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The Granny Penalty: Navigating the Challenges of Informal Childcare

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Abstract

This study examines the impact of grandchild care on the labor market outcomes of grandparents amid the rapid aging and feminization of the global population. Employing an instrumental variable approach, we find a substantial negative effect on the employment rate of grandmothers, particularly for those cohabiting with their children, while no significant effect is observed for grandfathers. These findings suggest that grandchild caregiving contributes to the gender gap in labor force participation among the elderly, with a more pronounced effect in urban areas. We also find that the reduction in labor supply occurs primarily among younger grandmothers, indicating an early withdrawal from the workforce. Our findings provide new evidence of a penalty of grandmotherhood in labor supply, highlighting the challenges faced by elderly women in developing countries, where caregiving duties and co-residence norms are prevalent. These results offer valuable insights for policies supporting female labor market participation in regions experiencing similar demographic transitions.

Keywords: Grandparents, Labor force participation, Grandchild care, Gender, LASI, India

JEL Codes: D10, D19, J13, J14, J22, J26

Declarations of interest: none

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1. Introduction

In recent times, the swift aging of the global population and its growing feminization have captured significant attention[3]. Currently, developing countries house approximately 66% of the global elderly population (UN World Population Ageing, 2017). In India, the number of older adults, including those in the pre-retirement phase, aged 45 years and above, is expected to comprise more than 40% of the country's total population by 2050[4] (UN World Population Prospects, 2019). Additionally, a substantial portion of the population attains grandparent status before retirement age. Figure A1 indicates that, as of 2017, over half (51%) of Indian women become grandmothers by the age of 45, and this percentage increases to around 95% by the age of 64. For grandfathers, the proportion increases from around 33% to 90% during the same age range. Despite this, there is a lack of evidence, particularly in developing countries, on how becoming a grandparent during the working age affects the labor supply in the growing elderly population.

The Longitudinal Ageing Study in India (LASI, 2017-19) indicates that nearly 22% of grandparents are involved in daily care for their grandchildren, dedicating an average of 21 hours per week. This exceeds the levels observed in developed countries. In comparison, according to the 2015 Survey of Health, Ageing, and Retirement in Europe, 18.5% of grandparents reported providing care almost daily (Floridi, 2022). In the United States, grandmothers aged 50-64 reported spending 15.7 hours per week on grandchild care, while grandfathers reported spending 6.7 hours per week on similar responsibilities (Rupert & Zanella, 2018). The considerable time transfers associated with grandparenting raise questions about how much it displaces labor supply. While the literature has explored the effects of grandparent-provided childcare on parents' labor supply (Khanna & Pandey, 2024; Meng et al., 2023; Husain & Dutta, 2015), there is limited understanding of the effects on grandparents' labor supply.

Our paper endeavors to bridge this gap by studying the labor market outcomes of the elderly who assume caregiving responsibilities for their grandchildren. The average labor force participation rates in India between the age of 45-60 have plummeted from 86% to 54% for

[3] Worldwide, the share of older adults (those above 60) is expected to surpass the share of children (those below the age of 10) by 2030. As of 2017, women constituted 54% of the global older adults and 61% of those 80 years or above (UN World Population Ageing, 2017). As a result of women's extended life expectancy, we can see an increasing share of females among the elderly population.
[4] This is equivalent to approximately 655 million people.

grandfathers and from 45% to 21% for grandmothers during the survey year 2017-19 (Figure A2). This gender gap between the labor force participation of the grandparents and the alarmingly low participation of grandmothers towards the end of their working age could be a contributing factor to the overall gender gap observed in formal employment. However, identifying the causal effect of grandchild care on grandparent's labor force participation is complicated, given the endogeneity concerns. Endogeneity can arise from unobservable omitted variables, such as the value individuals assign to family care, which would bias our estimates. This bias may be more prominent for grandmothers due to cultural norms around caregiving. Additionally, the availability of childcare from grandparents may factor into parents' decision-making regarding having children, leading to reverse causality.

Considering these concerns, we employ an instrumental variable approach to estimate the effects of providing grandchild care services on grandmothers' labor supply in India. We use nationally representative data from the first wave of LASI, which provides information on the aging, work, and health of the 45 years and above elderly population. We propose the first child being male as an instrument for providing grandchild care following the reasoning that, in India, married male children tend to reside with their parents instead of married female children, and it is uncommon to bear children out of wedlock. Therefore, having a first male child increases the probability of providing grandchild care in later life.

The validity of this instrument rests on the assumption that the sex of the first child must be random and influence the grandparent's labor supply solely through their caregiving behavior. Although it has already been established in the literature that the sex of the first child is random (Das Gupta & Bhat, 1997; Visaria, 2005; Bhalotra & Cochrane, 2010; Rosenblum, 2013; Kugler & Kumar,2017, Anukriti et al., 2022), we also provide evidence supporting the exogeneity of the gender of the firstborn in our sample. Notably, the exclusion restriction is violated if (potential) grandmothers exit the labor market because their first child is male and, therefore, wants to provide more care to the male child. If the mother does not join the labor market again, she will be unemployed, even as a grandmother, later in life. So, the grandmother's labor force participation is affected by the sex of her first child directly and not through her grand-child care activity. To address this concern, we show that having a first-born male child does not impact the labor force

participation of the potential grandparents[5]. Also, we check separately for grandparents whose firstborn male child co-resides with them versus those without co-residing status. We find no effect on grandmothers who do not reside with children since they are less likely to provide care for grandchildren. Since our estimates are conditional on the number of offspring to the grandparents, having the first male child should have no other direct effect on the labor supply. Another concern is that a first male child, now an adult having children, leads to higher potential family income. This can affect labor supply. To address this concern, we control for total income of the household.

We find that providing grandchildren care substantially and negatively impacts the grandmother's employment. However, we do not find any significant effect of grandparenthood on the labor supply of grandfathers. At the same time, the number of hours worked by employed grandparents is not affected. Our findings are consistent across various robustness checks. Extending the analysis to different age groups reveals that the labor supply adaptations made by grandmothers occur primarily at younger ages. This suggests that women assume the role of grandmothers earlier than their male counterparts and have a higher likelihood of exiting the labor market. To investigate the robustness of our 2SLS estimates, we randomly delete 1% of our sample and re-estimate the model. This process is repeated 1000 times, and the results suggest that the deletions do not alter our findings. In addition to the primary findings, the effects are concentrated in urban areas.

The contemporary literature builds on earlier findings that becoming a grandparent is associated with declining labor supply (Hagestad, 2006; Ho, 2015). It addresses the endogeneity problem using instrumental variables to establish a causal effect of having grandchildren on grandparents' labor supply (Asquith, 2018; Frimmel et al., 2022; Rupert & Zanella, 2018; Backhaus & Barslund, 2021; Malisa, 2024). Asquith (2018) estimates that the birth of a grandchild in the US increases the likelihood of retirement, on average, by 8.5% for grandmothers, while for those still working, the annual work hours fall by 14% (which implies a reduction of 120 hours annually). They utilize variations in access to different types of contraceptives across states and years as instruments for fertility patterns. Frimmel et al. (2022), using twin birth as an instrument

[5] Potential grandparents are individuals aged 45 and above, who have not yet attained grandparenthood status, and have children aged 18 and above. Note that this is not to say that having children has no effect on labor force participation, but that the sex of that child is not a determinant.

in a timing-of-events study design, found that grandmothers are around 8.5% more likely to leave the workforce in Austria.

Rupert & Zanella (2018) provide a theoretical framework on how intergenerational dynamics between grandparents (Seniors) and their children (Juniors) affect labor supply and childcare for grandchildren (Babies). Their model demonstrates that Seniors' labor supply response to becoming a grandparent depends on their valuation of grandparenting and their altruism towards Juniors. The model also addresses the endogeneity issue, where the anticipated level of childcare support from seniors may influence Juniors' decision to have children. They use the birth of a first-born female child as an instrument, given that females tend to marry and have children earlier than males. They find that becoming a grandmother in the US leads to a 30% reduction in employed women's labor supply compared to non-grandparents. In contrast, no significant decline is noted among grandfathers. Similarly, Backhaus & Barslund (2021) use this instrument in Europe, establishing a 36-percentage point decrease in the probability of workforce participation for grandmothers, with no significant effect on their work hours. Consistent with the findings of Rupert & Zanella (2018), Backhaus & Barslund (2021) also find grandfathers' labor supply to be unresponsive to the presence of grandchildren. However, a more recent study (Malisa, 2024) finds that the arrival of grandchildren increases the retirement rates of both grandmothers and grandfathers. Grandmothers tend to retire soon after a grandchild's birth, while grandfathers leave the workforce after their children's parental leave ends.

