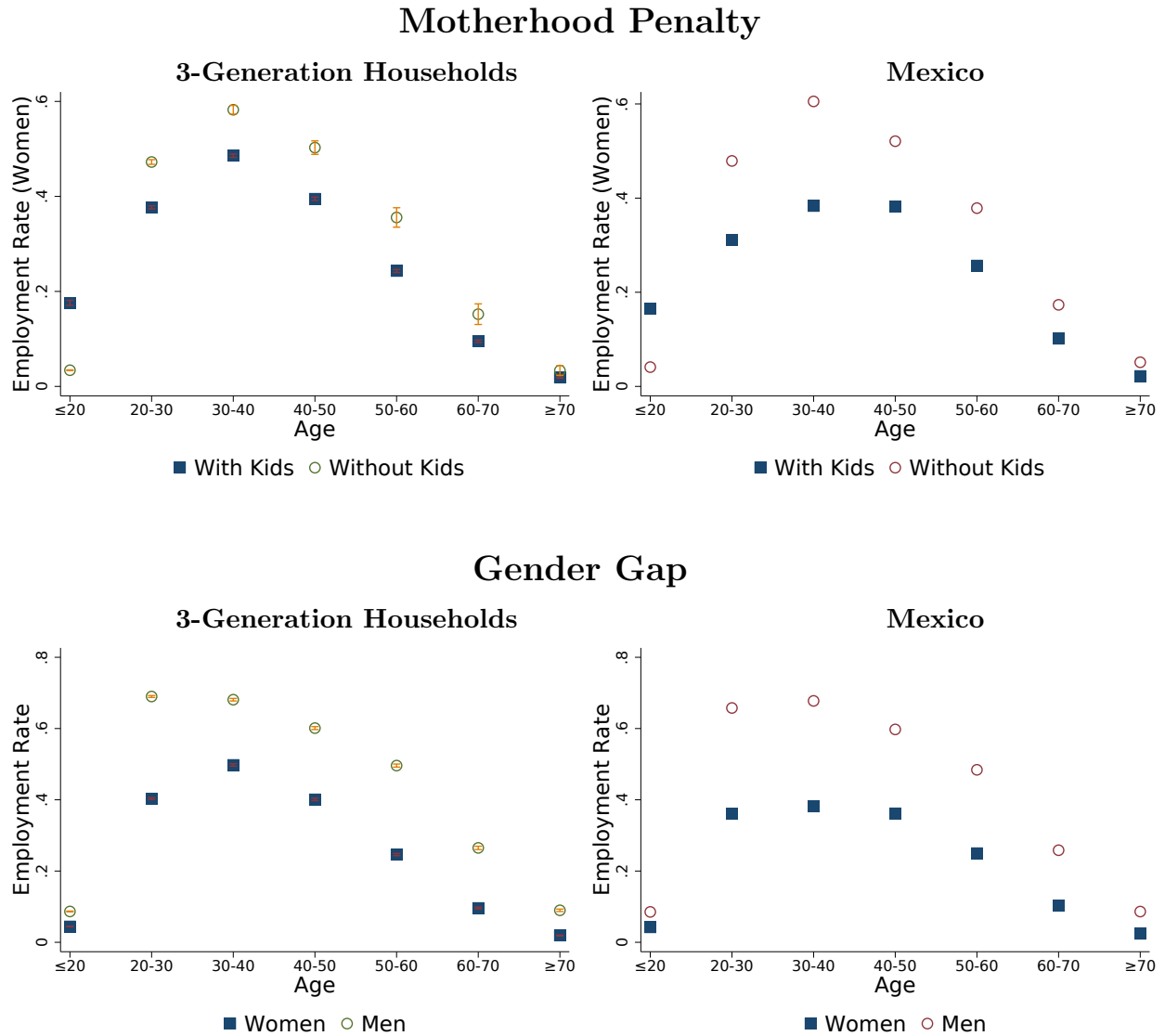


Figure 1: The Motherhood Penalty and the Gender Gap

Source: ENOE (Q1 2005 - Q1 2020)

Note: The graph displays the employment rate by age. The figures on the left include only three-generation households. The figures on the right include the full sample and use probability weights to obtain country-level representation. The figures on the top compare women with children to women without them. The figures on the bottom compare men to women.

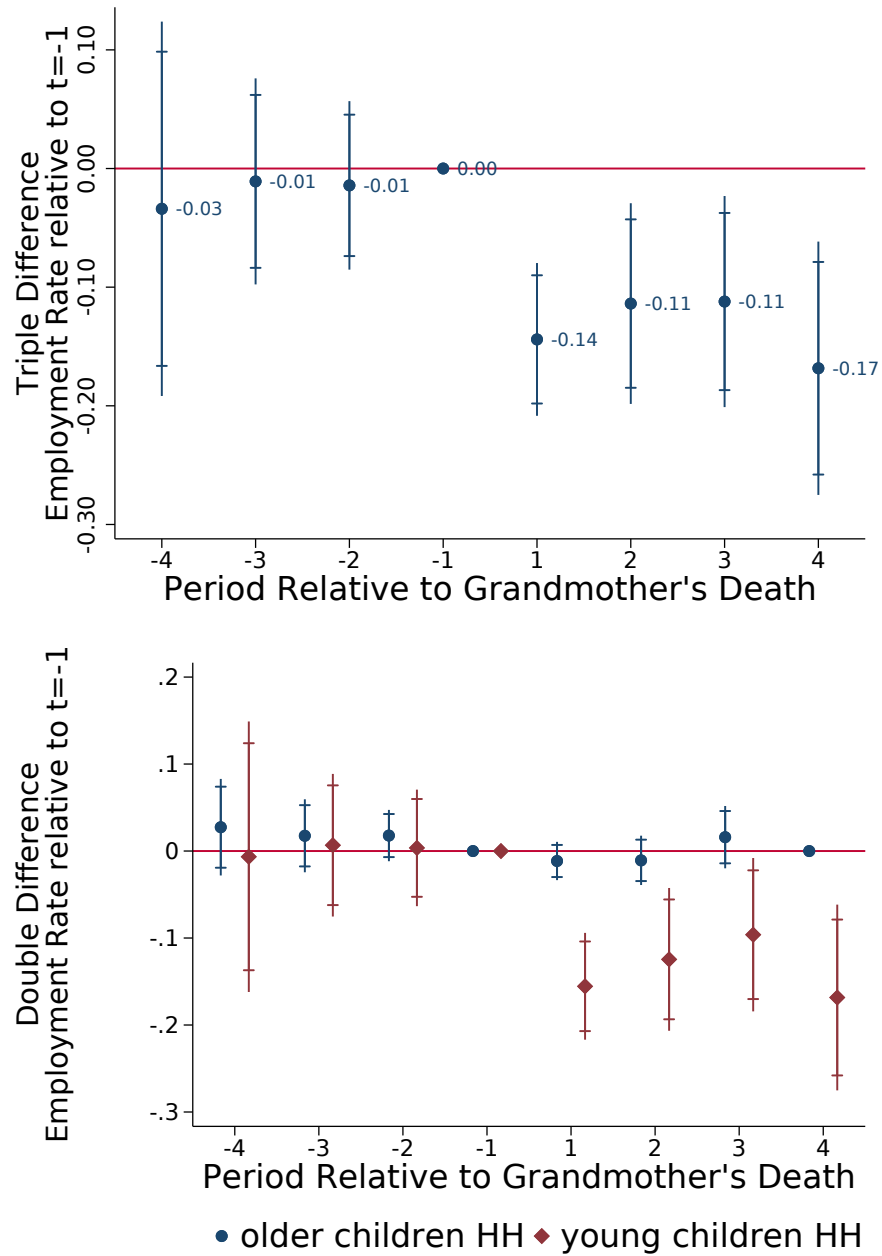


Figure 2: Event Study - Grandmother's Death and Mothers' Employment

Note: The graph displays the point estimate and the 90% and 95% confidence interval of the effect of the death of a grandmother on employment for mothers by quarter relative to the quarter just before the death, estimated using Equation 3. A household with young children is a household where the oldest child is at most 5 years old. The chart on the top is the double difference estimate, and the chart on the bottom is the first difference estimate. The sample includes mothers between 20 and 50 years old and living in three-generation household with five observations in the panel, one grandmother or one grandfather or both, the grandmother is at least forty years old, the oldest grandchild is at most thirty years old, the first generation is weakly older than the second generation, and the second generation is weakly older than the third generation. Standard errors are clustered at the household level.

