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Grandmothers and the gender gap in the Mexican labor market

Miguel Ángel Talamas Marcos[1]

Inter-American Development Bank, Kellogg School of Management, United States of America

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ABSTRACT

This paper estimates the effect of childcare availability on parents' employment probability using the timing of the grandmothers' death – the primary childcare provider in Mexico – as identifying variation. I use a triple-difference to disentangle the effect of coinhabiting grandmothers' deaths due to their impact on childcare from their effects due to alternative mechanisms. Through their impact on childcare availability, grandmothers' deaths reduce mothers' employment rate by 12 percentage points (27 percent) and do not affect fathers' employment rate. The negative effect on mothers' employment is smaller where public daycare is more available, or private daycare or schools are more affordable.

The gender gap in the 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 et al., 2010; Kleven et al., 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 et al., 2019), personal preferences (Daymont and Andrisani, 1984), and labor market discriminatory demand (Correll et al., 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 the death of coinhabiting grandmothers and a stacked triple-difference to disentangle the effect of these deaths due to their impact on childcare availability from their effects through alternative mechanisms. The first difference is a within individual comparison of employment status quarters before and after the death. The second difference compares those who suffered the loss with those who did not. The third difference exploits the discontinuity in childcare need generated by eligibility to attend elementary school by comparing the double difference effect on parents who need more childcare (oldest child not eligible to attend elementary school, less than 6 years old) with that of parents who need it less (oldest child old enough to attend elementary school, 6 years old or older). The triple-difference captures the effect of the grandmothers' deaths through their impact on childcare by canceling out mechanisms that impact households irrespectively of the oldest child's eligibility to attend elementary school.

The natural experiment and each of the differences in the triple-difference strategy address a class of issues that threaten identification. The effect of household characteristics, such as values, that might affect the likelihood of women being employed (both mother and grandmother) cancel out with the first difference that compares the same parent quarters before and after the death. Mechanisms that are present for both parents that suffered the death and those who did not (e.g. an economic recession) cancel out with the second difference. The grandmother's death's effects on labor force participation through alternative forms of home production, such as taking care of the house, cancel out with the third difference that compares mothers whose

E-mail address: miguelta@iadb.org.

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oldest child is not eligible to attend elementary school to mothers whose oldest child is.[2]

Grandmothers are one of the most important sources of childcare across the globe. For example, in the United States, grandparents look after 24% of the children regularly (U.S. Census Bureau, 2013), in Europe, between 50 and 70% of grandmothers provide childcare in some form within a year (Hank and Buber, 2009). In Mexico, grandmothers are the primary childcare providers. They care for almost 40 percent of children up to six years old — as much as schools and daycare combined (Figure A.1). 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 likely to be employed (Figure A.1 and Table A.1). This paper uses the timing of the death of the grandmother to explore whether the relationship between grandmother-provided childcare and the mother's employment is causal.

While grandmothers are the primary childcare provider in Mexico, grandfathers rarely provide it. 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 households substitute grandmother-provided childcare with public and private alternatives when public daycares are more available or when private daycares or schools are more affordable. The negative effect of the grandmother's death on mothers' employment is 9 pp smaller if public daycare is one standard deviation more available, 8 pp smaller if private daycare is one standard deviation cheaper, and 9 pp smaller if private schools are one standard deviation cheaper.

This paper has several advantages over the existing literature that studies the relationship between childcare availability and parental employment: (i) significantly weaker assumption for causal interpretation (the exact quarter within a year in which the grandmother died being as good as random), (ii) the panel structure of the data allows to control for both observed and unobserved time-invariant characteristics at the individual level, (iii) the triple-difference disentangles the effect through childcare from the effect through alternative mechanisms (e.g. inheritance, lost income, or household labor), (iv) showing heterogeneity by the availability and affordability of daycare, (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 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.[3] There has also been progress in identifying the mechanisms through which the gender gap is formed, such as, employer discrimination (Correll et al., 2007) and marital status (Fernandez and Wong, 2014a,b). Within the literature that studies the effect of the childcare mechanism, Jaumotte (2003) uses variation across OECD countries in childcare subsidies, Givord and Marbot (2015) uses a French reform in family allowance, and Lefebvre and Merrigan (2008) uses a new childcare policy implemented in Quebec to estimate the effect of childcare availability on parental employment. While policy changes create variation across time for all households simultaneously, using the timing of the death of grandmothers poses an identification advantage because it generates variation across time specific to the household that is improbably correlated with changes in societal values that may drive policy changes.

Within the papers that study the relationship between childcare availability and labor supply, several papers use the presence of grandparents as variation in childcare availability. Zanella (2017) contains a literature review on the relationship between grandparent availability 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 causal identification 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 the mother's employment directly.

Posadas and Vidal-Fernandez (2013) and Arpino et al. (2014) use an instrumental variable (IV) based on whether the grandmother is alive or not, and Aparicio-Fenoll and Vidal-Fernandez (2015) and Aparicio Fenoll (2019) use the retirement eligibility of grandmothers in Italy and in Europe to instrument for grandparent-provided childcare. Unlike these, this paper controls for time-invariant characteristics at the individual and household level and disentangles the effect through childcare by exploiting the discontinuity in childcare availability generated by eligibility to attend elementary school.[4] Moreover, this paper relies on a weaker identification assumption: the timing (quarter) of death to be random instead of grandparents' longevity to be random. If household characteristics such as habits, income, or education affect the grandmother's longevity and also affect the mother's employment probability (Hughes et al., 2007; Chen and Liu, 2011; Di Gessa et al., 2016), the IV estimate would be biased.

Bratti et al. (2018) further discusses the disadvantages of using these IVs to estimate the causal relationship between grandmother-provided childcare and parental employment, and instead, directly estimates the relationship between female labor force participation and the availability of mothers, mothers-in-law, fathers, and fathers-in-law using pension reform-induced changes in retirement eligibility in Italy. Similar to the work discussed earlier, longevity or retirement eligibility is assumed to be random,[5] and the estimated effect does not need to be through the childcare mechanism (e.g., includes effects through inheritance or grandmothers' household production).

Compton and Pollak (2013) also uses variation in grandparent availability and finds a positive correlation between geographical proximity to grandmothers and mothers' labor supply in the U.S. The timing of death represents a lesser concern regarding endogeneity: while households can choose where to live, they cannot choose the grandmother's time of death.

The effects of childcare availability on mothers' 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

[2] The discontinuity in childcare availability generated by the eligibility of the oldest child to attend elementary school is unlikely correlated with other effects of the grandmother's death.

[3] See, for example, Kühn et al. (2017); Bertrand et al. (2010); Waldfogel (1998); Kleven et al. (2019); Cristia (2008), Agüero and Marks (2008), Jérôme et al. (2017), Angelov et al. (2016) and Fernández-Kranz et al. (2013)

[4] Posadas and Vidal-Fernandez (2013) has a fixed effects specification where the independent variable is whether the grandmother provides childcare. As the authors mention, the interpretation is not causal because fixed effects do not address reverse causality (whether the grandmother provides childcare because the daughter works or vice versa).

[5] The omitted category in the empirical specification 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.

decision-making power (Jayachandran, 2015). As discussed in more detail by Jayachandran (2021), changing gender norms regarding who is responsible for household work and child care is one way of freeing up women to participate in the labor market, but other alternatives that free up women's time could help as well. For example, childcare availability can enable women to join the labor market despite gender norms that place the burden of childcare on women.

In the context of developing countries, Barros et al. (2013) use a lottery in Rio de Janeiro to estimate the effect of access to childcare on mothers' employment. 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. Khanna and Pandey (2021) estimate the net effect of the death of the coinhabiting mother-in-law on the daughter-in-law labor force participation using a two-wave survey conducted in India in 2005 and 2012.

Finally, this paper is also related to existing work studying the gender gap and the motherhood penalty in the Mexican labor market. For example, Aguilar Gomez et al. (2019) show that relative to four quarters before the birth of a child, mothers relative to fathers are 12.5 pp less likely to be in the workforce one quarter before the birth, 20 pp less likely to be in the workforce the first quarter after the birth, and 15 pp less likely to be in the workforce four quarters after the birth. Arceo-Gómez and Campos-Vázquez (2014) analyze the gender wage gap in Mexico from 1990 to 2010, finding that while the gap has decreased, it is still 6% in 2010. Calderón (2014) studies the effect of a child care program (Estancias Infantiles para Apoyar a Madres Trabajadoras) on easing burdens on working women, finding that the program increased women's probability of working, reduced the time they devoted to child-rearing and increased their labor incomes.

2. Data, the gender gap, and the motherhood penalty

The main data source is the Mexican National Survey of Occupation and Employment (ENOE). 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. 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 of 2005 to Q1 of 2020, a total of 61 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 household, gender, education, marital status, reason for not living in the household anymore (after the first survey), access to health care, employment, income, and hours worked.