Our study contributes to the literature in four ways. First, using the caregiving information of the data, we estimate the effect of actual caregiving for the grandchildren on the labor supply of grandparents rather than estimating the effects of the birth or arrival of a grandchild. This way, we capture the Local Average Treatment Effects on Treated (LATE) and not the Intention-To-Treat (ITT) effects. Second, we study the caregiving effect in the context of a developing country where co-residing is a standard norm and providing unpaid work, or informal care is a widespread phenomenon among women[6]. Moreover, India is among the few growing economies facing declining female labor force participation, and several studies have shown that social norms continue to impede women's ability to participate in the workforce in India despite improvements

[6] As per OECD (2012) India has the largest unpaid work gender gap wherein women spend on average 352 minutes per day on unpaid labor relative to men who spend around 52 minutes.

in education and a drop in fertility rates (Bedi et al., 2018; Jayachandran, 2020). Therefore, we anticipate the effects on the labor force participation of grandparents in India to be much stronger.

Third, while there is ample literature on the motherhood penalty[7], the literature on the grand-motherhood penalty is limited. On an extensive margin, studies point out the negative effects of having a young child on mothers' labor supply (Sengupta & Das, 2014; Klasen & Pieters, 2015; Deshpande et al., 2021). On an intensive margin, Sarkhel & Mukherjee (2020) find an association between childrearing and the labor market through reduced wages and working hours of women. However, the presence of older women in the household appears to partially mitigate this effect, suggesting a shared caregiving responsibility among women (Das & Zumbyte, 2017). Childcare provided by grandparents reduces the impact of fertility on the parental labor supply in rural China (Guo et al., 2018). Also, mothers with two children are less likely to live with their parents or their partners' parents, but having more than two children significantly increases the likelihood of children co-residing with the maternal grandmother by 5 percentage points (Schmieder, 2021). This suggests that grandmothers play a key role in substituting for the childcare typically provided by mothers. Supporting these findings, Khanna and Pandey (2024) find that the death of a co-resident mother-in-law reduces women's labor supply in India. None of these studies investigate the grandmotherhood penalty, which is our contribution to the literature investigating the puzzle of falling female labor force participation.

2. Data

We use nationally representative data from wave 1 of LASI (Chien et al., 2023), surveyed in 2017-19, covering 42,951 households from 35 states and union territories of India[8]. Households are eligible if they have at least one member above 45 years. 72,250 individuals who are 45 years or above and their spouses (irrespective of age) living in the same households are eligible members. The survey collects data on demographic information, financial status, biomarkers, cognitive abilities, healthcare coverage, employment history, retirement plans, and social and family connections. It belongs to the Health and Retirement Studies (HRS) family, an initiative to offer

[7] Motherhood penalty refers to the disproportionate impact on women's labor market outcomes, such as their labor supply, wages and employment opportunities that arises from the bearing and caring for children in comparison to men (Das & Žumbyt˙e ,2017; Sarkhel & Mukherjee, 2020; Deshpande et al., 2021).
[8] Sikkim was not surveyed.

policymakers a thorough understanding of the global aging population's economic, social, and health aspects.

As we plan to study the effect of grandchild care on grandparents' labor force participation, we restrict our sample to grandparents whose first child was born before 2000 (at least 18 years old). We also restrict the maximum number of grandchildren to 40 to avoid outliers. Our working sample consists of 20,878 grandparents in the working age group (45-60) at the time of the interview.[9] We use two measures of labor supply: first, at the extensive margin, the labor force participation as a binary measure (if the respondent is working for pay); second, at the intensive margin, working hours (the number of hours worked in a week). The family care module of LASI asks the respondents if they take care of grandchildren, which is our independent variable. The survey does not disclose the birth year of their grandchildren. Consequently, the age at which individuals become grandparents cannot be determined from this data; nonetheless, this data point is not required for our identification approach.

The survey also provides demographic information of respondents co-residing and not co-residing children. If the child resides in the household, then their gender and year of birth are recorded in the household dataset. The respondents are also asked to provide the same information for the not co-residing children. We construct our instrumental variable by identifying the first or eldest living male child by combining both residing and not residing children's birth year data. So, our analytical sample consists of working-age grandparents (respondents) with at least one grandchild who provide information on their employment status, details about their children, and whether they care for their grandchildren.

Table 1 displays the summary statistics of this sample. The greater prevalence of grandmothers in our sample suggests a trend toward the feminization of the elderly population. Furthermore, on average, women tend to become grandmothers a year earlier than men. The table shows that approximately 51% of the firstborns are males, and individuals give birth to about four children on average. Grandmothers are less likely to be employed for pay, which aligns with low female labor force participation in India. We also observe that grandmothers are less educated; around 56% have no education, and less than 1% have attained tertiary education. The majority of our sample belongs to the Hindu religion and lives in rural areas. On average, 86% of grandparents

[9] We restrict our sample to 60 years old, which is the retirement age.

report being healthy (42% in good health and 44% in fair health), whereas 14% report being in bad health.

< Insert Table 1 here >

3. Identification Strategy

We use the linear probability model to estimate the effect of grandchild care (GC) on labor force participation and hours worked. For labor force participation, Y_{isb} is a binary variable taking the value one if grandparent *i* is employed in paid work in state s, with the first child born in year b For hours worked Y_{isb} is a continuous variable indicating the number of hours worked for pay in a week by the same grandparent. A natural logarithm of hours worked is taken to smoothen the distribution in a linear model. The estimation equation is as follows:

$$Y_{isb} = \alpha_S + \delta_b + \beta_1 GC_{isb} + \gamma X_i + \varepsilon_{isb} \quad (1)$$

GC_{isb} is an indicator variable equal to one if grandparent i takes care of their grandchildren. The vector X_i denoted the set of explanatory variables that directly affect the labor supply of grandparents, such as their age, age squared, education, caste, religion, total household income, area of residence, ratio of male children, and health status of respondents. α_S denotes state-fixed effects that control for state-specific time-invariant unobservables. δ_b controls for the birth year of first child, which accounts for the first-born cohort-specific characteristics. The coefficient of interest is β_1 , which represents the caregiving effect at the intensive and extensive margins of grandparents' labor supply.

There are two challenges to this identification strategy. The first and most significant challenge is the endogeneity of providing care. Grandparenting attributes such as family values can influence the time devoted to caring for grandchildren. Also, the time transfers from grandparents opting to invest their time in grandchild care rather than working reduce the cost of childbearing to the parents. The parents of the child may take this into consideration while having children. This creates simultaneity wherein the grandparent's labor supply adjustment leads to them becoming grandparents and thus providing care. A potential solution is to find a random event not directly affecting the labor supply in later stages of life but affecting the likelihood of

care-giving as a grandparent. One potential instrument can be the sex of their first child (Rupert & Zanella, 2018; Backhaus & Barslund, 2021). We instrument grandchild care with having a firstborn male child to the grandparent. A firstborn male child increases the probability of providing grandchild care during labor force participation age. This is because, in a typical Indian household where co-residing is a common norm (Jadhav et al., 2012; Saha & Majumdar, 2023), parents tend to stay with their male children even after the child's marriage, whereas the female children move away to their husband's home after marriage. Therefore, if the firstborn child is a male as compared to a female child, the demand for grandparents' care in child rearing arises earlier in a grandparent's life, potentially during their labor force participation age. Hence, the instrument is defined as follows:

$$z_i = \begin{cases} 1 & \text{if the first child of grandparent } i \text{ is male} \\ 0 & \text{if the first child of grandparent } i \text{ is female} \end{cases}$$

In the first stage of our 2SLS model, we estimate a linear probability model following an OLS regression method that estimates the association between having the first male(FC_i) child and the chances of providing grandchild care:

$$GC_{isb} = \alpha_S + \delta_b + \tau FC_i + \gamma X_i + \theta_{isb} \quad (2)$$

The 2SLS estimator employs exogenous instruments to get the predicted value of endogenous variables in a first-stage regression, which is used in the second stage. The validity of the instrument depends on meeting the following conditions: One, the first child being male is exogenous. Two, the labor outcomes of grandparents differ by the gender of their child only through the proposed channel of grandchild care. Three, the sex of the first child is correlated with higher grandchild care, The next few paragraphs help to demonstrate the validity of the instrument.