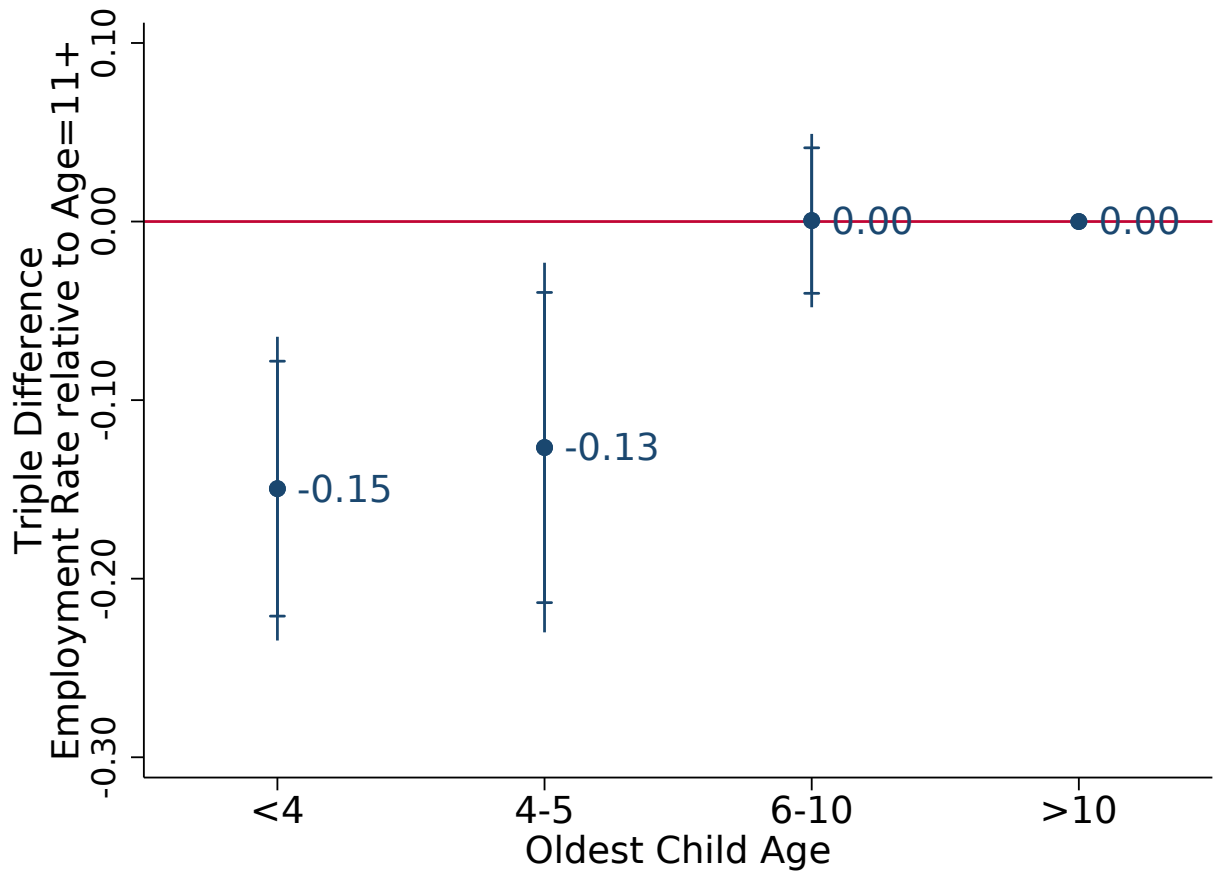


Figure 3: Grandmother’s Death and Mothers’ Employment by Age of the Oldest Child

Note: The graph displays the point estimate and the 90% and 95% confidence intervals of the additional effect that the death of a grandmother has on mothers’ employment rate by age of the oldest child in the household relative to when the oldest child in the household is older than 10. The plotted coefficients are  $\beta_{2,1}$ ,  $\beta_{2,2}$ ,  $\beta_{2,3}$  of Equation 2. The same sample as in Figure 2 is used. Standard errors are clustered at the household level.

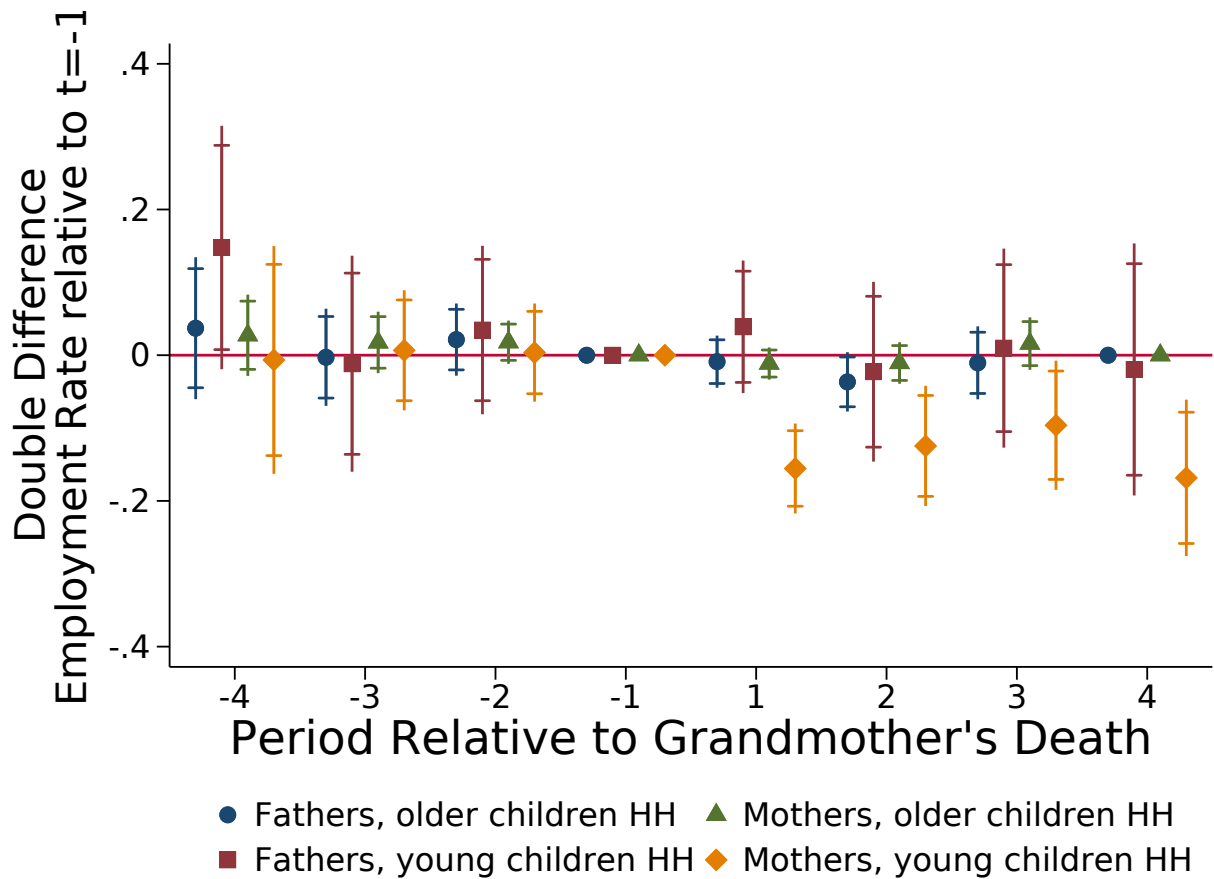


Figure 4: Event Study of Grandmother's Death (Mothers) for Mothers and Fathers

Note: The graph displays the point estimate and the 90 and 95% confidence interval of the effect that the death of a grandmother has on the employment rate for mothers and fathers estimated using Equation 5. A household with a young children is a household where the oldest child is at most 5 years old. The confidence intervals are computed using standard errors clustered at the household-level. The sample includes mothers and fathers between 20 and 50 years old and living in three-generation household with five observations in the panel, one grandmother or one grandfather or both, the grandmother is at least forty years old, the oldest grandchild is at most thirty years old, the first generation is weakly older than the second generation, and the second generation is weakly older than the third generation. Mothers are identified by belonging to the second generation and having children, and fathers are identified by belonging to the second generation and being married or cohabiting with their spouse.