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 line numbers and validate using the date of birth, age, and gender. I focus on three-generation households because the data provides grandparents' information only if they live in the same household. Within three-generation households, the generation to which each individual belongs to is identified only in terms of their relationship with the household head, but not in terms of their relationship with other family members. For women, mothers are identified by belonging to the second generation and having children. For men, there is no question about having children. Fathers are identified by belonging to the second generation and being married or coinhabiting with their partner. The death of a coinhabiting grandparent is revealed whenever the respondent answers that the grandparent is not present because he or she passed away.

On average, three-generation households represent 27 million Mexicans and 4.7 million households in Mexico — 23 percent of the total population and 15 percent of the households. Mothers in three-generation households are not identical to those in other households. Mothers in three-generation households are 1.5 pp (2.6%) more likely to live in a large city (population $\geq$ 100,000) and 2.9pp (17%) less likely to be rural (population $\leq$ 2500) (Table A.1, columns 1 and 2). The lower housing costs in less populated areas may be why three-generation households are less common. In three-generation households, grandmothers are 30pp (80%) more likely to provide childcare, and mothers are 12 pp (34%) more likely to be employed (Figure A.1 and column 3 of Table A.1). Three-generation households' income is 23% higher, but their income per capita is 27% lower (Columns 4 and 5). Mothers in three-generation households are 2.2 years younger (8%), and controlling for age, they have 14% fewer children, have 2% more years of schooling, are 8% more likely to be high school graduates, and 7% more likely to be college graduates (Columns 6–10). Finally, mothers in three-generation households have 12% higher average income and work 35% more hours, but conditioning on being employed, they earn 12% less and work 10% more hours (Columns 11–14).

Because of these differences between mothers in three-generation households and other households, the findings for three-generation households cannot be directly extended to other households. The subsection Bounds for the Average Effect of Grandmothers' Death on Women in the Results Section uses the estimates for three-generation households and two sets of assumptions to bound the average effect of the grandmother's death on women's employment rate in Mexico.

I add additional restrictions to construct the primary estimation sample of three-generation households. To reduce noise in the data, I do not include households where the oldest grandchild is thirty or older, where grandparents are less than forty years old, or more than one grandmother or grandfather died. This restriction reduces the sample by 6% but ensures that the three-generation households are more standard in their composition. There are three additional more meaningful restrictions (i) at most one grandfather and one grandmother (further reduces the sample by 0.7%), (ii) at most one mother and one father (further reduces the sample by 21%), and (iii) balanced panel with five observations per individual (further reduces the sample by 15%). The robustness section shows that the results are consistent and very similar if lifting any of these restrictions on the sample. The main reason for restrictions (i) and (ii) is to avoid situations in which the childcare provided by the grandmother who died is replaced by that of another coinhabiting grandmother after the death. Table A.2 compares mothers in the base sample and mothers in samples after lifting these restrictions. Lifting the restrictions has little influence on the composition of mothers.

To construct measures of childcare availability, I use the first National Economic Units Statistical Directory (DENUE) dated 2015 and the Population Census of 2020, the first one available after 2015. The DENUE lists all the public and private daycare facilities, and the population census provides the number of children up to five years of age living in each municipality. I construct of measure of the availability of public and private daycare at the municipality level by dividing the number of daycare facilities of each type by the number of children up to five years of age. I use this measure for 1479 municipalities that are also covered by the ENOE.

To construct measures of childcare affordability, I use data from the Employment and National Security Survey (ENESS) from 2009, 2013, and 2017. The ENESS is a joint project between the Mexican National Statistics Institute (INEGI) and the Mexican Institute of Social Security (IMSS). The survey occurs every four or five years since 1996 to provide statistical information regarding the coverage and characteristics of social security and health care services in Mexico. As an accompanying module of the ENOE, it covers all the households covered by the ENOE for two out of the three months in the quarter. Hence the ENESS covers roughly two-thirds of the ENOE sample for the quarter. Both ENOE and ENESS are designed to be representative at the state and country level.

The ENESS data includes responses from 209,266 households. These households use public and private daycare providers for 3991 and

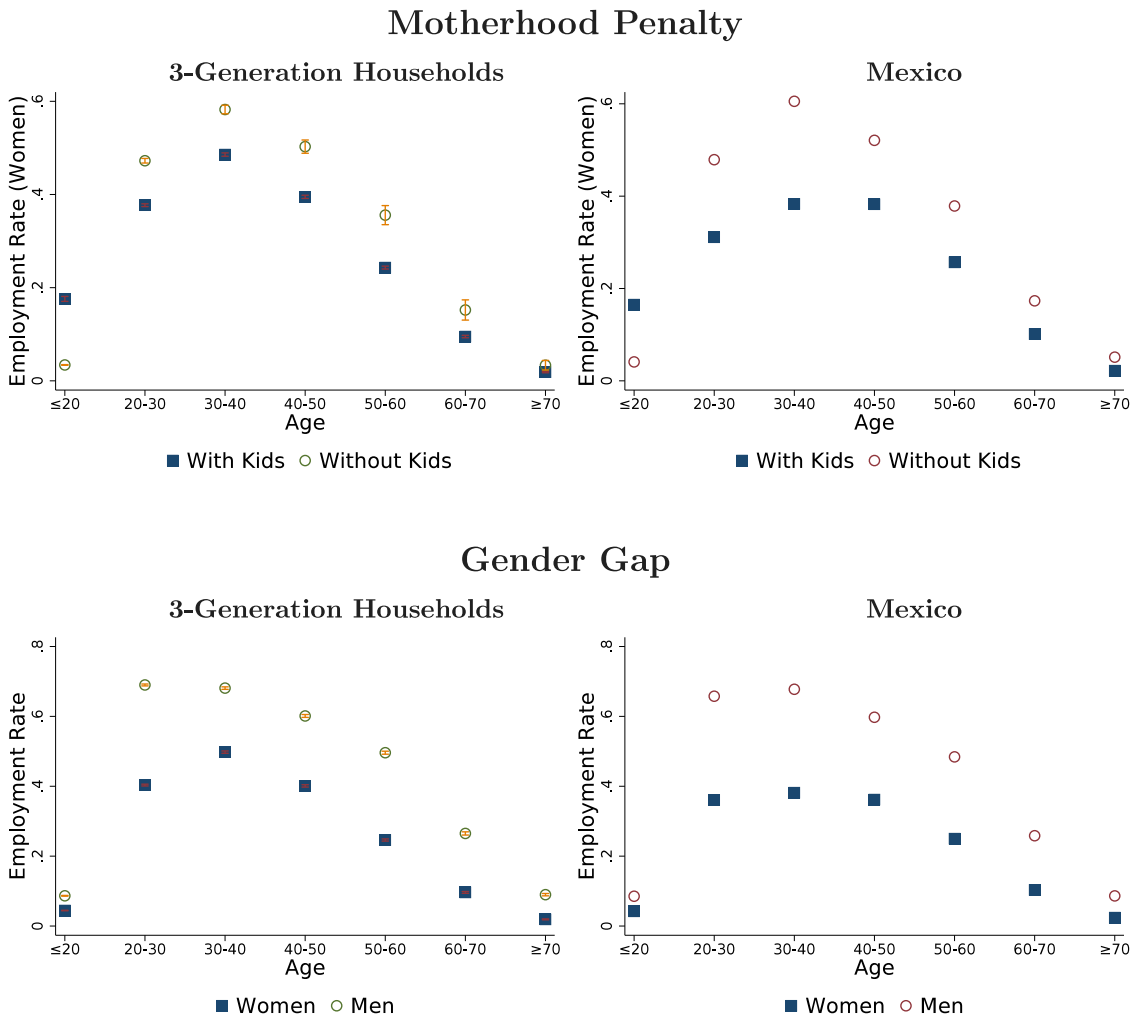

Fig. 1. The motherhood penalty and the gender Gap.
Note: The graph displays the employment rate by age. The figures on the left include only three-generation households. The figures on the right include the full sample and use probability weights to obtain country-level representation. The figures on the top compare women with children to women without them. The figures on the bottom compare men to women.
Source: ENOE (Q1 2005 - Q1 2020).

1177 children under seven years old. The ENESS asks how much the household paid for the service and the number of hours. I use this information to compute the cost per hour of daycare for each child. Then I average at the locality level and by whether the service was public or private. The result is a proxy for the private cost of daycare for 231 localities and the public cost of daycare for 527 localities.

2.1. Grandparents, children, and childcare

The ENESS asks households that are not using a public or private daycare service about their reason for not doing so, limiting the respondent to one answer. 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 responded that they did not need daycare, more than 90 percent relied on a family member to provide childcare. Specifically, more than 60 percent relied on grandmothers to provide childcare (see Figure A.5).