The first child being male is exogenous: One potential concern can be the use of prenatal sex selection techniques to alter the sex of the first child. We produce supporting evidence that the sex of the firstborn is not endogenous to the model. Figure A3 illustrates this. Panel (a) plots the grandparents in our sample with a firstborn male by children's birth year. For the children born between 1970-1990, the average proportion of firstborn males remains within the expected range of 50% to 55%. As having a first female child increases the probability of attaining

grandparenthood status at an earlier age, we observe that post-1990, the share of grandparents having a first child male declines. Additionally, we expand our analysis to include the entire sample of individuals, irrespective of grandparenthood status, as demonstrated in Panel (b) of Figure A2. The trend in the proportion of firstborn males does not exhibit any sudden spike.

Some of the previous studies have also supported the exogeneity of the sex of the first child in India (Das Gupta & Bhat,1997; Bhalotra & Cochrane, 2010; Kugler & Kumar, 2017; Anukriti et al., 2022). In light of the strong son preference in India and the availability of prenatal sex detection facilities, Anukriti (2018) argues that financial incentives that aim to reduce fertility may violate this assumption of exogeneity. In particular, she shows that the Devi Rupak scheme in Haryana augmented the sex ratio during first births by 1% to 2.3% by giving benefits to even one male child. However, fertility targeting schemes were introduced in the mid-2000s, and because we limit our data to births before 2000, the interference of such schemes is potentially avoided. Also, according to Jayachandran's (2017), while most families in India desire a male child if they can have one child only, they prefer having both a daughter and a son, when their family size is two. Given that the desired and actual fertility rates in India are higher than one, it can be inferred that parents are not opposed to having at least one girl child, despite a preference for a boy (Anukriti et al., 2022). In our sample, individuals have 3-4 children on average. Also, as noted in the summary statistics, the proportion of first male children remains in the expected range at 51.5% approximately[10].

The first child being male affects elder labor supply only through grandchild care: If there are other channels through which the sex of the first child influences the labor outcomes in the older age, then our identification strategy will not hold. One concern pertains to potential bias resulting from respondents exiting the labor market due to the birth of a male child. In such a case, the treatment effects will confound the effects of childcare and grandchild care. Rose (2000) develops an intertemporal model that predicts the effects of a gender shock (i.e. birth of a boy relative to a girl), conditional on whether the household faces credit constraints. Her findings for rural India reveal that gender shock reduces men's leisure time in landless and small farm households, whereas an increase is observed in men's leisure time in medium to large farm

[10] Without any interventions, the probability of having a son independent of genetic factors is approximately 0.512 (Ben-Porath and Welch 1976; Jacobsen et al. 1999).

households. Furthermore, across all farm households, women tend to work less following the birth of a son than a daughter in credit-constrained households.

Regarding these concerns, it is important to note that there have been issues with how to measure female employment in rural areas[11]. Jia and Dong (2013) focus on estimating the wage penalty of motherhood for urban women in China, highlighting rural-urban differences in the trade-offs women face between employment and childcare. They argue that rural women primarily work on family farms and suggest that self-employment may offer better opportunities for combining work and childcare than wage employment. Deshpande and Kabeer (2021) reveal that a substantial number of women are involved in economic activities categorized as "expenditure saving," which often go unrecognized as conventional economic production[12]. The literature suggests that in India, women often experience transitions into and out of the labor force. Unlike findings in developed countries, there is no abrupt decline in female labor force participation during or immediately after childbirth (Deshpande & Singh, 2021). Instead, women anticipating future childbirth exit the labor market years before delivery, maintaining a consistently lower female labor force participation for the subsequent years[13]. As this decision is made beforehand, it is unlikely that the gender of the first child will play a role in exiting the labor force.

Without having panel data, tracking the exact time of transition from the labor market is not possible. Nevertheless, we present evidence suggesting that this potential bias will likely have a minimal impact. Specifically, we regress being employed on the occurrence of a first male child for individuals who are yet to be grandparents to capture the effect of caregiving for the male child. The results are presented in Table 2. We do not observe any significant impact on all non-grandparents or by gender.

[11] Female Labor Force Participation Rates typically derived from the National Sample Survey in India tend to underestimate women's engagement in economic activities (Sudarshan and Bhattacharya, 2009; Hirway and Jose, 2011)

[12] Women work in farming, family business, livestock rearing is not accounted for whereas their male counterparts performing similar tasks are reported as working.

[13] Similarly, those with childcare responsibilities tend to leave the workforce earlier than when they actually give birth, staying out for an extended period. In contrast, employment patterns in developed countries often reveal mothers exiting the labor force a few months before childbirth, with a significant portion rejoining after delivery. (Deshpande & Singh, 2021)

< Insert Table 2 here >

Lastly, we also show that the first child being male correlates with the grandparents' employment status to ensure that our model has a valid reduced form. These findings are presented in Table 3. As anticipated, when the first child is male, it decreases the chances of grandparents' employment by approximately 4 percentage points (as shown in column 1). We observe no significant impact on the probability of employment of grandfathers; rather, the effect is driven by grandmothers (as shown in column 2). In conclusion, the gender of the first child affects the employment of grandparents but not potential grandparents, suggesting that grandchild care plays a significant role in the labor supply decisions of grandmothers. Later, while testing the robustness of our estimates, we also show that the grandchild care effect is driven by those whose first male child resides with them. This further supports our argument that the condition of having a first male child is not likely to affect the labor force participation decision directly.

< Insert Table 3 here >

First child being male is correlated with higher grandchild care: Finally, we show that the instrument satisfy the relevance condition, i.e., it is sufficiently correlated with grandchild care. It is to be noted here that the instrument functions through the assumption that cohabitation with male children leads to grandchild care. We depict this in Figure A4. The figure shows a notable disparity in the proportion of grandparents caring for their grandchildren when their first child is a male versus a female. The percentage of grandparents caring for their grandchildren is higher if their firstborn is male. Figure A5 further depicts these results by gender of the grandparent. As expected, the proportion of grandmothers who provide care for their grandchildren is higher on average than that of grandfathers. We explicate this further by regressing grandchild care on the first child being male. Table 4 displays that the instrument has a robust first stage, and the direction aligns with expectations. Specifically, grandparents' likelihood of providing grandchild care increases by approximately seven percentage points on average when their first child is male. These estimates have small standard errors and are supported by an F-statistic greater than 10, which dismisses concerns regarding weak instrumental variables.

< Insert Table 4 here >

4. Results

Panel A of Table 5 presents the impact of grandparenthood on the labor market status of the entire sample aged 45 to 60. The first two columns report the coefficients from the ordinary least squares (OLS) estimates, which do not account for the potential endogeneity in the relationship between grandparenthood and labor market outcomes. Providing grandchild care is associated with a 4.9 percentage point reduction in the probability of employment (Column 1). Upon conditioning on covariates, both the magnitude and statistical significance decrease (Column 2). In the following columns (3-4), we use the *First Male Child* instrument to address the potential endogeneity issue. The instrumented coefficient reveals a notably larger impact of grandparenthood on employment status compared to the OLS estimates. With the covariates, providing care leads now lead to a 29 percentage point lower probability of being employed, which is statistically significant at a 10% level (Column 4). Panels 2 and 3 show the caregiving effect separately for grandmothers and grandfathers. The observed effect is predominantly driven by grandmothers, indicating a significant negative 38 percentage point reduction in the probability of working in the 2SLS estimate (Panel 2, Column 4). We do not find any significant effect on grandfather's employment.