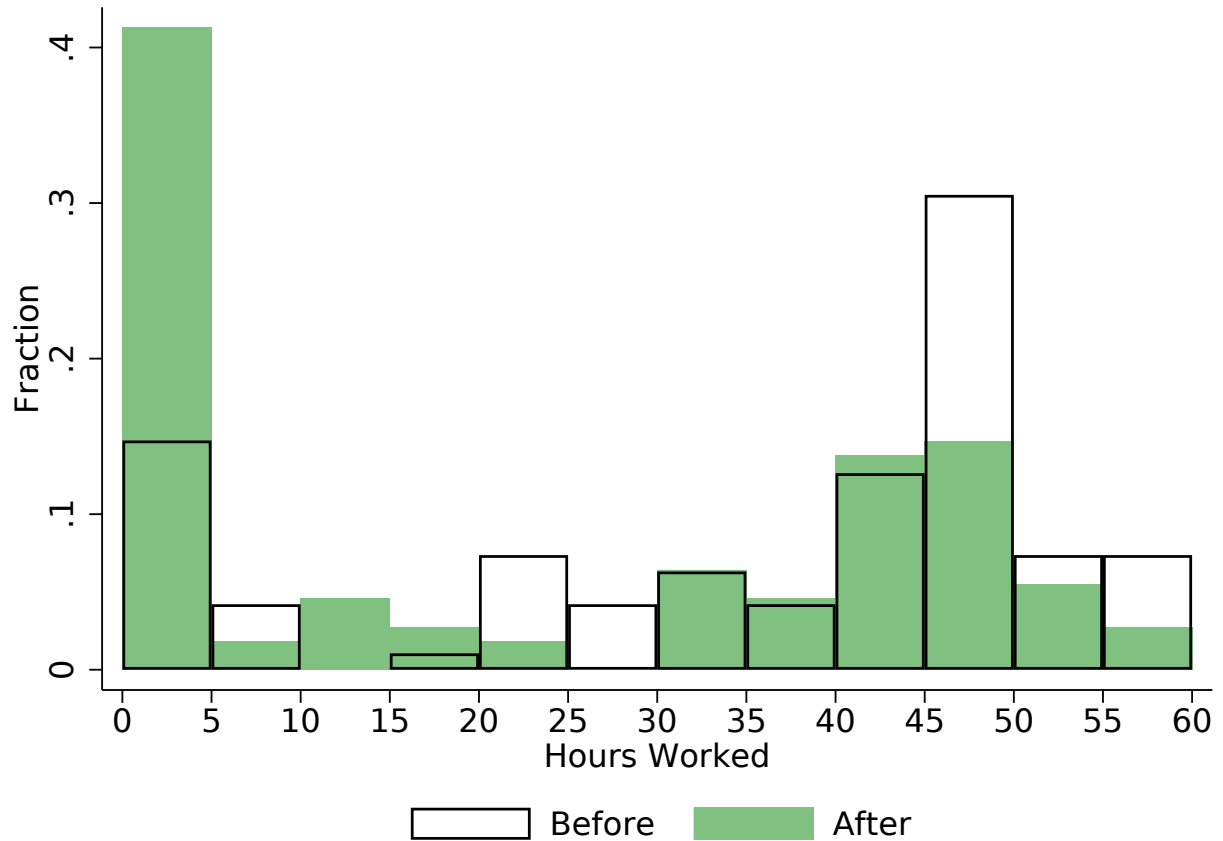


Figure 5: Mothers' Hours Worked Before and After the Grandmother's Death

Note: The sample includes mothers living in households where the grandmother died, the oldest child is at most 5 years old, and that were employed in the first survey period. Before(After) includes the observations before(after) the death of the grandmother. Hours worked are winsorized at the 5% level

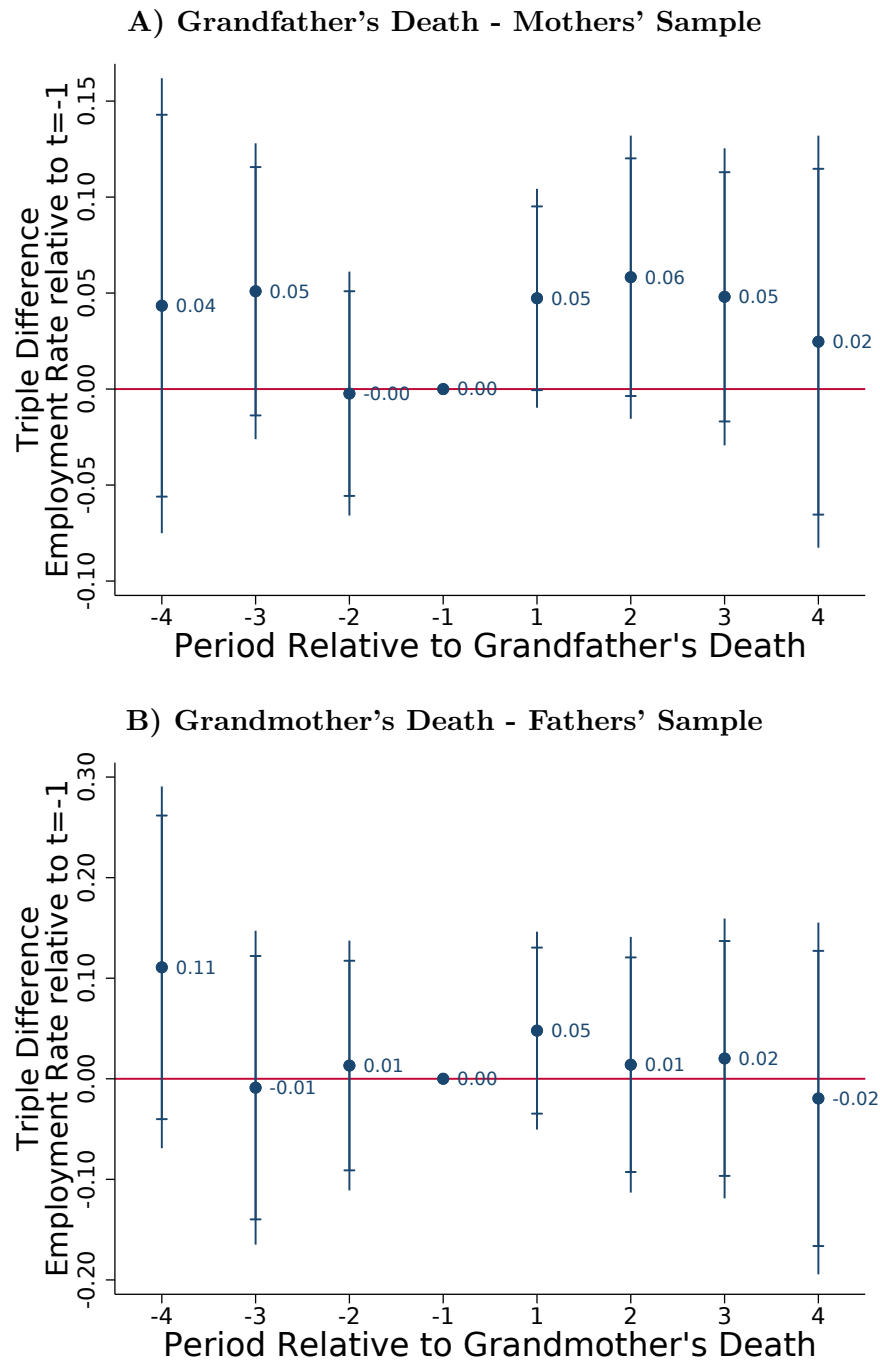


Figure 6: Event Study of Grandfather's Death (Mothers) and Grandmother's Death (Fathers)

Note: The top (bottom) graph displays the point estimate and the 90 and 95% confidence interval of the effect that the death of a grandfather (grandmother) has on the employment rate of mothers (fathers) by period relative to the period just before the death. A household with a young children is a household where the oldest child is at most 5 years old. Standard errors are clustered at the household level. The same sample as in Figure 4 is used.

# 8 TABLES

Table 1: Grandmother's Death and Employment Rate

Panel A) Mothers											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Post x Grandmother died	-0.0154 (0.0133)	-0.0223* (0.0123)	-0.0159 (0.0133)	0.00740 (0.00960)	-0.0172 (0.0120)	0.00642 (0.00959)	-0.0175 (0.0120)	0.00355 (0.00852)	-0.00990 (0.00848)	-0.0290** (0.0140)	-0.0307** (0.0151)
Post x Grandmother died x Oldest grandchild at most 5 years old	-0.124*** (0.0307)	-0.107*** (0.0278)	-0.121*** (0.0307)	-0.122*** (0.0313)	-0.0916*** (0.0279)	-0.118*** (0.0312)	-0.0888*** (0.0278)	-0.0905*** (0.0281)	-0.0870*** (0.0280)	-0.0798*** (0.0401)	-0.0754* (0.0427)
N	484,464	484,464	484,464	484,464	484,464	484,464	484,464	484,464	484,464	484,244	484,464
Panel B) Mothers and Fathers											
Post x Grandmother died	-0.00971 (0.0219)	-0.00930 (0.0211)	-0.00428 (0.0219)	0.0201 (0.0153)	-0.0104 (0.0204)	0.0318** (0.0153)	-0.00519 (0.0204)	0.0161 (0.0137)	-0.0221 (0.0186)	-0.00131 (0.0186)	0.00266 (0.0189)
Post x Grandmother died x Oldest grandchild at most 5 years old	0.0232 (0.0418)	0.0267 (0.0371)	-0.0116 (0.0416)	0.0265 (0.0423)	0.0381 (0.0344)	-0.00869 (0.0422)	0.00567 (0.0344)	0.0412 (0.0354)	0.0102 (0.0353)	-0.00233 (0.0475)	-0.00179 (0.0474)
Post x Grandmother died x Mother	-0.00569 (0.0252)	-0.0130 (0.0243)	-0.0116 (0.0252)	-0.0127 (0.0183)	-0.00682 (0.0234)	-0.0254 (0.0183)	-0.0123 (0.0234)	-0.0125 (0.0163)	0.0122 (0.0162)	-0.0277 (0.0234)	-0.0333 (0.0244)
Post x Grandmother died x Oldest grandchild at most 5 x Mother	-0.147*** (0.0489)	-0.134*** (0.0431)	-0.109** (0.0486)	-0.148*** (0.0492)	-0.130*** (0.0405)	-0.110** (0.0490)	-0.0945** (0.0404)	-0.132*** (0.0413)	-0.0973** (0.0411)	-0.0774 (0.0595)	-0.0736 (0.0625)
N	743,733	743,733	743,733	743,733	743,733	743,733	743,733	743,733	743,733	743,215	743,733
Individual FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	-	-
Year - Quarter - Locality - Gender FE	Y	-	Y	Y	-	Y	-	-	-	Y	Y
Year - Quarter - Young Child - Gender FE	Y	Y	-	Y	Y	-	-	Y	-	-	-
Year - Quarter - Grandmother Died - Gender FE	Y	Y	Y	Y	Y	-	Y	-	-	-	-
Year - Locality - Gender FE	-	Y	-	-	-	-	-	-	-	-	-
Age - Gender FE	-	-	-	-	-	-	-	-	-	Y	-
Household composition - Gender FE	-	-	-	-	-	-	-	-	-	Y	-
Household income - Gender FE	-	-	-	-	-	-	-	-	-	Y	-
Education - Gender FE	-	-	-	-	-	-	-	-	-	Y	-

Note: All models estimate the coefficients of lower level interactions if they are not captured by the fixed effects. The sample includes “mothers” and “fathers” of the second generation between 20 and 50 years of age living in three-generation households: females with children are classified as mothers and males that are married or cohabiting are classified as fathers. The Age x Gender fixed effect (FE) uses 5-year age brackets. The HH Composition FE is the interaction of the number of members in the second generation, in the third generation, and in the household. GF age and GM age are the Grandfather and Grandmother age FE. Income FE is the decile of per capita family income. The Education x Gender FE is the maximum level of education interacted by gender. Households included in the sample have 5 observations, one grandmother or one grandfather or both, the grandmother is at least forty years old, the oldest grandchild is at most thirty years old, the first generation is weakly older than the second generation, and the second generation is weakly older than the third generation. Standard errors are clustered at the household level. The number of stars indicates the significance level at which the coefficient is statistically significant: .01, .05, and .1 for three, two, and one stars respectively. [Correia \(2016\)](#) is used to estimate high-dimensional FE.