According to Mexican law, education from preschool to middle school is compulsory, and kids should attend school starting from 3–4 years of age. However, *de facto*, school becomes a relevant childcare provider only when kids turn 5–6 and they start elementary school. This may be because even if they go to preschool, the parents still consider the grandmother the primary provider. The bottom of Figure A.1 shows parents' responses to who takes care of the child when the mother goes to work by the child's age from the ENESS (the survey allows only for one answer). Until the children are four years old, grandmothers look after 47% of the children while schools look after 5%. However, by the time they are six years old, grandmothers only look after 28% of them while schools look after 49% of them.

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. The top of Fig. 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 the 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 the mother's employment. The next section explains how the triple-difference estimation addresses whether this correlation is causal.

3. Empirical strategy

The timing of the 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 double-difference effect for mothers whose oldest child is eligible to attend elementary school to those whose oldest child is not. Childcare is scarcer and needed more when children cannot attend elementary school; 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 the 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 gradually reducing what the fixed effects control for are also reported in Table 1. Eq. (1) is the main specification and β_2, the triple-difference estimate, is the parameter of interest:

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

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, $Death^{GM}_{i,l}$ 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, ϕ_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 the oldest child of at most 5 years old to be considered a young child. 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 the governmental classification of children education by age group (0–2 years is initial education and 3–5 is preschool), and (iii) it presents an advantage over using a cutoff at a younger age by increasing the size of the "treatment" group.

One of the most common concerns in the literature is the grandmother affecting the labor force participation of the mother through alternative mechanisms such as inheritance, sickness, or household labor. For example, the income effect of inheritance may increase leisure consumption. I use the discontinuity in childcare availability generated by eligibility to attend elementary school to disentangle the childcare mechanism from these other mechanisms that are unlikely discontinuous at exactly the age of 6. As long as mothers whose oldest child is 4 years old and those whose oldest child is 6 years old are as likely to receive an inheritance, or the grandmother is as likely to supply household labor or to be sick, then these effects will cancel out with the third difference and the remaining effect is the effect through the childcare mechanism.

To test the discontinuity generated by the availability of elementary school, I estimate the triple-difference effect by age bracket of the oldest child. 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 β_1. The estimated equation is:

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

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 Eq. (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, $s \in \{-4, -3, -2, -1, 1, 2, 3, 4\}$. Period s=−1 is the last period before the death and period s=1 is the first period after the death. The period $s = -1$ is the omitted category in the estimation. The estimated equation is the following:

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

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. Eqs. (1) and (3) are modified to include a quadruple difference resulting on Eqs. (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 the gender of the parent.

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

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

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 ENESS and fall into the category of other family members. Other family members provide in total close to 20 percent of childcare (see Figure A.1). The

Table 1
Grandmother's death and parents' employment rate.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Panel (A) Mothers											
Post x Grandmother died	−0.0154	−0.0223*	−0.0159	0.00740	−0.0172	0.00642	−0.0175	0.00355	−0.00990	−0.0294**	−0.0307**
	(0.0133)	(0.0123)	(0.0133)	(0.00960)	(0.0120)	(0.00959)	(0.0120)	(0.00852)	(0.00848)	(0.0142)	(0.0151)
Post x Grandmother died x Oldest	−0.124***	−0.107***	−0.121***	−0.122***	−0.0916***	−0.118***	−0.0888***	−0.0905***	−0.0870***	−0.0749*	−0.0754*
Grandchild at most 5 years old	(0.0307)	(0.0278)	(0.0307)	(0.0313)	(0.0279)	(0.0312)	(0.0278)	(0.0281)	(0.0280)	(0.0407)	(0.0427)
N	484,464	484,464	484,464	484,464	484,464	484,464	484,464	484,464	484,464	484,234	484,464
Panel (B) Mothers and Fathers											
Post x Grandmother died	−0.00971	−0.00930	−0.00428	0.0201	−0.0104	0.0318**	−0.00519	0.0161	−0.0221	0.000213	0.00266
	(0.0219)	(0.0211)	(0.0219)	(0.0153)	(0.0204)	(0.0153)	(0.0204)	(0.0137)	(0.0136)	(0.0187)	(0.0189)
Post x Grandmother died x Oldest	0.0232	0.0267	−0.0116	0.0265	0.0381	−0.00869	0.00567	0.0412	0.0102	−0.00388	−0.00179
Grandchild at most 5 years old	(0.0418)	(0.0371)	(0.0416)	(0.0423)	(0.0344)	(0.0422)	(0.0344)	(0.0354)	(0.0353)	(0.0472)	(0.0474)
Post x Grandmother died x Mother	−0.00569	−0.0130	−0.0116	−0.0127	−0.00682	−0.0254	−0.0123	−0.0125	0.0122	−0.0299	−0.0333
	(0.0252)	(0.0243)	(0.0252)	(0.0183)	(0.0234)	(0.0183)	(0.0234)	(0.0163)	(0.0162)	(0.0236)	(0.0244)
Post x Grandmother died x Oldest	−0.147***	−0.134***	−0.109**	−0.148***	−0.130***	−0.110**	−0.0945**	−0.132***	−0.0973**	−0.0719	−0.0736
grandchild at most 5 x Mother	(0.0489)	(0.0431)	(0.0486)	(0.0492)	(0.0405)	(0.0490)	(0.0404)	(0.0413)	(0.0411)	(0.0599)	(0.0625)
N	743,733	743,733	743,733	743,733	743,733	743,733	743,733	743,733	743,733	744,464	743,733
Individual FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	–	–
Y - Q - Locality - Gender FE	Y	–	Y	Y	–	Y	–	–	–	Y	Y
Y – Q - Young Child - Gender FE	Y	Y	–	Y	Y	–	–	Y	–	–	–
Y – Q - Grandmother Died - Gender FE	Y	Y	Y	–	Y	–	Y	–	–	–	–
Year - Locality - Gender FE	–	Y	–	–	–	–	–	–	–	–	–
Age - Gender FE	–	–	–	–	–	–	–	–	–	–	–
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 married or coinhabiting are classified as fathers. In panel (B) the fixed effects are interacted with the gender of the parent (Panel A only has mothers). Y-Q stands for year x quarter fixed effect. 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 star, respectively. Correia (2016) is used to estimate high-dimensional FE.

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.

The main specification of the empirical strategy uses the age of the oldest child in the triple difference to separate households that need more childcare from those that need it less. Previous literature has estimated the effect of childcare availability on mothers' employment rate and heterogeneous effects based on cutoffs built using the age of the youngest child (Posadas and Vidal-Fernandez, 2013; Arpino et al., 2014; Bratti et al., 2018; Compton and Pollak, 2013). Other papers look at the time of birth of the first child (Kleven et al., 2019). I use the age of the oldest instead of the youngest child because the Mexican context is different than that of developed countries that have been the focus of previous literature.

In Mexico, it is widespread for children to provide care for other children in the household. Based on time allocation from the ENOE, when there is a child up to five years old in the household, 26% of 17-years-olds spend some time exclusively providing care without pay. This is true even for younger children; 16% of 12-year-olds provide care when there is a child up to 5 years old in the household. The time allocation question is only available for 12-year-olds and older, but even younger children are likely to provide care. Hence, the split between households that need more childcare and those that need it less is more reasonable when using the age of the oldest grandchild because the households classified as those that need more childcare do not have older siblings that can provide care. However, specifications using the age of the youngest child are also valid, and I present these estimates in the Robustness Section.

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 (triple 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, reduces the probability of being employed for mothers by 15 percentage points more than for fathers (quadruple difference).

The second subsection uses the estimate of the average effect of the grandmother's death in three-generation households and two sets of assumptions to create bounds on the average effect of the grandmother's deaths on women in Mexico. This exercise implies that the average effect of grandmothers' death on women's employment in Mexico ranges between 1.8pp and 5.3pp (4.6%–13.5%).

The third subsection presents heterogeneous effects of the grandmother's death on the mothers' employment. The negative effect of the grandmother's death on mothers' employment is 9 pp smaller if public daycare is one standard deviation more available, 8 pp smaller if private daycare is one standard deviation cheaper, and 9 pp smaller if private schools are one standard deviation cheaper. This section also shows that the negative effect of the grandmother's death is larger when the maternal grandmother dies, increasing in the hours the grandmother used to provide care, and significantly smaller if there are male grandchildren.