< Insert Table 5 here >

Table 6 indicates the caregiving effect on hours worked per week among those engaged in paid employment. In Panel 1, the OLS estimates reveal a negative association between providing care and hours worked, although the coefficient is not statistically significant in a full model. In Panel 2, the OLS estimate (column 2) suggests that grandmothers who care for grandchildren decrease their hours worked by approximately 8.7%. Accounting for endogeneity in the 2SLS estimations, the coefficients (in columns 3 and 4 of Panel 2), although negative in sign and comparatively large in quantity, lose precision. In Panel 3, for the men's sample, the reduction in sample size makes both the OLS and IV estimates imprecise. For the male grandparents, we do not find any evidence of an effect of caregiving on the work hours at the intensive margin.

< Insert Table 6 here >

5. Robustness

5.1 Cohabitation with a first male child

First, we check the robustness of the effects of caregiving on the labor supply of grandparents by cohabitation status with the first male child. We expect the effect to be strong if they co-reside. Table 7 presents the impact of grandparenthood on labor force participation, stratified by whether or not the grandparent resides with their firstborn male child. Columns (1) and (2) instrument grandchild care with a first male child residing in the same household[14]. In contrast, columns (3) and (4) use the first male child is not residing in the same household as the instrumental variable[15]. We drop male twins if one is residing together, and the other is not. The results indicate that cohabitation significantly reduces the chances of labor force participation by approximately 50 percentage points (Column 1 of Panel 1). This effect is substantial in magnitude and larger than the coefficient previously estimated. Consistent with prior findings, grandmothers exhibit a more significant reduction in employment rates than grandfathers. However, in Column (2), we detect a sizeable reduction in the work hours at the intensive margin of labor supply in cohabiting households, which is statistically significant at the 5% level. Grandfathers primarily drive this effect at the intensive margin (column 2 of Panel 3) due to the lower employment rates of grandmothers at baseline.

Notably, we do not observe any significant impacts on either at the extensive or intensive margins of labor supply while grandparenting if the firstborn male child does not cohabitate (Columns 3-4). This outcome provides further assurance that our instrumental variable effectively captures the caregiving effect for grandchildren on labor force participation.

We also address that the additional income brought by the cohabitating male child could play a role in grandparents withdrawing from the labor force. We do so by controlling for the household's total income, which includes rental income, government transfers, agriculture and non-agriculture income, business, pensions, and salaries. We note that our main findings remain valid, and these additional analyses help to establish the robustness of our results.

[14] The instrument takes the value 1 if firstborn male child is co-residing and 0 for firstborn female child.
[15] The instrument takes the value 1 if a firstborn male child is not co-residing in the household and 0 for a firstborn female child.

< Insert Table 7 here >

5.2 Random deletion of one percent of the sample

Following (Backhaus & Barslund, 2021), we do a test of random simulation to check the sensitivity of our 2SLS estimates. We randomly delete 1% of our working samples of grandmothers and grandfathers separately and estimate specification (1) using the remaining data. We do this 1000 times and note the coefficient from each simulation. Figures 1 and 2 display the distribution of coefficients obtained from this exercise for employment and hours worked. At an extensive margin, the effect of providing grandchild care on grandmothers' employment is centered around -0.30, which is approximately equal to our 2SLS estimate (Figure 1, Panel (a)). Panel (b) of Figure 1 plots the same coefficients for the sample of grandfathers, and the effect is centered around -0.16, which again matches our initial estimate. Figure 2 displays the distribution of effect sizes at the intensive margin. The results remain consistent with the previous estimates for grandmothers and grandfathers. Based on the analysis of these distributions, we infer that the effect sizes appear relatively robust to the deletions.

< Insert Figure 1 here >

< Insert Figure 2 here >

5.3 Sample Restriction

We further explore the impact of providing grandchild care by focusing on a a sub-sample of younger grandparents. This approach is motivated by the recognition that various factors may influence grandparents' decisions regarding labor market participation as they approach the end of their working years. They may become less attached to the labor market as retirement approaches, preferring to engage more in household duties. Conversely, they may remain strongly attached to the job market to maximize retirement benefits such as pensions. To address these concerns, we examine the effect of providing grandchild care on a sub-sample of grandparents aged 45-55[16].

[16] This age range was not arbitrarily chosen. Our results remain consistent even when adjusting the age range by a year or two.

Table A1 shows the results for the younger age group. On the extensive margin, we find that providing grandchild care leads to a 5.5 percentage point decrease in the likelihood of employment (column 1). However, once we control for the covariates, these effects disappear in the OLS estimation. Upon correcting for bias in our 2SLS model, we find that providing grandchild care results in a much larger 31.8 percentage point decrease in the likelihood of employment (in column 4). This effect is primarily due to grandmothers, who account for approximately a 53.4 percentage point decrease in employment. We do not observe any significant effect in the intensive margin of hours worked. Our previous findings that grandfathers have no significant effect on labor force participation remain robust to the sample split.

5.4 Falsification

We selected the first male instrument for two primary reasons. Firstly, in India, it is common practice for parents to reside with their male children, increasing the likelihood of them providing care for grandchildren born from the first male child rather than a female child. Secondly, they tend to become grandparents at a younger age from their first male child compared to their second. Following this reasoning, we anticipate that using this instrument should not affect the labor supply of older grandparents. Given that the retirement age in India varies from 60 to 65 across different states, a robust falsification test would be to analyze the impact of providing grandchild care on the labor decisions of individuals aged 65 and above. To conduct this test, we apply our same model to a sample of grandparents aged 65-75, and the results are reported in Table A2. We observe no effect on either the extensive or intensive margin. This finding assures us that our estimated effects are not spurious.

6. Conclusion

The existing literature documents that grandmothers are more commonly relied upon in developed countries to replace working mothers in childcare. However, the literature does not explore this much in the context of developing countries, where formal labor force participation of women is an increasing concern. The findings presented in this paper add to the literature that suggests a trade-off between grandchild caregiving and grandparental labor supply, particularly

for grandmothers. Our analysis reveals a substantial negative impact of providing grandchild care on the labor force participation of grandmothers at the extensive margin. We employ the first male child as an instrument, substantiating a highly significant and appropriate first-stage estimate. Our instrumental variable approach effectively addresses the potential bias otherwise found from the OLS estimation in the extensive margin for grandmothers.

It is worth noting that Backhaus & Barslund (2021) and Rupert & Zanella (2018) also observe a similar bias in the OLS estimates. Rupert & Zanella (2018) observe a significant bias in the OLS estimates due to the simultaneity issue in becoming a grandparent and labor force participation decisions in the US. They find that the arrival of a grandchild leads to a reduction in 480 hours of work per year for grandmothers. Their IV estimates sharply contrast with their much smaller and closer to zero OLS estimate in the intensive margin. Similarly, Backhaus & Barslund (2021) identify significant bias at both extensive and intensive margins in the countries of the European Union (EU). They find that being a grandmother concurrently reduces the likelihood of employment by a substantial 30 percentage points, whereas the OLS estimate suggests an 8 percentage point decrease only. Our research aligns with this literature, showing a consistent pattern in the nature of bias while estimating the effects on labor force participation using the OLS method.

Our study also confirms the findings of Rupert & Zanella (2018) & Backhaus & Barslund (2021) regarding the absence of an effect at the intensive margin. However, our effect sizes are comparatively larger than those of similar studies in the context of other countries, as mentioned above. This is because first, we estimate the effect of actual caregiving for grandchildren rather than having grandchildren, whereas the latter would capture the effects of potential grandchild care only. Second, contrary to the US and the EU, which are experiencing increasing female labor force participation, India is experiencing a declining trend. Therefore, the effects on women in India are much higher. Third, differences in norms around women's work may also explain why labor supply decisions operate differently in developing countries like India. Grandfathers in the Indian context show no significant change in their labor supply to grandchild care. This finding is similar in the US and EU context, where the presence of grandchildren did not impact grandfathers' labor outcomes (Rupert & Zanella, 2018; Backhaus & Barslund, 2021).