Table 2: Grandmother's Death, Earned Income, and Hours Worked

	Intensive + Extensive Margin		Intensive Margin	
	(1)	(2)	(3)	(4)
	Hours Worked	Earned Income	Hours Worked	Earned Income
Post grandmother death	0.00306 (0.0718)	0.0145 (0.151)	0.0357 (0.0578)	0.132 (0.107)
Post grandmother death x oldest grandchild at most 5 years old	-0.355** (0.164)	-0.763** (0.339)	-0.127 (0.106)	-0.296 (0.180)
Dif-in-Dif $\Delta\%$	-29.883	-53.373	-11.927	-25.621
N	393,456	393,456	123,942	123,942

Note: The table displays the marginal effect that the death of a grandmother has on the inverse hyperbolic sine of earned income and hours worked. For columns 1 and 2 only observations with either both strictly positive hours worked and earned income or both hours worked and earned income equal to zero are included. Columns 3 and 4 observations with strictly positive hours worked and earned income. The percentage changes are obtained by exponentiating of the coefficient and subtracting one. This approximation relies on  $\exp(\operatorname{arcsinh}(x)) \approx 2x$  for large values of  $x$ . Hours worked and income are winsorized at the 5% level from each tail. Standard errors clustered at the household level.

Table 3: Substituting Grandmother's Childcare

	Observed				Residual			
	Hourly Cost		Total Cost		Hourly Cost		Total Cost	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post grandmother death	-0.0164 (0.0165)	-0.0144 (0.0154)	-0.0157 (0.0165)	-0.0144 (0.0153)	-0.0165 (0.0165)	-0.0144 (0.0154)	-0.0159 (0.0165)	-0.0144 (0.0154)
Post x Grandmother Died x Oldest Grandchild at most 5 years old	-0.112*** (0.0364)	-0.122*** (0.0353)	-0.114*** (0.0372)	-0.122*** (0.0354)	-0.112*** (0.0365)	-0.122*** (0.0352)	-0.114*** (0.0373)	-0.122*** (0.0353)
Post x Grandmother Died x Cost of private daycare	-0.000337 (0.0145)		0.00636 (0.0149)		-0.00360 (0.0145)		0.00424 (0.0142)	
Post x Grandmother Died x Oldest Grandchild at most 5 years old x Cost of private daycare	-0.0697** (0.0351)		-0.0611* (0.0363)		-0.0721* (0.0372)		-0.0651* (0.0373)	
Post x Grandmother Died x Cost of public daycare		0.000478 (0.0118)		0.00187 (0.0113)		-0.000839 (0.0114)		-0.000584 (0.0108)
Post x Grandmother Died x Oldest Grandchild at most 5 years old x Cost of public daycare		-0.00683 (0.0400)		-0.00268 (0.0385)		-0.00548 (0.0371)		-0.000654 (0.0355)
N	317,239	355,928	317,239	355,928	317,239	355,920	317,239	355,920
Individual FE	Y	Y	Y	Y	Y	Y	Y	Y
Locality-Year-Quarter FE	Y	Y	Y	Y	Y	Y	Y	Y
Household-level clustered SE	Y	Y	Y	Y	Y	Y	Y	Y
# of localities to estimate residuals	-	-	-	-	219	511	219	511

Note: The table displays the marginal effect that the death of a grandmother has on the probability of a mother being employed, estimated using Equation 7. The number of stars indicates the significance level at which the coefficient is statistically significant: .01, .05, and .1 for three, two, and one stars respectively. Standard errors are clustered at the locality level.

Table 4: Effect on Employment Probability: Alternative Specifications

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Base	Unbalanced	Any # of	Any # of	Any # of	Any type of	Any paid	Grandmother	Grandmother	Youngest	DiD
		grandparents	parents	work	work	work	≤ 60	≤ 70	≤ 5	
<b>Panel A) Mothers</b>										
Post x Grandmother died	-0.0154 (0.0133)	-0.0216* (0.0126)	-0.0150 (0.0130)	-0.0270** (0.0123)	0.00309 (0.0163)	0.00317 (0.0158)	-0.0263 (0.0290)	-0.0303* (0.0172)	-0.0155 (0.0146)	0.0131 (0.0283)
Post x Grandmother died x Oldest grandchild at most 5 years old	-0.124*** (0.0307)	-0.0986*** (0.0273)	-0.129*** (0.0306)	-0.100*** (0.0285)	-0.0909** (0.0371)	-0.101*** (0.0356)	-0.163*** (0.0548)	-0.137*** (0.0369)	-0.0381** (0.0191)	-0.161** (0.0672)
N	484,464	561,129	488,296	620,182	484,464	484,464	484,464	484,464	484,464	2,561
<b>Panel B) Mothers and Fathers</b>										
Post x Grandmother died	-0.00971 (0.0219)	0.00449 (0.0208)	-0.00520 (0.0218)	-0.00313 (0.0215)	0.000665 (0.0170)	-0.00409 (0.0180)	-0.0308 (0.0396)	-0.0237 (0.0260)	-0.0286 (0.0242)	-0.000486 (0.0433)
Post x Grandmother died x Oldest grandchild at most 5 years old	0.0232 (0.0418)	0.0200 (0.0395)	0.0244 (0.0422)	0.0337 (0.0383)	0.0198 (0.0341)	0.00551 (0.0356)	0.00390 (0.0739)	0.0754 (0.0478)	0.0445 (0.0284)	0.0298 (0.0957)
Post x Grandmother died x Mother at most 5 years old	-0.00569 (0.0252)	-0.0261 (0.0240)	-0.00977 (0.0251)	-0.0239 (0.0242)	0.00242 (0.0232)	0.00726 (0.0238)	0.00449 (0.0507)	-0.00656 (0.0315)	0.0131 (0.0284)	0.0136 (0.0507)
Post x Grandmother died x Oldest grandchild at most 5 x Mother	-0.147*** (0.0489)	-0.119*** (0.0454)	-0.154*** (0.0499)	-0.134*** (0.0451)	-0.111** (0.0487)	-0.107** (0.0495)	-0.167* (0.0862)	-0.212*** (0.0568)	-0.0826** (0.0340)	-0.190* (0.103)
N	743,733	861,578	749,876	933,831	743,733	743,733	743,733	743,733	743,733	3,591
Individual FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year - Quarter - Young Child - Gender FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year - Quarter - GM Died - Gender FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year - Quarter - Locality - Gender FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Note: The table displays the marginal effect of the death of a grandmother on the employment rate of mothers (Panel A) and the employment rate of mothers and fathers (Panel B). Column 1 is the main specification. Column 2, Unbalanced, the restriction of observing the household for five surveys is dropped. Column 3, Any number of grandparents, allows for any number of members of the first generation of the household. Column 4, any number of parents, allows for any number of members of the second generation of the household. In Column 5, Any Work, the dependent variable takes the value of one if the individual is a subordinate and paid employee, an employer, works on his/her own, or works without pay. In Column 6, Any paid Work, the dependent variable takes the value of one if the individual is a subordinate and paid employee, an employer, or works on his/her own. In Column 7 and 8, In Column 9, Youngest ≤ 5, the dummy Young Children takes the value of 1 in the youngest child in the household is at most 5 years old. The number of stars indicates the significance level at which the coefficient is statistically significant: \*0.1, \*\*0.05, and \*\*\*0.01 for three, two, and one stars respectively. The numbers in parenthesis are the standard errors clustered at the household-level.