4.1. The effect on employment, hours worked, and earned income

The estimates of Eq. (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 gradually reducing what the fixed effects control for. The

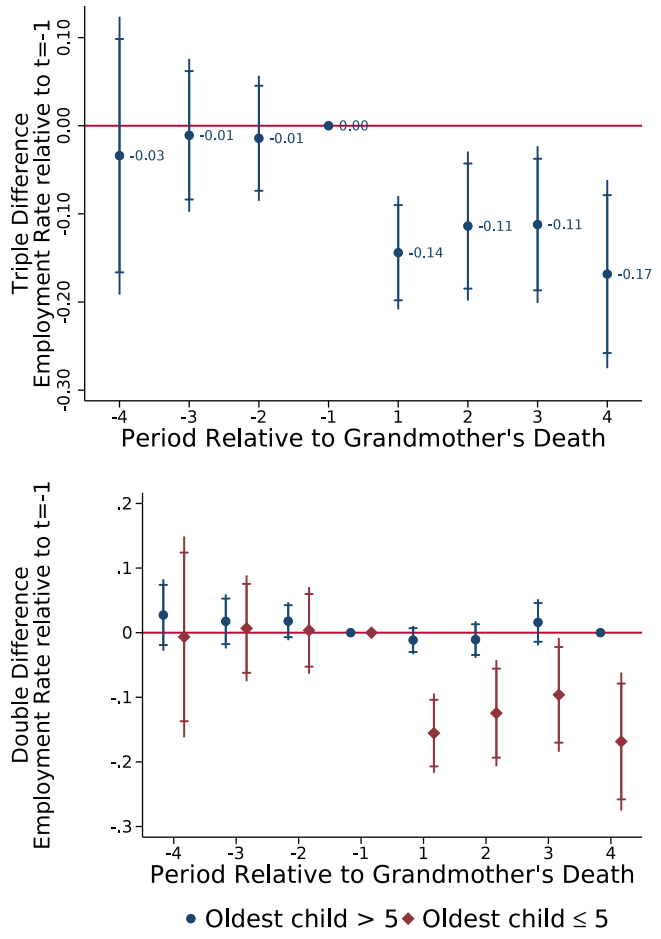

Fig. 2. Event study - grandmother's death and mothers' employment.
Note: The graph displays the point estimate and the 90% and 95% confidence interval of the effect of the death of a grandmother on employment for mothers by quarter relative to the quarter just before the death, estimated using Equation Eq. (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.

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 Fig. 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 the top of Fig. 2). In the triple-difference figure (top of Fig. 2), the omitted category is $t = -1$, hence this coefficient is not estimated. Similarly, plotting the two double differences (bottom of Fig. 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.[6]

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 Fig. 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 documents a clear discontinuity in the effect of the grandmother's death at the time when the oldest child is eligible, and by law required, to attend elementary school.

The effect on the probability of being employed is the net effect from transitions across full-time employment, part-time employment, and unemployment. In the sample, 43% of mothers are employed, 34% work full-time (more than 30 h per week), and 9% work part-time (less than 30 h per week). Columns 1 and 2 of Table 2 display the effect of grandmothers' death on the full-time and part-time employment rates of mothers. Through its impact on childcare availability, the grandmother's death reduces the probability of being employed full-time by 8.5 pp (25%) and the probability of being part-time employed by 3.9 pp (40%).

Even though more mothers employed full-time leave the labor force than part-time employed ones, they are not more likely to do so. The reduction in the probability of being full-time employed is 8.5pp and 3.9pp for part-time employed. However, in relative terms, the latter is larger because 34.4% of women are full-time employees and 9.6% of women are part-time employees. Moreover, mothers employed full-time left their jobs instead of switching to part-time employment. Column 5 shows the effect on the probability of part-time employment for the subsample of mothers employed full-time in the first survey wave. These mothers do not transition from full-time employment to part-time employment. Their probability of being part-time employees decreases by 5.8pp (not statistically significant at conventional levels).

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 3 and 5 of Table 2). These effects include both extensive and intensive margins. The extensive margin is from mothers that went from employed to unemployed, and the intensive margin is from mothers that continue to be employed but for fewer hours or with a lower wage. Columns 4 and 6 display the results for the intensive margin — restricted 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 the ages of twenties, thirties, and forties, respectively (see the top of Fig. 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 the employment rate. Keeping preferences, socioeconomic constraints, gender roles, and discriminatory demand fixed, a reduction in 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 formation of the gender gap in employment,

[6] 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).

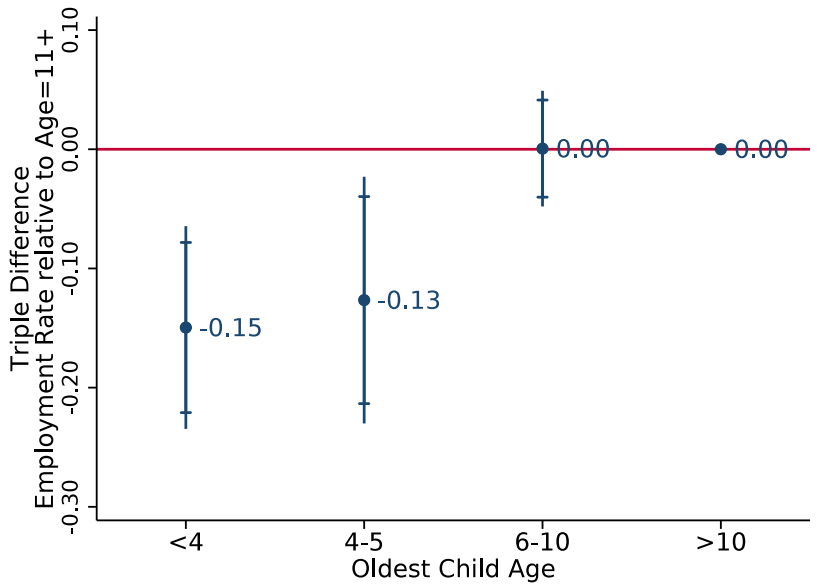

Fig. 3. Grandmother's death and mothers' employment by age of the oldest child
Note: The graph displays the point estimate and the 90% and 95% confidence intervals of the additional effect that the death of a grandmother has on mothers' employment rate by age of the oldest child in the household relative 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 Eq. (2). The same sample as in Fig. 2 is used. Standard errors are clustered at the household level.

Table 2
Grandmother's death, employment, hours worked, and earned income.

Dependent variable:	Employment					Hours worked		Earned income	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Full-time	Part-time	Part-time	Part-time	Part-time	Intensive + Extensive	Intensive	Intensive + Extensive	Intensive
Post grandmother death	−0.0253*	0.00989	0.0316	−0.0266	0.0440	0.00306	0.0357	0.0145	0.132
	(0.0151)	(0.0131)	(0.0287)	(0.0851)	(0.0297)	(0.0718)	(0.0578)	(0.151)	(0.107)
Post grandmother death x	−0.0850***	−0.0391*	−0.126*	−0.339**	−0.0575	−0.355**	−0.127	−0.763**	−0.296
oldest grandchild at most 5	(0.0289)	(0.0233)	(0.0647)	(0.152)	(0.0499)	(0.164)	(0.106)	(0.339)	(0.180)
Sample	Full	Full	Employed First Wave	Part-time First Wave	Full-time First Wave	Income and Hours Avail.	Employed	Income and Hours Avail.	Employed
N	484,454	484,454	196,376	35,894	148,905	393,456	123,942	393,456	123,942

Note: The table displays the marginal effect of the grandmother's death on the probability of being full-time employed, half-time employed, and the inverse hyperbolic sine of earned income and hours worked. For columns 6 and 8 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 7 and 9 include observations with strictly positive hours worked and earned income. Hours worked and income are winsorized at the 5% level from each tail. Standard errors clustered at the household level. Part-time employment is 30 h or less per week, and Full-time employment is more than 30 h a week.

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 negative effect of the grandmother's death on the employment rate, through the childcare mechanism, is 14.7 pp larger for mothers than for fathers. Columns 2–11 contain estimates Columns 2–11 display alternative specifications gradually reducing what the fixed effects control for; the estimates of the coefficient of interest 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 Fig. 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 the employment rate.

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 child] goes to work, the child 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, 2013).

The gender gap in employment in Mexico, the difference in employment rate between women and men, is at its maximum size during the ages of twenties, thirties, and forties, ranging between 24 and 30 percentage points (see Fig. 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.