The continued importance of childcare during all stages of women's lives is a matter of concern. Given the declining trend in female labor supply and the notable impact on grandmothers aged 45-54 observed in our study, we anticipate a further decrease in female labor force participation. Our paper also complements the literature showing that grandmother-provided childcare increases mothers' labor force participation (Guo et al., 2018; Meng et al., 2023; Khanna and Pandey, 2024). This indicates an intergenerational trade-off where both the mothers and grandmothers adjust their work hours to provide childcare, highlighting the need for well-considered childcare policy design. Additionally, evidence from China, shows that grandparent caregiving can negatively impact children's academic outcomes, particularly when grandparents have lower education levels (Wang & Bansak, 2024). Studies show that when public daycares become more accessible or private childcare options become more affordable, households tend to substitute grandmother-provided childcare with these alternatives (Marcos, 2023). As we are able to establish the effects of grandchild care on a grandmother's labor supply in the context of a developing country, future research in this area can guide toward necessary policy formulation.

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Table 1: Summary statistics

	Grandparents	Grandmothers	Grandfathers
Age	53.306	53.013	53.821
Male	0.363	0.000	1.000
Married	0.838	0.779	0.941
First child is male	0.505	0.516	0.486
Total no. of children	3.690	3.661	3.740
Total no. of grandchildren	4.668	5.029	4.035
Employment rate	0.544	0.385	0.823
No education	0.565	0.672	0.377
Primary education	0.244	0.205	0.313
Secondary education	0.174	0.116	0.277
Tertiary education	0.017	0.007	0.033
Poorest	0.225	0.223	0.227
Poorer	0.227	0.224	0.231
Middle	0.204	0.203	0.206
Richer	0.187	0.186	0.190
Richest	0.157	0.164	0.146
Hindu religion	0.836	0.833	0.840
Muslim religion	0.113	0.112	0.114
SC Caste	0.230	0.229	0.233
ST Caste	0.100	0.099	0.103
OBC Caste	0.454	0.452	0.457
Rural residence	0.762	0.744	0.794
Good Health	0.422	0.397	0.465
Fair Health	0.435	0.451	0.409
Bad Health	0.143	0.152	0.126
No. of observations	20878	13404	7474

Notes: The table reports summary statistics of grandparents aged 45-60 by gender. Those who have at least one grandchild are classified as grandparents. All variables except for the respondent's age, total number of grandchildren, and total number of children are binary. SC, ST, and OBC variables denote households belonging to scheduled castes, scheduled tribes, and other backward castes, respectively. Respondent's highest level of education: No education, Primary, Secondary, and Higher. LASI categorizes household wealth into five quintiles: poorest, poorest, middle, richer, and richest. Respondent health is categorized into good, fair, and poor. National-level individual weights are applied. Source: LASI waves 1, 2017-19.

Table 2: Association between first child is male and employment status of potential grandparents from OLS

Dependent Variable	(1) Employed=1, Else 0	(2) Employed=1, Else 0
Panel 1: Full sample		
First Child is male (z_i)	0.023	0.013
	(0.027)	(0.021)
Observations	10447	10447
Panel 2: Grandmothers		
First Child is male (z_i)	0.054	0.053
	(0.045)	(0.032)
Observations	4742	4742
Panel 3: Grandfathers		
First Child is male (z_i)	0.010	0.015
	(0.015)	(0.016)
Observations	5705	5705
State Fixed Effects	Yes	Yes
Controls	No	Yes

Sample: LASI Wave 1, observations are individuals aged 45–60 who are not yet grandparents and have at least one child.

Notes: The table presents the coefficient from a OLS regression of the employment indicator on the first child is male dummy (z_i). Controls for respondents' age, age-squared, residence, caste, religion, educational attainment, number of children, self-reported health status, and wealth quintile of household are included. All regressions include state-fixed effects. Robust standard errors are reported in parentheses. *p < 0.10, **p < 0.05, ***p < 0.01.

Table 3: Reduced form Estimates of 2SLS Model

Dependent Variable	(1) Employed=1, Else 0	(2) Employed =1, Else 0
Panel 1: Full sample		
First Child is male (z_i)	-0.040***	-0.019*
	(0.011)	(0.010)
Observations	20878	20878
Panel 2: Grandmothers		
First Child is male (z_i)	-0.030**	-0.026*
	(0.013)	(0.013)
Observations	13403	13403
Panel 3: Grandfathers		
First Child is male (z_i)	-0.015	-0.001
	(0.012)	(0.013)
Observations	7475	7475
State Fixed Effects	Yes	Yes
Controls	No	Yes

Sample: LASI Waves 1, grandparents aged 45–60.

Notes: The table reports reduced form estimates, i.e., the coefficient from a linear regression of the employment indicator on the first child is a male dummy (z_i). Controls for respondents' age, age-squared, marital status, residence, caste, religion, educational attainment, number of children, self-reported health, the birth year of the firstborn child, wealth quintile of household, and total income of household are included. Robust standard errors are reported in parentheses. *p < 0.10, **p < 0.05, ***p < 0.01.

Table 4: First Stage Estimates of 2SLS model

	(1) Grandchild care =1, else 0	(2) Grandchild care =1, else 0
Panel 1: Full sample		
First Child is male (z_i)	0.072***	0.067***
	(0.010)	(0.011)
F test of excluded instruments	53.39	38.89
Observations	20878	20878
Panel 2: Grandmothers		
First Child is male (z_i)	0.065***	0.063***
	(0.013)	(0.013)
F test of excluded instruments	26.96	22.27
Observations	13403	13403
Panel 3: Grandfathers		
First Child is male (z_i)	0.065***	0.063***
	(0.013)	(0.013)
F test of excluded instruments	24.90	17.43
Observations	13403	13403
State Fixed Effects	Yes	Yes
Controls	No	Yes

Sample: LASI Waves 1, grandparents aged 45–60.

Notes: The table reports first-stage estimates, i.e., the coefficient from a linear regression of the grandchild care indicator on the first child is male dummy (z_i). All controls are the same as in Table 3. All regressions include state-fixed effects. Robust standard errors are reported in parentheses. *p < 0.10, **p < 0.05, ***p < 0.01.

Table 5: OLS and 2SLS estimates of the effect of grandchild care on employment of grandparents aged 45-60.

	OLS		2SLS	
	(1) Employed	(2) Employed	(3) Employed	(4) Employed
Panel 1: Full sample				
Grandchild care	-0.049***	-0.016	-0.550***	-0.290*
	(0.015)	(0.013)	(0.171)	(0.159)
Observations	20878	20878	20878	20878
Panel 2: Grandmothers				
Grandchild care	-0.003	-0.011	-0.464**	-0.407*
	(0.017)	(0.016)	(0.223)	(0.227)
Observations	13403	13403	13403	13403
Panel 3: Grandfathers				
Grandchild care	-0.035*	-0.022	-0.188	-0.012
	(0.019)	(0.018)	(0.159)	(0.190)
Observations	7475	7475	7475	7475
State Fixed Effects	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes

Sample: LASI Waves 1, grandparents aged 45–60.
Notes: Columns (1) and (2) present the coefficients from a linear regression of an employment indicator on providing grandchild care indicator. Columns (3) and (4) present the coefficients from the 2SLS model utilizing the First Child is Male indicator as an instrument for grandchild care. All controls are the same as in Table 3. All regressions include state-fixed effects. National-level individual weights are applied. Robust standard errors are reported in parentheses.
*p < 0.10, **p < 0.05, ***p < 0.01

Table 6: OLS and 2SLS estimates of the effect of grandchild care on hours worked by grandparents aged 45-60

	OLS		2SLS	
	(1) Log Hours	(2) Log Hours	(3) Log Hours	(4) Log Hours
Panel 1: Full sample				
Grandchild care	-0.054**	-0.038	-0.573**	-0.608*
	(0.026)	(0.027)	(0.267)	(0.323)
Observations	12045	12045	12045	12045
Panel 2: Women				
Grandchild care	-0.080**	-0.087**	-0.639	-0.925
	(0.035)	(0.034)	(0.473)	(0.653)
Observations	5584	5584	5584	5584
Panel 3: Men				
Grandchild care	0.001	0.009	-0.528	-0.524
	(0.039)	(0.039)	(0.332)	(0.401)
Observations	6461	6461	6461	6461
State Fixed Effects	Yes	Yes	Yes	Yes
Controls	Yes	Yes	No	No

Sample: LASI Waves 1, grandparents aged 45–60.