## 9 Online Appendix

Table A.1: Mothers in 2 vs 3-Generation Households

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Employed		Years of Schooling	Highschool+	College+	Income (NL)	Hours Worked
3-Generation Household	0.112*** (0.00144)	0.0261*** (0.00151)	0.104*** (0.0193)	0.0232*** (0.00243)	-0.0214*** (0.00215)	-0.0372*** (0.00348)	1.433*** (0.0875)
Mean Dependent Variable	0.36		11.15	0.56	0.26	8.30	39.09
Sample	All	All	Employed	Employed	Employed	Employed	Employed
Sample Size	747,735	745,322	258,577	258,928	258,928	206,038	206,038
Controls							
Locality x Quarter FE	Y	Y	Y	Y	Y	Y	Y
Education FE		Y				Y	Y
Age FE		Y				Y	Y
Marital Status FE		Y				Y	Y
# of Children FE		Y				Y	Y

Note: The table displays the differences between mothers that live in two-generation households and those that live in three-generation households. Mothers of ages between 20 and 50 living in households where the oldest member of the youngest generation is less than 30-years-old are included. The employed sample includes only mothers that are employed and have strictly positive income and hours worked.

## 9.1 Online Appendix Figures

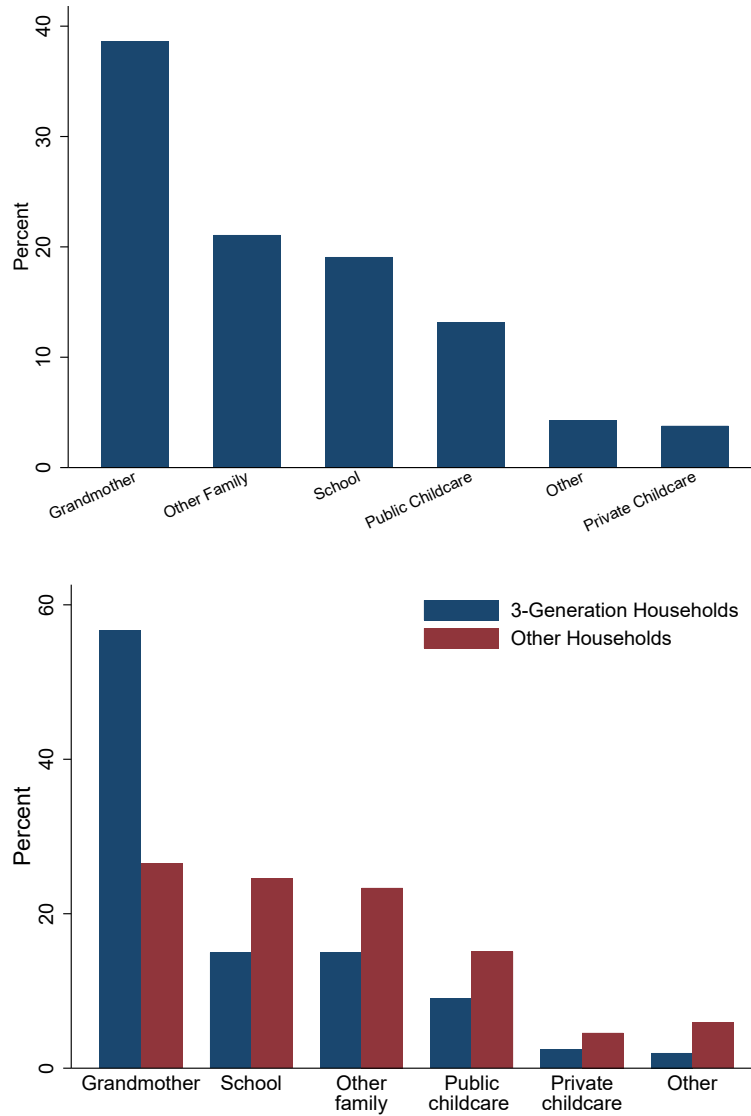
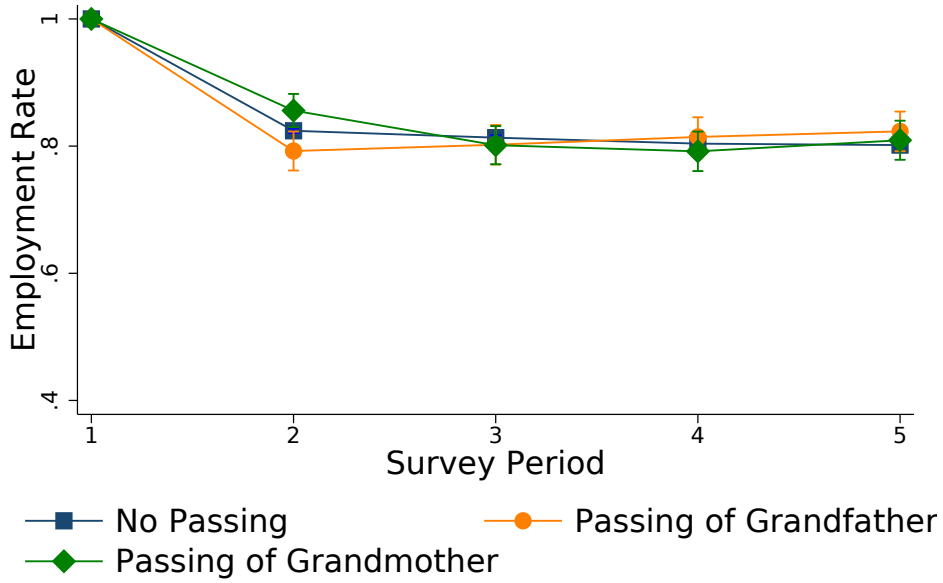


Figure A.1: When the mother goes to work, who takes care of the child?

Source: ENES 2009, ENES 2013

Note: The surveys include responses for children between age 0 and 6 years. Other includes non-family members and leaving the child alone. Children that go with their mothers to work or whose mothers do not work are not included.

(A) Three-Generation Households: Oldest child at least 6 years old



(B) Three-Generation Households: Oldest child at most 5 years old

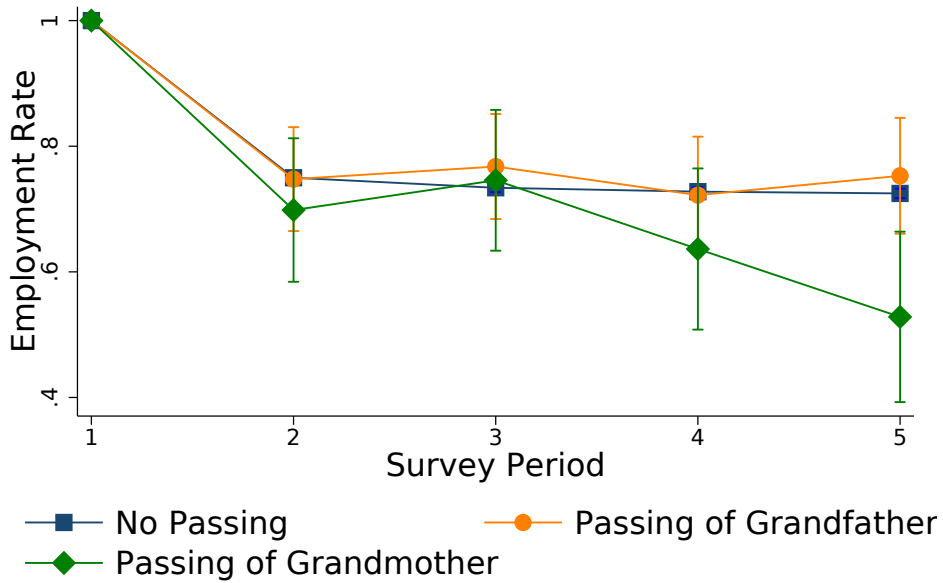


Figure A.2: Mothers' Employment Rate and the Death of Grandparents

Source: ENOE (Q1 2005 - Q1 2020)

Note: The graphs display the probability being employed for mothers who were employed in the first survey period. Mothers are divided in three groups: (i) no grandparent died in the household, (ii) the grandfather died between period 1 and 5, and (iii) the grandmother died between period 1 and 5.

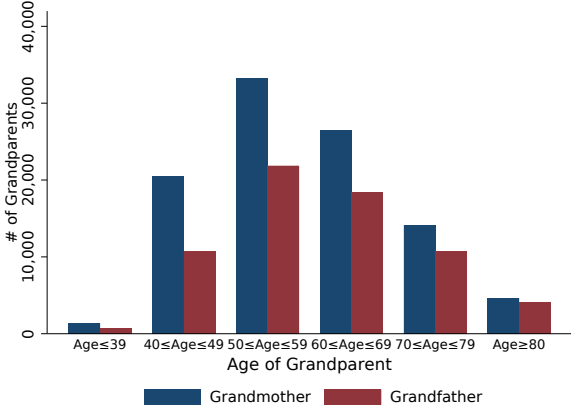


Figure A.3: Age of Grandparents  
 Source: ENOE (Q1 2005 - Q1 2020)  
 Note: The sample includes three-generation households.

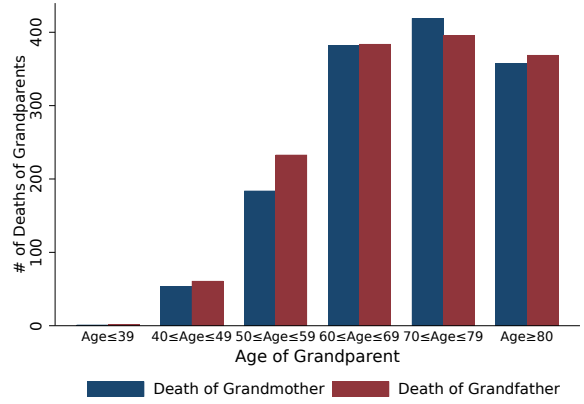


Figure A.5: Deaths of Grandparents  
 Source: ENOE (Q1 2005 - Q1 2020)  
 The sample includes three-generation households.