4.2. Bounds for the average effect of grandmothers' death on women

The estimated 12pp decrease in mothers' employment rate after the grandmother's death is based on three-generation households. Using

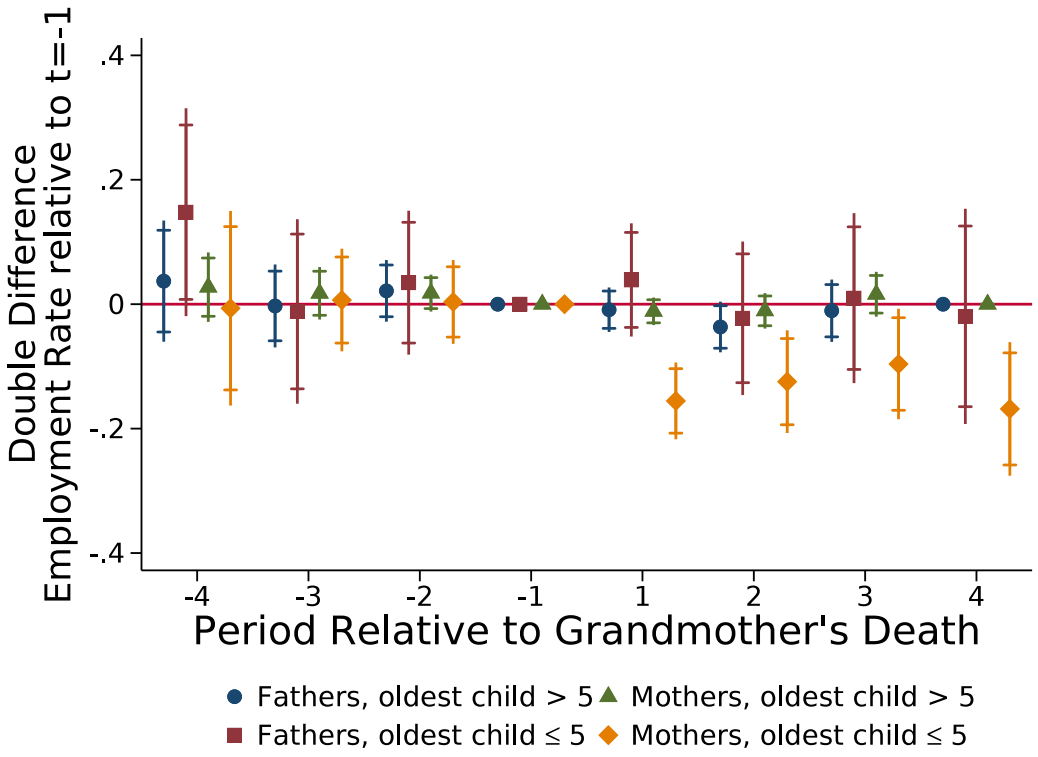

Fig. 4. Event study of grandmother's death (mothers) for mothers and fathers
Note: The graph displays the point estimate and the 90 and 95% confidence interval of the effect that the death of a grandmother has on the employment rate for mothers and fathers estimated using Eq. (5). A household with a 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 coinhabiting with their spouse.

two sets of assumptions, I create bounds for the average effect for women in Mexico. The average effect is a weighted average of the effect on one, two, three, and more than three generations households. The following equation denotes this weighted average, where i denotes the number of generations in a household and Share $_i$ is the share of households with i generations:[7]

$$\text{Average Effect} = \sum_{i=1}^{4} \text{Effect}_i \times \text{Share}_i \tag{6}$$

The effect is only known for three-generation households ($i = 3$). I use two sets of assumptions to determine the effect on other households. For the lower bound, I assume that grandmothers' deaths only affect three-generation households. Hence the lower bound is 0 x 23% + 0 x 61% + 12 x 15% + 0 x 1% = 1.8pp. For the upper bound, I use two assumptions: (i) conditionally on the grandmother providing childcare, the negative effect of grandmothers' deaths through childcare is the same for mothers in two- and three-generation households and (ii) there is no effect through childcare when grandmothers do not provide childcare. The effect on mothers of three-generation households where the grandmother provides childcare is given by the average effect on three-generation households divided by the share of households where the grandmother provides childcare (12pp/57% = 21pp). The average effect on mothers of two-generation households is the effect on mothers of three-generation households where the grandmother provides childcare times the probability of the grandmother providing childcare in two-generation households (21pp x 27% = 5.7pp). Hence the upper bound of the average effect is 5.27pp (0 x 23% + 5.7 x 61% + 12 x 15% + 0 x 1%). This exercise implies that the average effect of grandmothers' death on women's employment in Mexico ranges between 1.8pp and 5.3pp (4.6%–13.5%). The range would be between 2.3pp - 6.8pp if women in one-generation households (non-mothers) are not included because the share of two- and three-generations households would increase by a factor of 1.3.

[7] Households with four or more generations are represented by $i = 4$.

4.3. Heterogeneous effect of the grandmother's death

This section presents heterogeneity of the effect of the grandmother's death on mothers' employment by the availability and affordability of public and private daycare, the grandmother's side of the family, the grandmother's time spent providing care, and mother and household characteristics. The section aims to understand better which mothers and households are more affected by the negative shock in childcare availability from the grandmother's death. To measure heterogeneous effects, two additional coefficients are estimated. These coefficients are those on the interaction between the variable for which heterogeneous effects are estimated, $Z_{i,l}$, and the variables of Eq. (1). The estimating equation is the following:

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

4.3.1. Heterogeneity by availability of daycare

To create a measure of public and private daycare availability, I divide the number of public and private daycares in the municipality (from DENUE) by the number of children up to five years old (from the Population Census). I use this measure for 1479 municipalities where

Table 3
Heterogeneity by daycare availability.

	Residual			Observed		
	(1)	(2)	(3)	(4)	(5)	(6)
Post grandmother death	−0.0136	−0.0134	−0.0136	−0.0139	−0.0134	−0.0139
	(0.0136)	(0.0137)	(0.0136)	(0.0136)	(0.0136)	(0.0136)
Post x Grandmother Died x Oldest Grandchild at most 5 years Old	−0.126***	−0.125***	−0.125***	−0.125***	−0.123***	−0.122***
	(0.0324)	(0.0317)	(0.0318)	(0.0319)	(0.0313)	(0.0311)
Post x Grandmother Died x Private Daycares per Child	0.0127		0.0127	0.00705		0.00686
	(0.01)		(0.01)	(0.00997)		(0.00995)
Post x Grandmother Died x Oldest Grandchild at most 5 years Old x Private Daycares per Child	−0.0149		−0.0268	−0.0166		−0.0305
	(0.032)		(0.0321)	(0.0307)		(0.0307)
Post x Grandmother Died x Public Daycares per Child		0.00107	−0.000276		0.00294	0.00239
		(0.00724)	(0.007)		(0.00761)	(0.00738)
Post x Grandmother Died x Oldest Grandchild at most 5 years Old x Public Daycares per Child		0.0829**	0.0905**		0.0894**	0.100**
		(0.0421)	(0.042)		(0.0428)	(0.0441)
N	464,974	464,974	464,974	465,342	465,342	465,342
Individual FE	Y	Y	Y	Y	Y	Y
Year - Quarter - Locality FE	Y	Y	Y	Y	Y	Y
Year - Quarter - Young Child FE	Y	Y	Y	Y	Y	Y
Year - Quarter - Grandmother Died FE	Y	Y	Y	Y	Y	Y
# of municipalities to estimate residuals	1047	1047	1047	–	–	–

Note: The table displays heterogeneity of the marginal effect of the grandmother's death on mother's employment by daycare availability, estimated using Eq. (7). Daycare per child is calculated by dividing the number of daycare facilities by the number of children up to five years old in the municipality. Daycares per child are standardized. The number of stars indicates the significance level at which the coefficient is statistically significant: .01, .05, and .1 for three, two, and one star, respectively. Standard errors are clustered at the household level.

the ENOE also has data. If the availability of daycare is correlated with other variables, such as income, there is a risk that I capture heterogeneity by income instead of capturing heterogeneity by the availability of daycare. I address this concern by using an additional measure of daycare availability not driven by the average income, size, or share of working mothers. To construct this measure, I regress the average cost of daycare (either public or private) on the share of employed mothers, dummies for quintiles of average income, and dummies for quintiles of population, using the following estimating equation:

$$Availability_l = \beta_0 + \beta_1 ShareEmpMothers_l + \sum_{j=1}^{4} \psi_j Income_l^j + \sum_{j=1}^{4} \Gamma_j Population_l^j + \epsilon_l \quad (8)$$

The residual of the previous estimation is the measure of daycare availability that is not explained by mothers' employment rate, income, and population.

The negative effect of the grandmother's death on mothers' employment is 9 pp smaller if public daycare is one standard deviation more available (Table 3, columns 2 and 3). Using the observed measure of daycare availability instead of the residual one leads to very similar results (columns 5 and 6). This finding is consistent with the substitutability between grandmother-provided childcare and public daycare if public daycare is available enough. At least two mechanisms could drive this substitution: (i) when the grandmother dies, mothers in locations where public daycare is more available substitute grandmother-provided childcare with public daycares, or (ii) mothers in locations where public daycare is more available use public daycare more and grandmother-provided childcare less, hence the smaller effect. There is no heterogeneity by the availability of private daycare (columns 1, 3, 4, and 6).

4.3.2. Heterogeneity by affordability of daycare

To measure daycare affordability, I average the hourly cost and total cost of daycare in the locality using data from the ENESS. The ENESS includes the childcare alternative that households use, how much they pay, and for how many hours. The implicit assumptions of using these average total price and price per hour are that: (i) the price paid by households that use private and public daycare is representative of the price that households that do not use these alternatives would pay, and (ii) that the average computed from the ENESS respondents is informative of the cost level of daycare alternatives in the locality. To avoid issues related to the measure of daycare affordability capturing income, population, or share of mothers working, I also use a residualized measure estimated using Eq. (8). This measure is equivalent to the one used for childcare availability in the previous section.