Notes: Columns (1) and (2) present the coefficient from a linear regression of the log of hours worked weekly on providing grandchild care indicator. Columns (3) and (4) present the coefficients from the 2SLS model utilizing the First Child is Male indicator as an instrument for grandchild care. All controls are the same as in Table 3. National-level individual weights are applied. Robust standard errors are reported in parentheses.

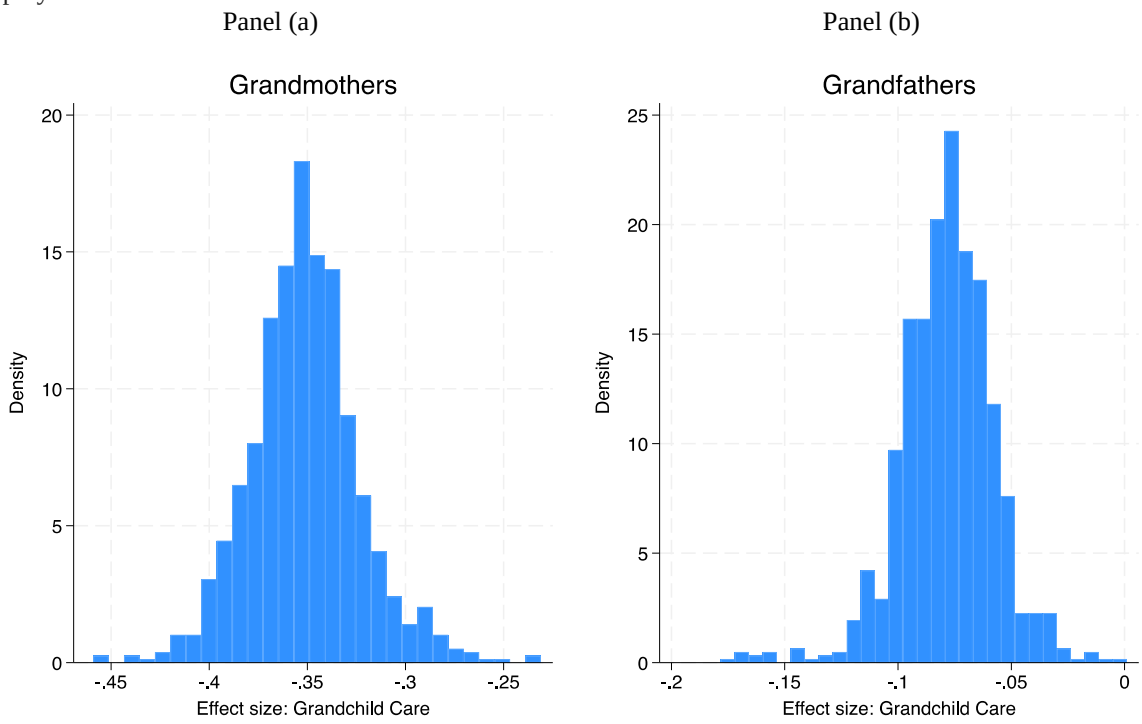
*p < 0.10, **p < 0.05, ***p < 0.01

Table 7: 2SLS estimates by cohabitation status with the first male child

	Cohabitating		Not Cohabitating	
	(1) Employment	(2) Hours Worked	(3) Employment	(4) Hours Worked
Panel 1: Full sample				
Grandchild care	-0.508***	-0.821**	0.184	0.022
	(0.159)	(0.327)	(0.336)	(0.569)
Observations	15836	9179	15315	9041
Panel 2: Grandmothers				
Grandchild care	-0.667***	-0.904	0.185	-0.630
	(0.223)	(0.630)	(0.465)	(1.121)
Observations	9980	4115	9892	4302
Panel 3: Grandfathers				
Grandchild care	-0.185	-0.788**	0.496	0.498
	(0.182)	(0.383)	(0.525)	(0.768)
Observations	5856	5064	5423	4739
State Fixed Effects	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes

Sample: LASI Waves 1, grandparents aged 45–60.
Notes: The table presents the IV estimates of the effects of grandchild care on employment and hours worked by grandparents. Columns (1) and (2) display the results 2SLS model using the Cohabitating First Male Child as an instrument for the grandchild care indicator. Columns (3) and (4) display the same using Non-Cohabitating First Male Child as an instrument for the grandchild care indicator. All controls are the same as in Table 4. National-level individual weights are applied. Robust standard errors are reported in parentheses.
*p < 0.10, **p < 0.05, ***p < 0.01

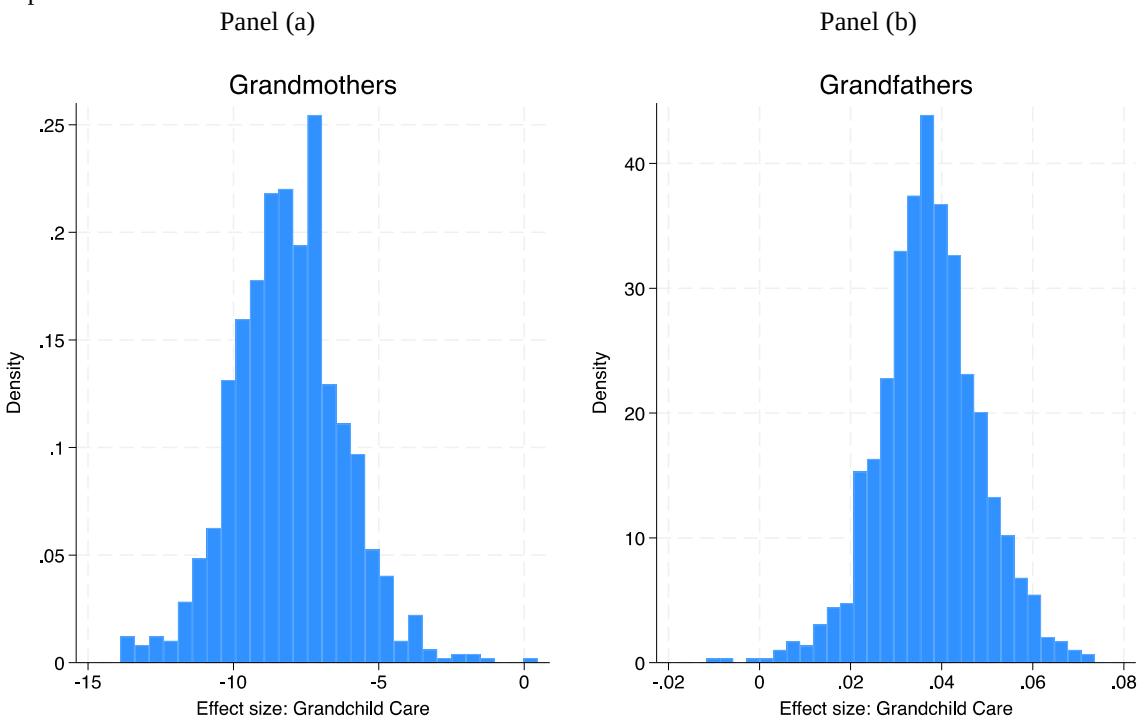
Figure 1: Random Simulations Distribution of the effect of providing grandchildren care on grandparent's employment status



Sample: LASI Waves 1, grandparents aged 45–60.

Notes: The left panel shows the distribution of the effect of providing grandchild care on the grandmother's employment rate. The right panel shows the distribution of the effect of providing grandchild care on the grandfather's employment rate. Distribution is obtained by estimating our regression model 1000 times using the full set of controls and randomly omitting 1% of the estimation sample each time. All controls are the same as in Table 4. National-level individual weights are applied.