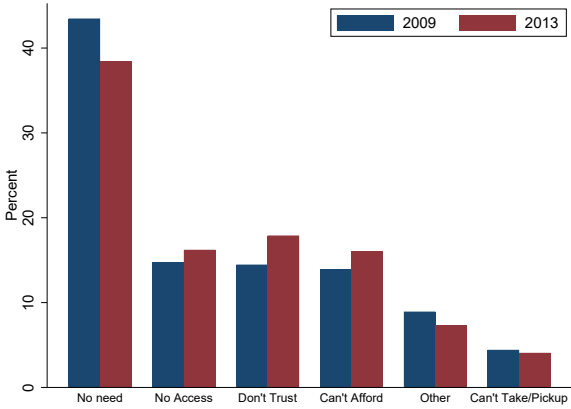


Figure A.4: Why are you not using daycare?  
 Source: ENESS (2009, 2013)

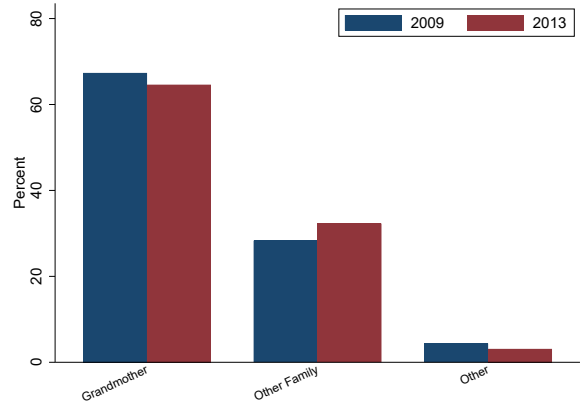


Figure A.6: If there is no need for daycare, who takes care of the child?  
 Source: ENESS 2009, ENESS 2013

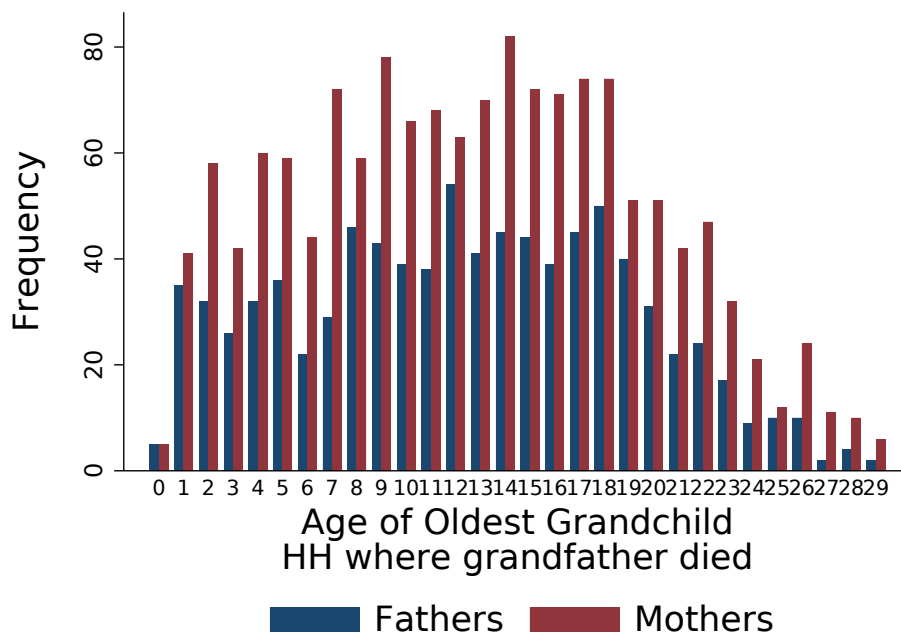


Figure A.7: Grandfather Died by Age of the Oldest Grandchild

Source: ENOE (Q1 2005 - Q1 2020)

Note: The sample includes second generation individuals of three-generation households where the grandfather died.

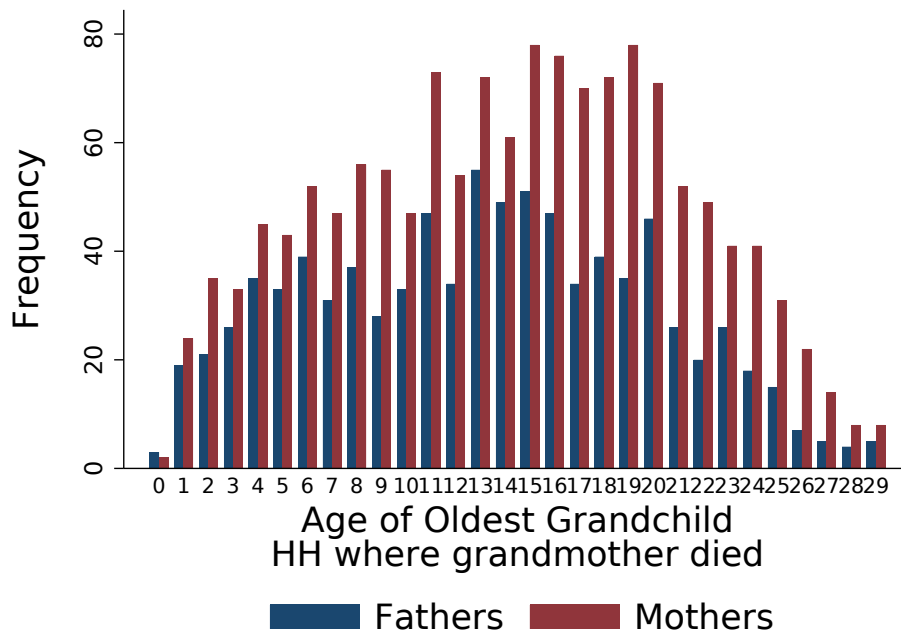


Figure A.8: Grandmother Died by Age of the Oldest Grandchild

Source: ENOE (Q1 2005 - Q1 2020)

Note: The sample includes second generation individuals of three-generation households where the grandmother died.



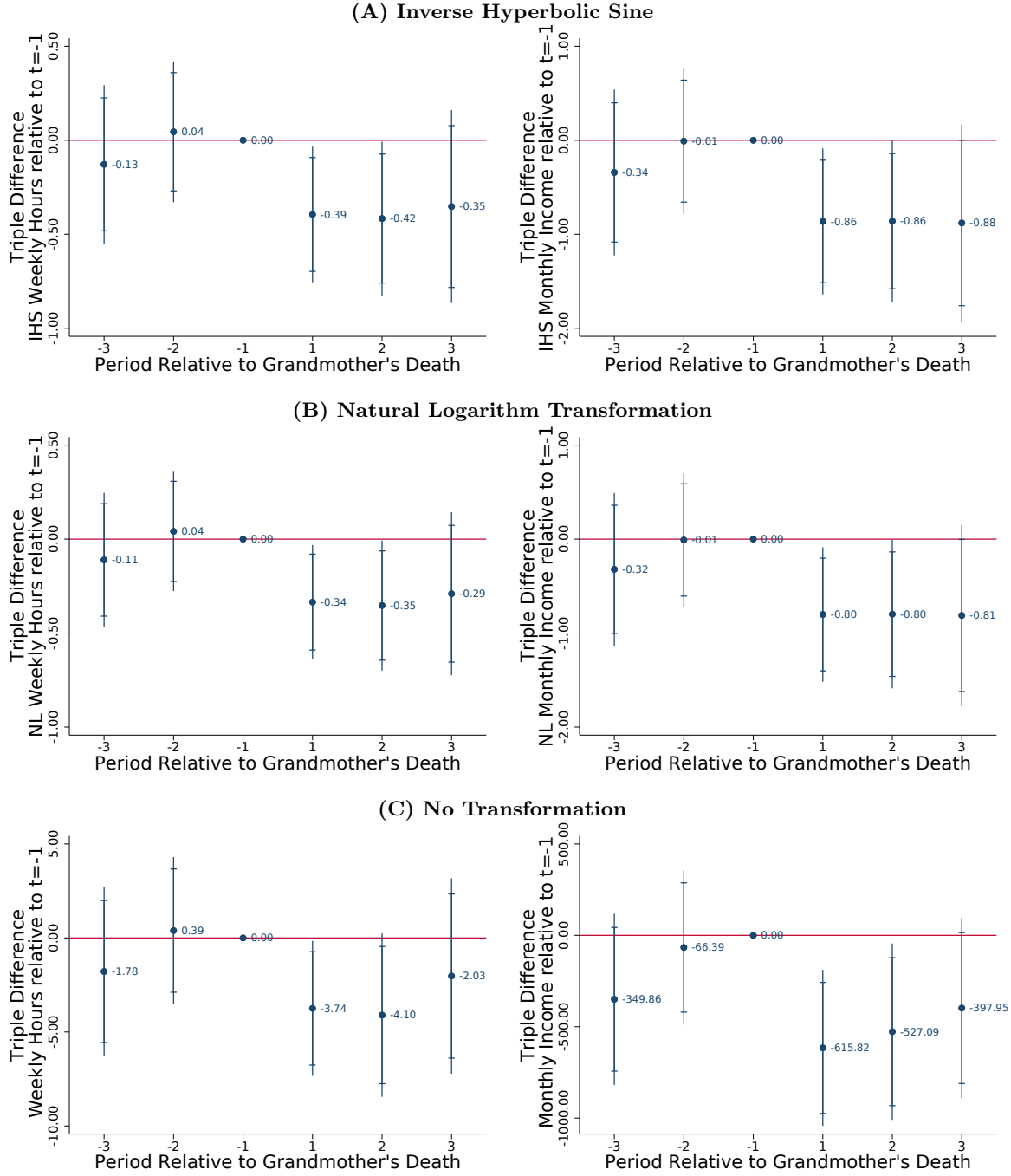
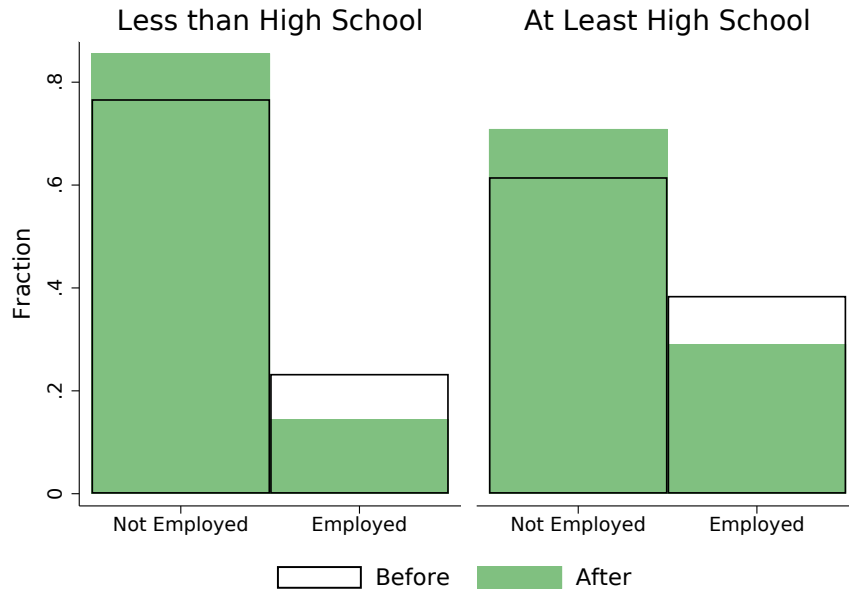