The negative effect of the grandmother's death on mothers' employment is 8 pp smaller if private daycare is one standard deviation cheaper (Table 4, columns 1 and 3). This heterogeneity is robust to using the residual and the actual affordability measures (columns 7 and 9). The result is also robust to using the hourly and total costs (columns 4, 6, 10, and 12). Public daycare has no equivalent heterogeneity (columns 2, 3, 5, 6, 8, 9, 11, and 12). There are two considerations 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 have an average hourly cost below 0.33 USD.[8] Moreover, even if there was price variation for public daycare, it might not necessarily be a measure of how accessible it is because there are no vacancies. On the other hand, private daycare price varies more because it is unregulated.[9]

There are additional considerations to interpret the magnitude of the heterogeneity by the cost of private daycare. First, a one standard deviation change in the price of private daycare is significant: it is equivalent to going from the 25th percentile to the 75th percentile of the distribution. Second, based on the ENESS, three-generation households rarely use private daycare (2%). However, if there are no co-inhabiting grandparents, they are twice as likely to use it (4%). Hence, the relevance of private daycare costs may increase significantly after the grandmother's death. Note that these shares of private daycare

[8] The exchange rate used to calculate is: 1USD = 15 MXN.

[9] There were less than 8 percent of localities with an average private daycare cost of 0, and 70 percent have an average hourly cost above 0.33 USD.

Table 4
Heterogeneity by daycare affordability.

	Residual						Observed					
	Hourly cost			Total cost			Hourly cost			Total cost		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Post GM death	−0.0161	−0.0141	−0.0133	−0.0158	−0.0141	−0.0130	−0.0164	−0.0145	−0.0137	−0.0159	−0.0144	−0.0132
	(0.0156)	(0.0149)	(0.0156)	(0.0156)	(0.0149)	(0.0156)	(0.0156)	(0.0149)	(0.0156)	(0.0156)	(0.0149)	(0.0157)
Post x GM Died x Oldest	−0.110***	−0.122***	−0.110***	−0.112***	−0.122***	−0.112***	−0.111***	−0.123***	−0.112***	−0.113***	−0.123***	−0.114***
GC at most 5 years old	(0.0371)	(0.0371)	(0.0375)	(0.0385)	(0.0370)	(0.0388)	(0.0380)	(0.0374)	(0.0386)	(0.0390)	(0.0374)	(0.0398)
Post x GM Died x Cost		0.00592	0.0105		0.00316	0.00562		0.00198	0.00362		0.00372	0.00501
of Public Daycare		(0.0111)	(0.0138)		(0.0106)	(0.0132)		(0.0113)	(0.0139)		(0.0108)	(0.0134)
Post x GM Died x Oldest GC at most		−0.00684	−0.00512		−0.00631	−0.00190		0.000515	0.00781		0.00480	0.0132
5 years old x Cost of Public Daycare		(0.0332)	(0.0371)		(0.0299)	(0.0326)		(0.0359)	(0.0396)		(0.0328)	(0.0357)
Post x GM Died x Cost of	−0.00813		−0.00627	0.000904		0.00308	−0.000468		0.00266	0.00498		0.00761
Private Daycare	(0.0114)		(0.0115)	(0.0118)		(0.0121)	(0.0115)		(0.0116)	(0.0123)		(0.0127)
Post x GM Died x Oldest GC at most	−0.0767**		−0.0790**	−0.0648**		−0.0676**	−0.0601*		−0.0649*	−0.0508		−0.0563*
5 years old x Cost of Private Daycare	(0.0370)		(0.0370)	(0.0330)		(0.0327)	(0.0352)		(0.0354)	(0.0344)		(0.0340)
N	316,832	354,865	312,892	316,832	354,865	312,892	317,239	355,928	313,279	317,239	355,928	313,279
Individual FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year - Quarter - Locality FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year - Quarter - Young Child FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year - Quarter - GM Died FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
# of localities to estimate residuals	204	466	–	204	466	–	–	–	–	–	–	–

Note: The table displays heterogeneity of the marginal effect of the grandmother's death on mother's employment by daycare affordability, estimated using Eq. (7). Public and private daycare costs are standardized. The number of stars indicates the significance level at which the coefficient is statistically significant: .01, .05, and .1 for three, two, and one star, respectively. Standard errors are clustered at the household level.

use are likely underestimates because the question of who takes care of the child while the mother works allows for only one response. For example, based on the ENESS 2009 and 2013, schools look after 22% of children between 3 and 5 years old, but according to the 2010 population census, 55% of these children attend school. This discrepancy is likely caused because even if children attend daycare or school, the parents may still consider the grandmother or other family member as the primary childcare provider.

Additionally, a negative correlation between the grandmother providing childcare and the cost of private daycare could drive this result. For example, suppose the private daycare industry needs a critical mass of children to flourish and lower costs (economies of scale or cluster economies). In that case, places where private daycares are more popular and the grandmothers are less popular would also have a lower cost of private daycare. In these places with lower costs, the effect of the grandmother's death would be smaller because she was less likely to provide care. In this example, a substitution between private daycare and the grandmother's care occurs before the grandmother's death.

Moreover, the average cost of private daycare may also capture overall childcare costs in the locality, not only daycares. If this was the case, the heterogeneity that I find in the cost of daycare should also exist in other childcare alternatives. A typical response to who takes care of children up to six years old when the mother goes to work in the ENESS is that the children go to school (21%, see Figure A.1). These schools may be public or private, but the ENESS keeps them in the same category when asking about the price paid. To create measures of the affordability of schools and separate the cost of private ones, I compute two averages. The first one is the average cost paid for schools in the locality. This average includes both public and private schools. Since public schools are primarily free and private schools cost, I also use the average conditional on reporting a strictly positive price. This average will not capture free public schools but the cost of private schools.

I find that the negative effect of the grandmother's death on mothers' employment is 9 pp smaller if private schools are one standard deviation cheaper. This result stands irrespective of using the total or hourly cost (Table A.3, columns 2 and 4) and of using the residual or observed cost measure (columns 6 and 8). This heterogeneity is smaller and not statistically significant when using the school cost that includes both public and private schools (columns 1, 3, 5, and 7). These results are consistent with those using daycare prices and share the same conclusion: the negative effect of the grandmother's death is smaller in locations with lower private childcare costs.

I also estimated heterogeneity by the availability of daycares affiliated with the Estancias Infantiles para Apoyar a Madres Trabajadoras Program. This program pays affiliated daycare providers 50 USD per month for each eligible child they provide care to. Eligible children are those in households with income below the poverty line; the average household income of beneficiaries before enrolment was 200 USD a month (CONEVAL, 2020). I found that one standard deviation increase in the availability of these daycares (measured as the number of affiliated daycares to estancias infantiles/number of children up to five years old) is associated with a 1-2pp smaller negative effect of grandmothers' death on mothers' employment. However, this result is not statistically significant; see Table A.4. The estimates are likely smaller and not statistically significant because the program only applies to low-income households.

These estimates are consistent with those in the literature of other developing countries. Barros et al. (2013) finds that winning a childcare slot in Rio de Janeiro increases the mothers' employment probability by 10pp (27%). Hojman and Lopez Boo (2019) find that mothers' probability of working outside the household increases by 14 pp when receiving access to subsidized daycare, and Halim et al. (2017) find that the expansion of public preschools in Indonesia increased the employment rate for women with preschool-age children.

4.3.3. Heterogeneity by the grandmother's side

Fig. 5 shows that the negative effect of the grandmother's death is significantly larger if the maternal grandmother dies rather than the paternal one. The total effect of the death of the paternal grandmother is a reduction in mothers' employment by 6pp. However, the impact through childcare is only 3 pp and not statistically significant. On the other hand, the maternal grandmother's death reduces mothers' employment by 21pp. The effect through childcare is a reduction by 17pp (the difference between the effect when the oldest is at most five years old vs. when the oldest is older), 14pp larger than the effect of the paternal grandmother's death. This result is consistent with previous results in the development literature. For example, Duflo (2003) finds that there is an effect of grandmother's pension eligibility on weight for height of South African granddaughters only if the mother's mother is who becomes eligible.

4.3.4. Other heterogeneity

This section presents a heterogeneity analysis of the effect of the grandmother's death on mothers' employment probability by the number of hours the grandmother provided care, the number of children, income, employment type (formal/informal), and education at the time of the first survey wave.