Figure 2: Random Simulations Distribution of the effect of providing grandchildren care on hours worked by grandparents

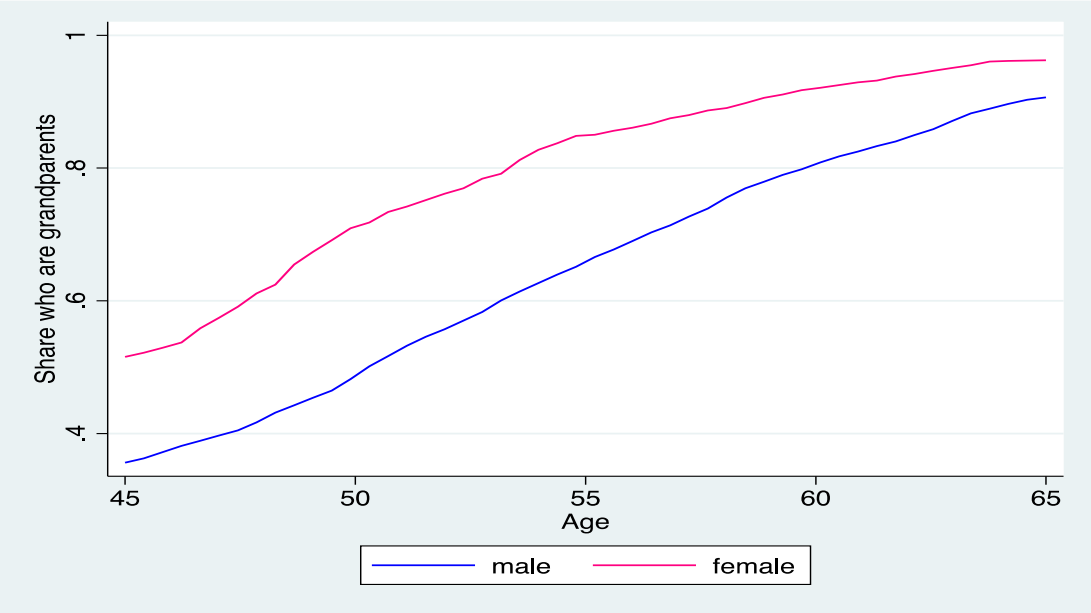


Sample: LASI Waves 1, grandparents aged 45–60.
Notes: The left panel shows the distribution of the effect of providing grandchild care on the grandmother's weekly hours worked. The right panel shows the distribution of the effect of providing grandchild care on the grandfather's weekly hours worked. Distribution is obtained by estimating our regression model 1000 times using the full set of controls and randomly omitting 1% of the estimation sample each time. All controls are the same as in Table 4. National-level individual weights are applied.

The Granny Penalty: Navigating the Challenges of Informal Childcare

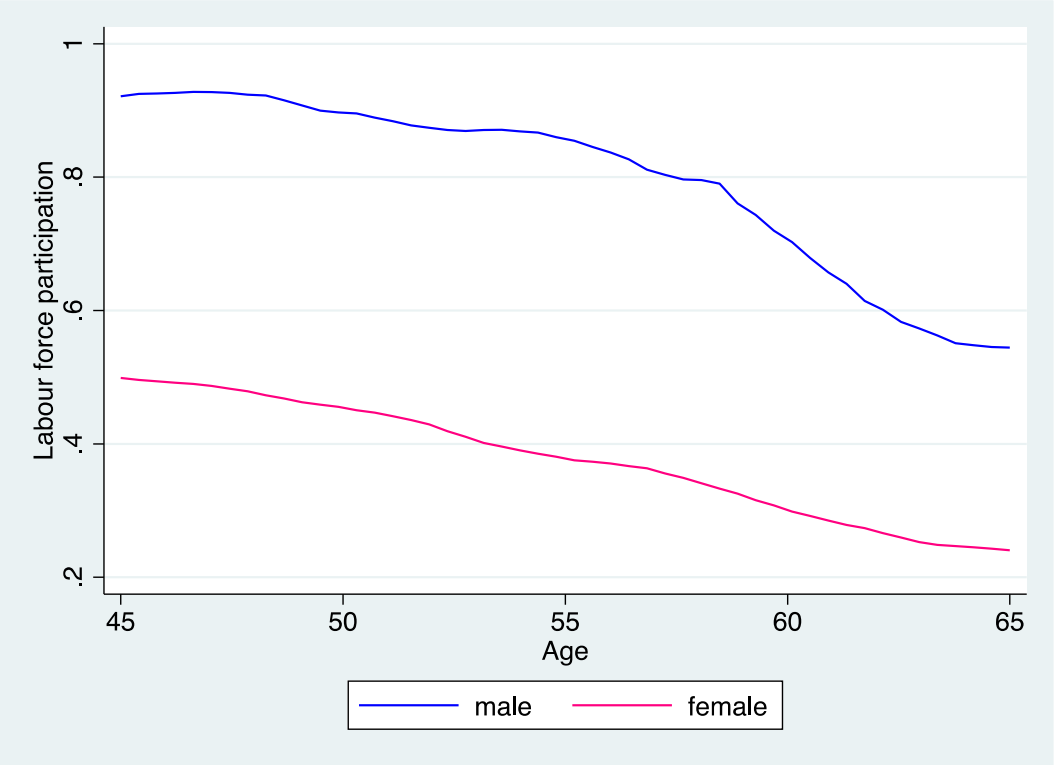
Appendix

Figure A1: Share of grandparents by age and by gender



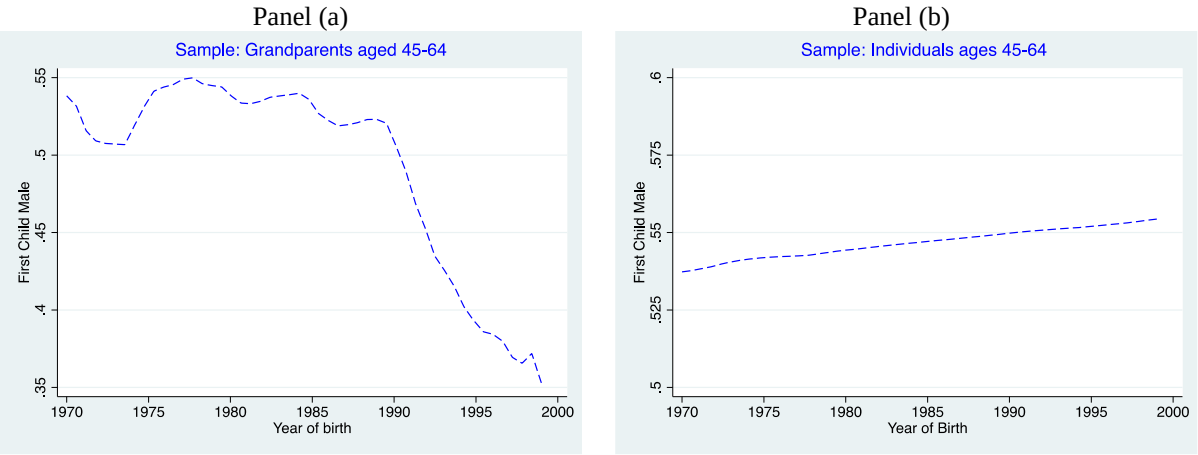
Notes: These trends are based on the authors' estimations from LASI wave 1 data, 2017-19. The figure shows the proportion of individuals who are grandparents by age. The pink line represents the share of grandmothers, and the blue line represents the share of grandfathers.