Figure A.9: Earned Income and Hours Worked - Mothers Sample

Note: The graphs display the point estimate and the 90% and 95% confidence interval of the effect that the death of the grandmother has on earned income and hours worked of mothers. The estimation is based of Equation 3, but replaces the dependent variable with earned income or hours worked. Income is winsorized at a 5% level from each tail, excluding 0's. Hours worked is winsorized at a 5% level from the right tail. Only observation where both earned income and hours worked are positive or both are zero are included. Panel A) presents results for the inverse hyperbolic sine transformation, Panel B) the natural logarithm, and Panel C) no transformation. The confidence intervals are computed using standard errors clustered at the household-level.

(A) High School Degree or More



(B) College Degree or More

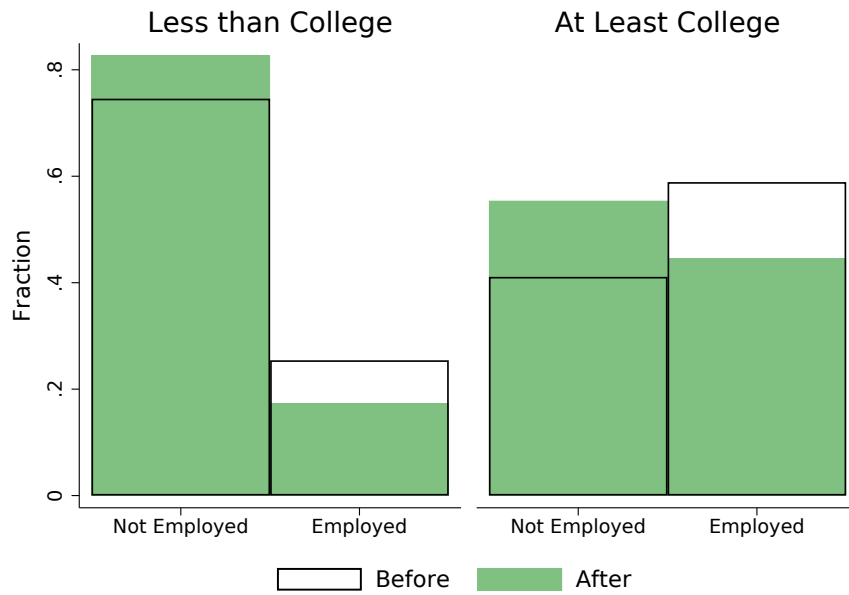


Figure A.10: Mothers' Employment Rate: Education

Note: The graph displays mothers' employment rate before and after the grandmother's death by education attainment. The sample includes mothers living in households where the grandmother died and the oldest child is at most 5 years old.

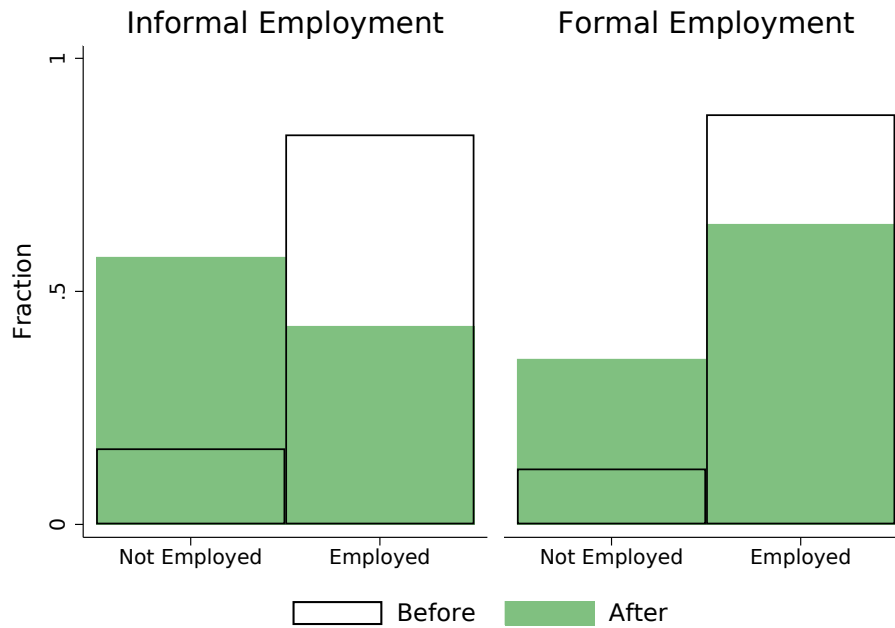


Figure A.11: Mothers' Employment Rate: Formal vs Informal Sector

Note: The graph displays mothers' employment rate before and after the grandmother's death by type of employment in the first survey period. Only mothers who were employed in the first survey period are included. The sample includes mothers living in households where the grandmother died, the oldest child is at most 5 years old, and that were employed in the first survey period.

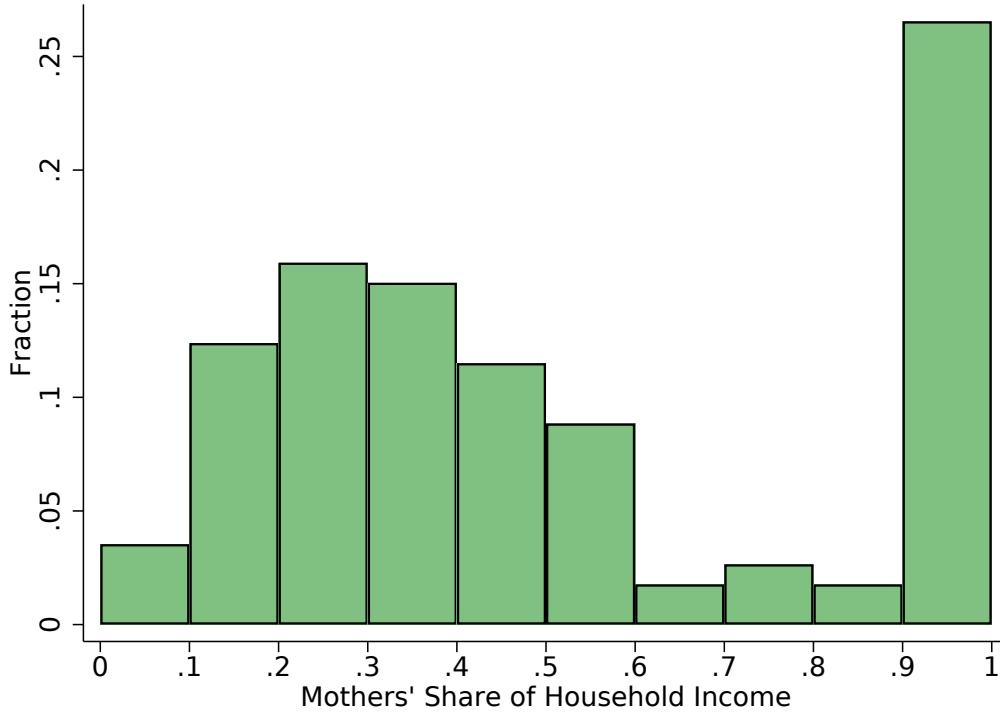


Figure A.12: Share of Household Earned Income: Mothers who became unemployed

Note: The graph displays the distribution of mothers' share of household income the period just before the death of the grandmother for mothers who were employed before the death of the grandmother but not employed afterwards. The sample includes mothers living in households where the oldest child is at most 5 years old. The share of earned income is the mother's income divided by total income earned by the household excluding the grandmother.