A one standard deviation increase in the number of hours the grandmother provided care (10.8 h) in the first survey wave is associated with a further reduction of mothers' employment rate by 9 pp, almost

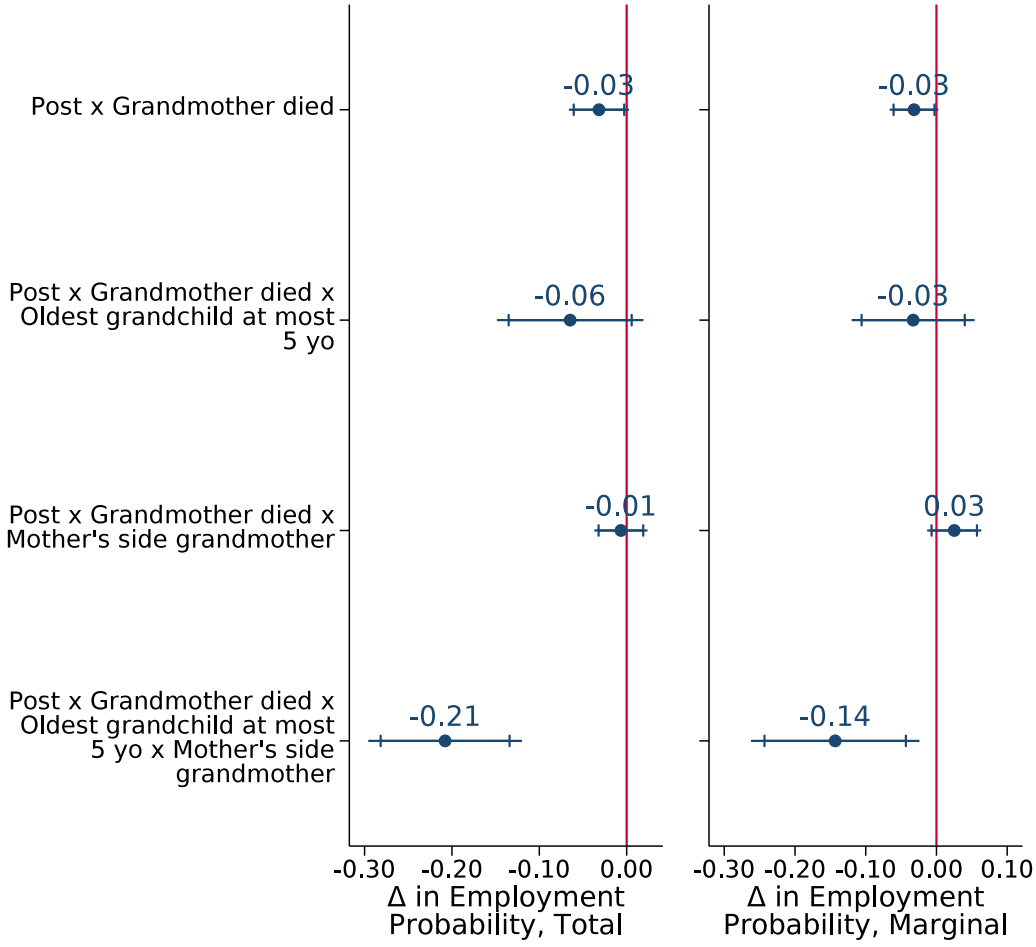

Fig. 5. Heterogeneity by grandmother's side (maternal vs. paternal)
Note: The figure displays the total and marginal effect of the death of grandmothers on mothers' employment probability. The coefficients are estimated using Eq. (1), but adding an interaction of the first two terms with a dummy that indicates whether the grandmother who died was the mother's side.

Table 5
Other heterogeneity.

Heterogeneous effect on employment probability by:	Hours GM Provided Care (1)	# of Kids (2)	# of Grandkids (3)	# of Grandkids ≤ 6 (4)	# of Male Grandkids (5)	1+ Male Grandkids (6)	Household Income† (7)	Income† (8)	Hours† (9)	Formal Empl. (10)	High School or more (11)	College or more (12)
Post GM death	−0.0197	−0.0286	−0.0148	−0.0196	−0.0111	0.00472	−0.0164	−0.0199	−0.0187	0.0165	−0.0360**	−0.0161
	(0.0158)	(0.0228)	(0.022)	(0.0143)	(0.0172)	(0.02)	(0.0133)	(0.0241)	(0.0239)	(0.0145)	(0.0157)	(0.0139)
Post x GM Died x Oldest	−0.122***	−0.134**	−0.172**	−0.167**	−0.183***	−0.209***	−0.129***	−0.200**	−0.201**	−0.119***	−0.0581	−0.106***
GC at most 5 years old	(0.0305)	(0.062)	(0.0678)	(0.0659)	(0.0436)	(0.0493)	(0.0316)	(0.0822)	(0.0828)	(0.033)	(0.0409)	(0.0332)
Post x GM Died x Z	−0.0126	0.00529	−0.000279	0.0116	−0.00391	−0.0270	−0.00912	0.0204	−0.00697	−0.116***	0.0490***	0.00488
	(0.0205)	(0.00768)	(0.00796)	(0.0155)	(0.00936)	(0.021)	(0.00882)	(0.0128)	(0.0187)	(0.0208)	(0.0189)	(0.0272)
Post x GM Died x Oldest	−0.0904**	0.0117	0.0363	0.0243	0.0897**	0.152**	−0.0319	0.0277	−0.0189	−0.0693	−0.133**	−0.0866
GC at most 5 years old x Z	(0.0446)	(0.0362)	(0.0447)	(0.0466)	(0.0369)	(0.0621)	(0.04)	(0.0512)	(0.0867)	(0.084)	(0.0605)	(0.0823)
	[0.1793]	[0.9163]	[0.8765]	[0.9044]	[0.0837]	[0.0837]	[0.8765]	[0.9044]	[0.9163]	[0.8765]	[0.1434]	[0.7729]
N	484,454	484,454	484,454	484,454	484,454	484,454	484,454	175,210	175,210	484,454	484,454	484,454
Individual FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Y-Q-Locality FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Y-Q-Young Child FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Y-Q-Grandmother Died FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Note: The table displays heterogeneity of the marginal effect of the grandmother's death on the mother's employment by the variable on the column header, estimated using Eq. (7). Variables with a † at the end are standardized. Standard errors are clustered at the household level. Y-Q stands for Year-Quarter. The number of stars indicates the significance level at which the coefficient is statistically significant: .01, .05, and .1 for three, two, and one star, respectively, and has no adjustment for multiple hypothesis testing. A Bonferroni correction where all the columns belong to the same family of tests would render none of the estimates in the fourth row statistically significant. A Bonferroni correction where columns are split into three families of tests: (i) grandmothers' time use (column 1), children in the household (columns 2-6), and employment and education (columns 7-12), leads to estimates in the fourth row of column 5 and 6 becoming statistically significant at a significance level of 0.1 instead of 0.05 and the estimate in column 11 becoming non-statistically significant at a significance level of 0.1. Numbers in brackets are Romano-Wolf stepdown p-values for multiple hypothesis testing based on Romano and Wolf (2016) and implemented using Clarke (2021).

doubling the negative effect of the grandmother's death on mothers (Column 1 of Table 5). This heterogeneity is not present in households where the oldest grandchild is older than five years.

Even though there is no statistically significant heterogeneity by the number of children (Table 5, columns 2–4), there is heterogeneity by their gender. When there are no male grandchildren, the negative effect

Table 6
Effect on employment probability: Alternative specifications.

	Base (1)	Unbalanced (2)	Any # of GPs (3)	Any # of parents (4)	Any type of work (5)	Any paid work (6)	GM ≤ 60 (7)	GM ≤ 70 (8)	ENOE weights (9)	Youngest ≤ 5 (10)	DiD (11)
Panel (A) Mothers											
Post x GM died	−0.0154	−0.0216*	−0.0150	−0.0270**	0.00309	0.00317	−0.0263	−0.0303*	−0.0366*	−0.0131	0.0131
	(0.0133)	(0.0126)	(0.0130)	(0.0123)	(0.0163)	(0.0158)	(0.0290)	(0.0172)	(0.0201)	(0.0146)	(0.0283)
Post x GM died x Oldest GC	−0.124***	−0.0986***	−0.129***	−0.100***	−0.0909**	−0.101***	−0.163***	−0.137***	−0.147***	−0.0440**	−0.161**
at most 5 years old	(0.0307)	(0.0273)	(0.0306)	(0.0285)	(0.0371)	(0.0356)	(0.0548)	(0.0369)	(0.0447)	(0.0191)	(0.0672)
N	484,454	561,119	487,651	620,172	484,454	484,454	484,454	484,454	484,454	484,454	2,561
Panel (B) Mothers and Fathers											
Post x GM died	−0.00971	0.00449	−0.00520	−0.00313	0.000665	−0.00409	−0.0308	−0.0237	0.0531*	−0.0353	−0.000486
	(0.0219)	(0.0208)	(0.0218)	(0.0215)	(0.0170)	(0.0180)	(0.0396)	(0.0260)	(0.0298)	(0.0242)	(0.0433)
Post x GM died x Oldest GC	0.0232	0.0200	0.0244	0.0337	0.0198	0.00551	0.00390	0.0754	0.0374	0.0589**	0.0298
at most 5 years old	(0.0418)	(0.0395)	(0.0422)	(0.0383)	(0.0341)	(0.0356)	(0.0739)	(0.0478)	(0.0563)	(0.0285)	(0.0957)
Post x GM died x Mother	−0.00569	−0.0261	−0.00985	−0.0239	0.00242	0.00726	0.00449	−0.00656	−0.0898**	0.0222	0.0136
	(0.0252)	(0.0240)	(0.0251)	(0.0242)	(0.0232)	(0.0238)	(0.0507)	(0.0315)	(0.0354)	(0.0284)	(0.0507)
Post x GM died x Oldest GC	−0.147***	−0.119***	−0.154***	−0.134***	−0.111**	−0.107**	−0.167*	−0.212***	−0.185***	−0.103***	−0.190*
at most 5 x Mother	(0.0489)	(0.0454)	(0.0499)	(0.0451)	(0.0487)	(0.0495)	(0.0862)	(0.0568)	(0.0697)	(0.0341)	(0.103)
N	743,723	861,568	749,231	933,821	743,723	743,723	743,723	743,723	743,723	743,723	3,591
Individual FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Y-Q-Young Child-Gender FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Y-Q-GM Died-Gender FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Y-Q-Locality-Gender FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Note: The table displays the marginal effect of the grandmother's death 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 Columns 7 and 8, the Grandmother died dummy takes the value of 1 only if the grandmother that died was under 60 or 70 years old. In Column 9, ENOE weights, the estimation uses the probability weights available in the ENOE. In Column 10, 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: .01, .05, and .1 for three, two, and one star, respectively. The numbers in parenthesis are the standard errors clustered at the household level.