Figure A2: Labor force participation rate of grandparents by age and by gender



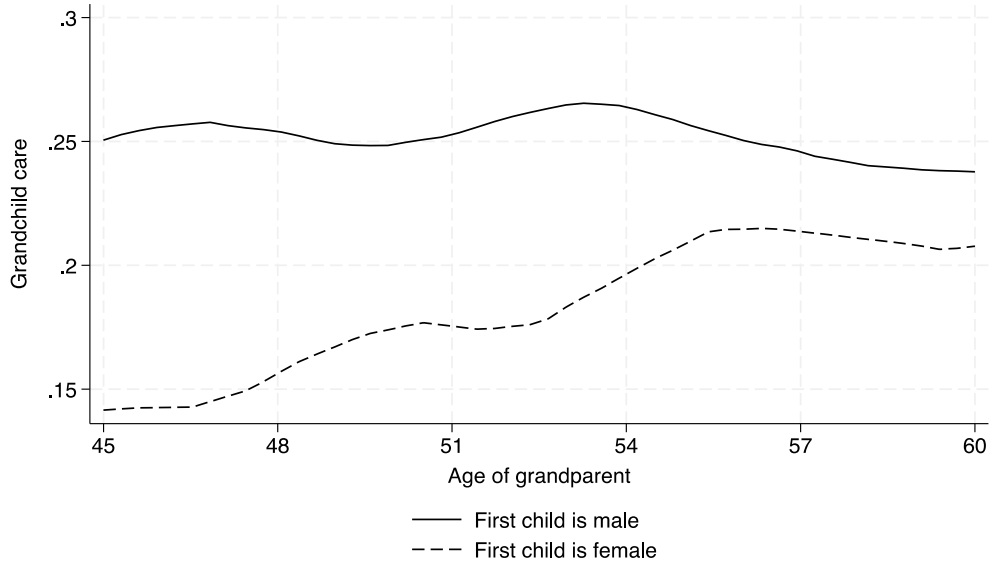
Notes: These trends are based on the authors' estimation from LASI waves 1 data, 2017-19. The figure shows the individuals who work for pay by age. The pink line represents the female labor force participation rate, and the blue line represents the male labor force participation rate.

Figure A3: Sex of the first child by birthyear



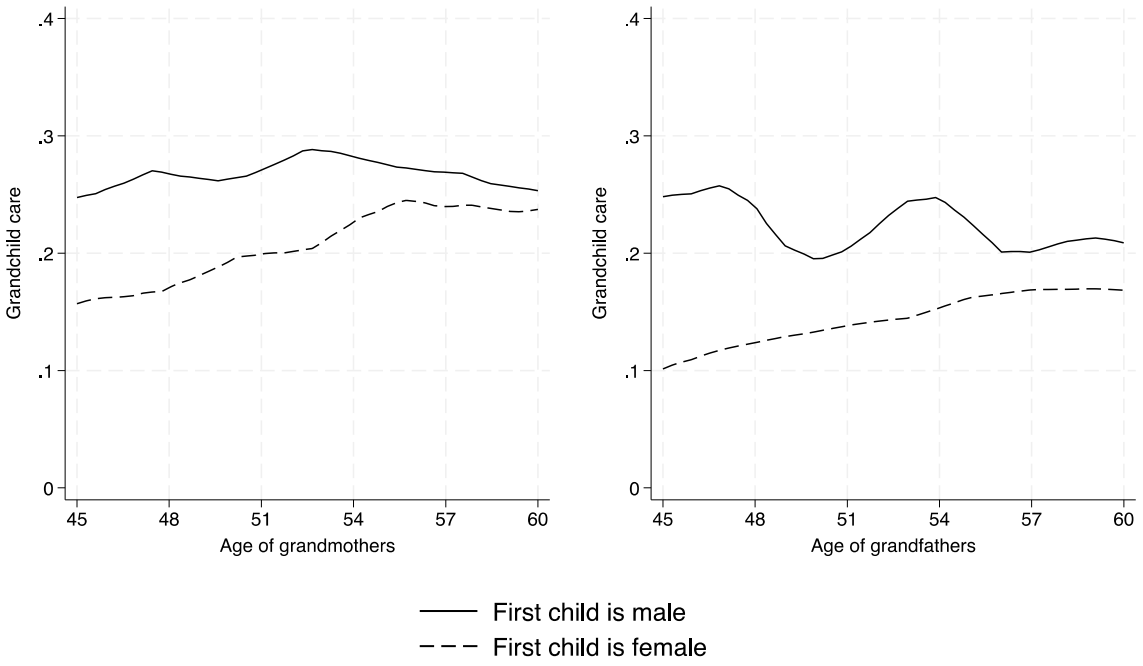
Sample: LASI Waves 1, grandparents aged 45–60.
Notes: Panel (a) plots the sex of the first child being male by birth years for the grandparents. Panel (b) plots the sex of the first child being male by birth years for both grandparents and not-grandparents.

Figure A4: Share of grandparents who take care of grandchildren at a given age, by sex of the first child



Sample: LASI Waves 1, grandparents aged 45–60.
Notes: The solid line represents the share of grandparents whose firstborn is male. The dotted line represents the same whose firstborn is female.

Figure A5: Share of grandmother (or grandfather) who take care of grandchildren at a given age, by sex of the first child – separate figures for grandmother and grandfather



Sample: LASI Waves 1, grandparents aged 45–64.
Notes: The solid line represents the share of grandparents whose firstborn is male. The dotted line represents the same whose firstborn is female. The left figure is for the grandmothers, and the right figure is for the grandfathers.

Table A1: OLS and 2SLS estimates of the effect of grandchild care on employment and hours worked by grandparents aged 45-55

	OLS		IV		OLS		IV	
	(1) Employed=1	(2) Employed=1	(3) Employed=1	(4) Employed=1	(5) Hours Worked	(6) Hours Worked	(7) Hours Worked	(8) Hours Worked
Panel 1: Full sample								
Grandchild care	-0.055***	-0.011	-0.457***	-0.318**	-0.029	-0.009	-0.429	-0.490
	(0.020)	(0.016)	(0.152)	(0.157)	(0.032)	(0.032)	(0.283)	(0.386)
Observations	11227	11227	11227	11227	6861	6861	6861	6861
Panel 2: Grandmothers								
Grandchild care	-0.003	-0.004	-0.390*	-0.524**	-0.029	-0.028	-0.139	-0.396
	(0.023)	(0.021)	(0.211)	(0.253)	(0.041)	(0.039)	(0.572)	(0.858)
Observations	7511	7511	7511	7511	3466	3466	3466	3466
Panel 3: Grandfathers								
Grandchild care	-0.023	-0.013	-0.002	0.060	0.009	0.007	-0.475	-0.645
	(0.021)	(0.020)	(0.126)	(0.154)	(0.050)	(0.049)	(0.330)	(0.415)
Observations	3716	3716	3716	3716	3395	3395	3395	3395
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes	No	Yes

Sample: LASI Waves 1, grandparents aged 45–54.

Notes: Columns (1-2) and (5-6) present the coefficients from an OLS regression of an employment indicator on providing grandchild care indicator. Columns (3-4) and (7-8) present the coefficients from the 2SLS model utilizing the First Child is Male indicator as an instrument for grandchild care. All controls are the same as in Table 4. National-level individual weights are applied. Robust standard errors are reported in parentheses.

*p < 0.10, **p < 0.05, ***p < 0.01

Table A2: OLS and 2SLS estimates of the effect of grandchild care on employment and hours worked by grandparents aged 65-75

	(1) Employed=1	(2) Employed=1	(3) Employed=1	(4) Employed=1	(5) Hours Worked	(6) Hours Worked	(7) Hours Worked	(8) Hours Worked
Panel 1: Full sample								
Grandchild care	0.018	-0.005	-1.670	-0.450	-0.053	-0.043	-2.303	-2.059
	(0.017)	(0.013)	(3.683)	(1.341)	(0.051)	(0.047)	(8.518)	(7.974)
Observations	18013	18013	18013	18013	4973	4973	4973	4973
Panel 2: Grandmothers								
Grandchild care	0.014	-0.010	0.452	0.847	-0.034	-0.042	5.944	3.889
	(0.020)	(0.016)	(0.685)	(0.904)	(0.073)	(0.072)	(12.243)	(5.203)
Observations	9266	9266	9266	9266	1500	1500	1500	1500
Panel 3: Grandfathers								
Grandchild care	0.050**	0.007	1.919	2.269	-0.079	-0.055	1.871	1.004
	(0.023)	(0.020)	(2.009)	(2.848)	(0.063)	(0.057)	(2.970)	(1.752)
Observations	8747	8747	8747	8747	3473	3473	3473	3473
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes	No	Yes

Sample: LASI Waves 1, grandparents aged 65–75.

Notes: Columns (1-2) and (5-6) present the coefficients from a linear regression of an employment indicator on providing grandchild care indicator. Columns (3-4) and (7-8) present the coefficients from the 2SLS model utilizing the First Child is Male indicator as an instrument for grandchild care. All controls are the same as in Table 4. National-level individual weights are applied. Robust standard errors are reported in parentheses.

*p < 0.10, **p < 0.05, ***p < 0.01