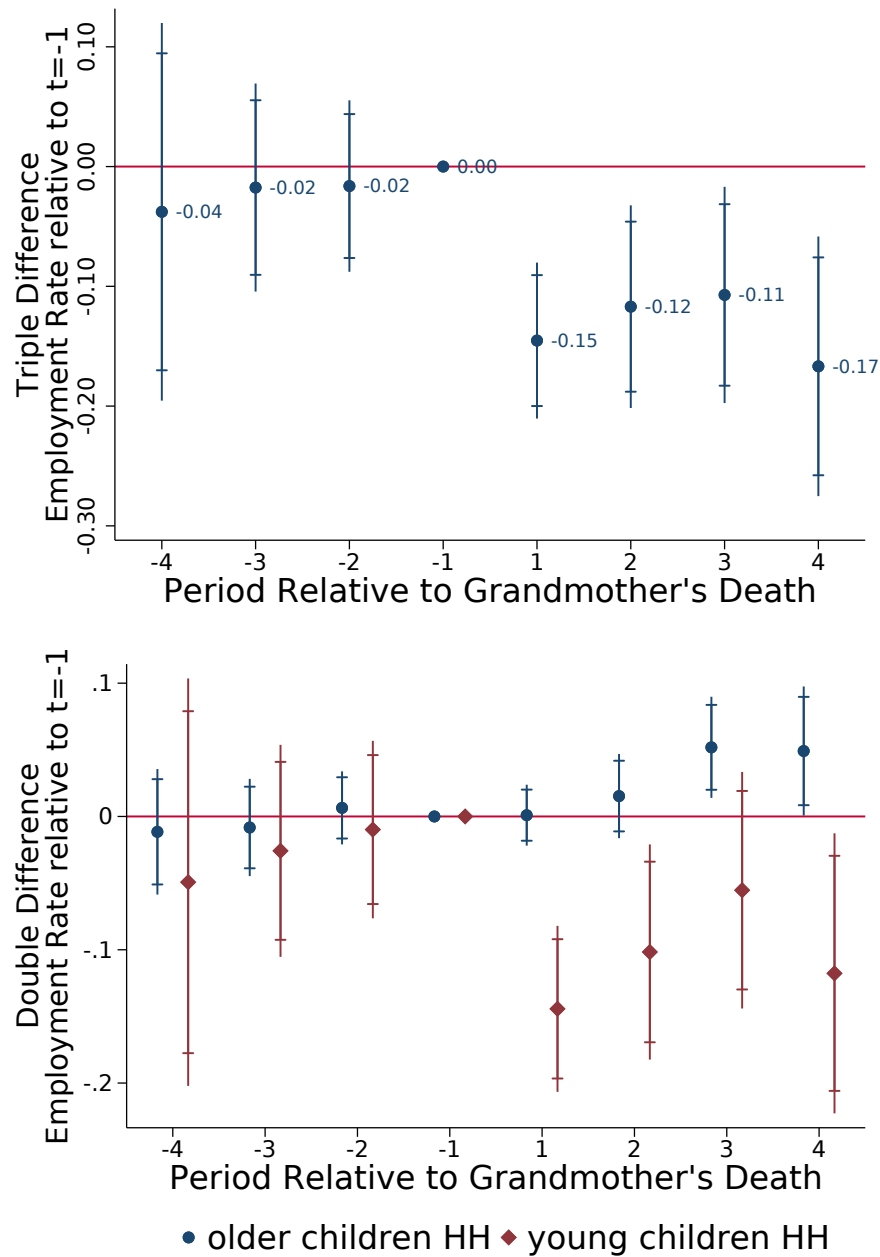


Figure A.13: Event Study - Grandmother's Death and Mothers' Employment

Note: The graph displays the point estimate and the 90% and 95% confidence interval of the effect of the death of a grandmother on employment for mothers by quarter relative to the quarter just before the death, estimated using Equation 3, but replacing the year-quarter-grandmother died fixed effect with a year-grandmother died fixed effect. A household with young children is a household where the oldest child is at most 5 years old. The chart on the top is the double difference estimate, and the chart on the bottom is the first difference estimate. The sample includes mothers between 20 and 50 years old and living in three-generation household with five observations in the panel, one grandmother or one grandfather or both, the grandmother is at least forty years old, the oldest grandchild is at most thirty years old, the first generation is weakly older than the second generation, and the second generation is weakly older than the third generation. Standard errors are clustered at the household level.

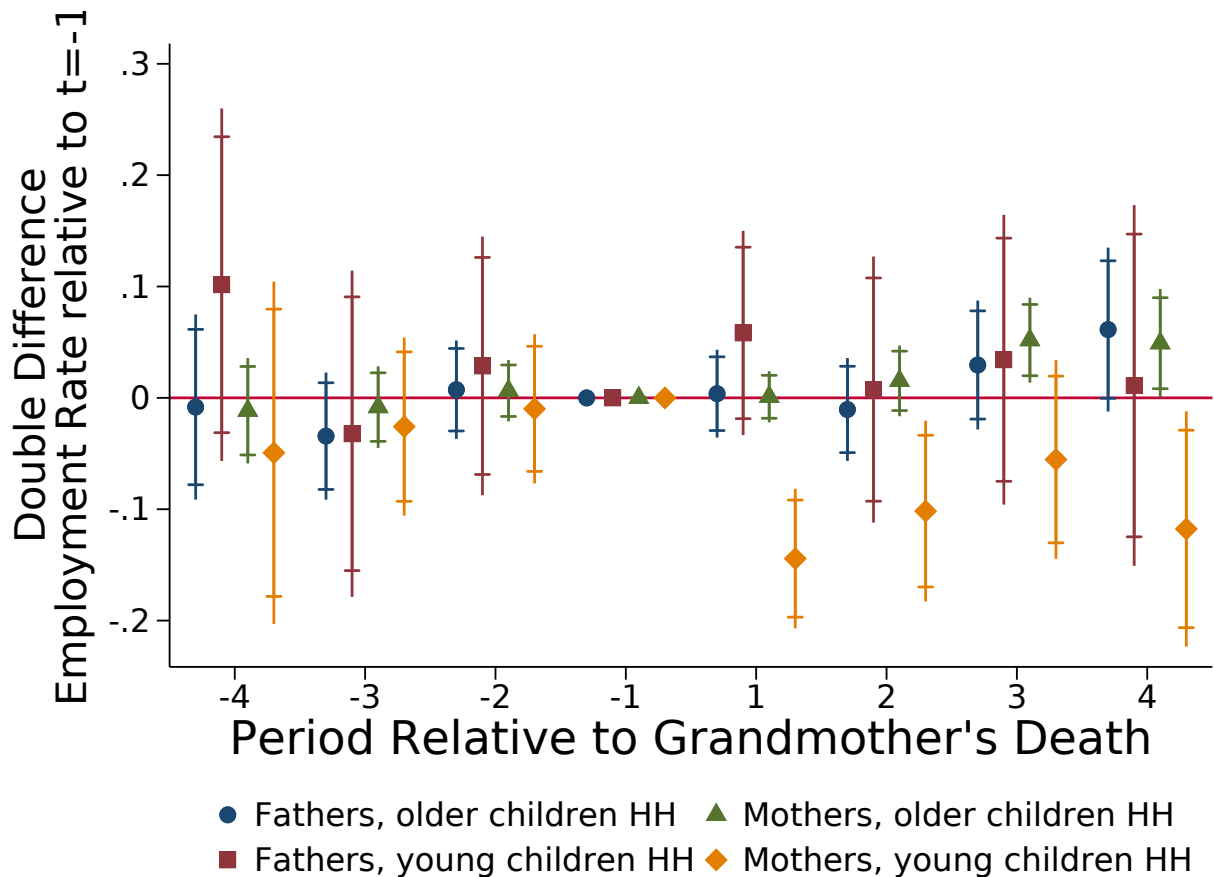


Figure A.14: Event Study of Grandmother's Death for Mothers and Fathers

Note: The graph displays the point estimate and the 90 and 95% confidence interval of the effect that the death of a grandmother has on the employment rate for mothers and fathers estimated using Equation 5, but replacing the year-quarter-grandmother died-gender fixed effect with a year-grandmother died-gender fixed effect. A household with a young children is a household where the oldest child is at most 5 years old. The confidence intervals are computed using standard errors clustered at the household-level. The sample includes mothers and fathers between 20 and 50 years old and living in three-generation household with five observations in the panel, one grandmother or one grandfather or both, the grandmother is at least forty years old, the oldest grandchild is at most thirty years old, the first generation is weakly older than the second generation, and the second generation is weakly older than the third generation. Mothers are identified by belonging to the second generation and having children, and fathers are identified by belonging to the second generation and being married or cohabiting with their spouse.