of the grandmother's death is 20.9pp, but if there is at least one male, this negative effect declines to 5.7pp. While fully characterizing the heterogeneity by gender of grandchildren is beyond the scope of this paper, this result is consistent with a society in which protecting and looking after girls is more important than looking after boys.

In the sample of mothers employed in the first survey wave, the grandmother's death reduces mothers' employment probability by 34.5pp for those in the informal sector (Column 10). However, this negative effect is 21.8pp smaller for those in the formal sector (yet this difference is not statistically significant, p-value = .15). I find no heterogeneity by household income, mothers' income, and mothers' hours worked (Columns 7–9).

The grandmother's death reduces mothers' employment probability irrespective of their education level. Columns 11 and 12 show that in absolute terms, the negative effect is much more extensive for more educated mothers. However, relative terms may be more informative because more educated mothers are more likely to be employed. In particular, the grandmother's death reduces the employment rate for mothers without high school by 5.8pp (17%) and for those without college by 10.6pp (27%). The negative effect for those with high school is a reduction in employment rate by 19.1pp (36%) and for those with college by 19.3pp (31.4%).

5. Robustness

This section is divided into two subsections: (i) alternative specifications, and (ii) the grandfather's death. The first subsection includes variations to the main specification: using an unbalanced panel, not restricting the maximum number of grandparents or parents in the household, broadening the definition of employment, using only the deaths of young grandmothers, using the age of the youngest child instead of the oldest, and estimating a double-difference only with the sample of parents who lived in a household where the grandmother died. 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, through its impact on childcare, should be smaller (if any); this is documented empirically in the second subsection.

5.1. Alternative specifications

Table 6 contains the main specification and ten 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. Column 2 presents the estimates for the unbalanced panel, which includes households that responded to the ENOE less than 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.

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 use only the deaths of grandmothers at most 60 and 70 years old.

Column 9 repeats the estimation but uses ENOE's probability weights that account, among many other things, for non-response. The estimates of interest are very similar in magnitude (within one standard error) and significance. I do not use this specification as the main one because INEGI designed these weights to make the survey representative at that quarter's state and country level. These weights are not necessarily representative of subsamples (three-generation households and three-generation households where the grandmother died). Moreover, the weights were designed to provide quarter-by-quarter snapshots of the labor market and not average effects on subsamples across years.

To disentangle the effect that the grandmother's death has through its impact on childcare from alternative mechanisms, the empirical

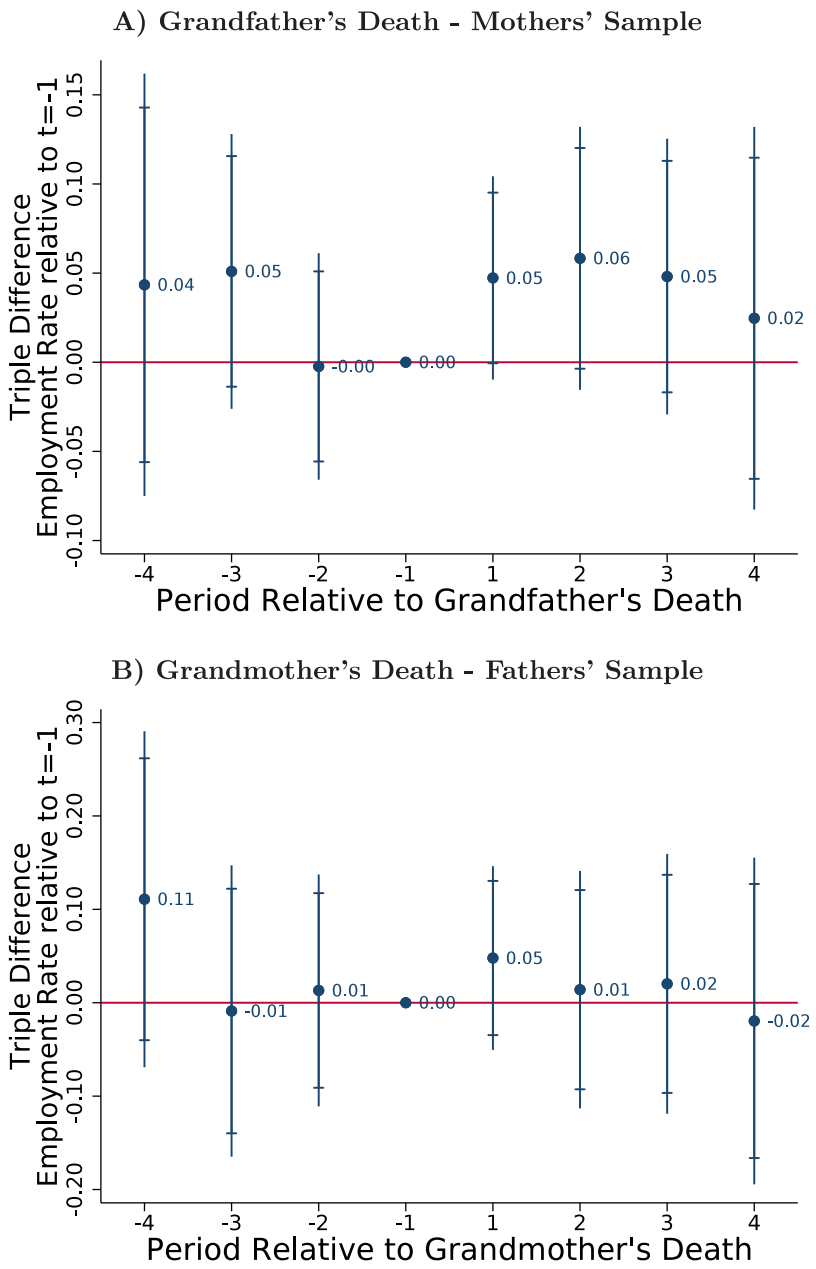

Fig. 6. Event study of grandfather's death (mothers) and grandmother's death (fathers)
Note: The top (bottom) graph displays the point estimate and the 90 and 95% confidence interval of the effect that the death of a grandfather (grandmother) has on the employment rate of mothers (fathers) by period 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 Fig. 4 is used.

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 10 replicates the analysis but uses 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. To show that older siblings providing care are substitutes for grandmother-provided care, Table A.5 presents the effect of the death of the grandmother on the amount of time that older grandchildren spend providing care. I estimate this effect for children ages 12 to 15, 12 to 18, and 12 to 21 in households where the youngest child is at most five years old, and the grandmother is less than 70.[10] The reason to estimate for grandmothers less than 70 is to avoid, to some extent, grandchildren providing care for the elderly because the question adds up the time spent providing care for children, the elderly, the sick, and the disabled. The grandmother's death increases the amount of time older grandchildren spend providing care between 94 and 112%, and the probability of them providing care by 6 to 7pp (58 to 65%).

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

[10] INEGI only asks the question for the population 12 years old and older.

the death and young vs old children). A disadvantage of this alternative is the loss of precision from estimating the time FE with a smaller sample. Column 11 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 Fig. 6 displays the triple-difference estimates of Eq. (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 coinhabiting 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 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.

CRediT authorship contribution statement

Miguel Ángel Talamas Marcos: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data curation, Writing – original draft, Visualization, Investigation, Supervision, Software, Validation, Writing – review & editing, Project administration.

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.jdeveco.2022.103013.

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