RETIREMENT AND GRANDCHILD CARE IN URBAN CHINA

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ABSTRACT

This paper estimates the causal effect of retirement on grandchild care. We exploit the exogenous variations in retirement status caused by China's mandatory retirement age policy. Drawing on the data on individuals close to their retirement age in the China Health and Retirement Longitudinal Study, our analysis shows a significant increase of 29 percentage points in the provision of grandchild care after the transition to retirement in females and a 21percentage points increase in males. Moreover, grandchild care is demand-driven in males and supply-driven in females. We also find that women with lower education levels have a lower probability of retirement after reaching eligible age, but are more likely to provide grandchild care after retirement.

KEY WORDS: Retirement eligibility, Grandchild care, Regression discontinuity

JEL codes: J26, J22, J13

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INTRODUCTION

Grandchild care is a common and important form of multigenerational family support around the world. In the US and European countries, more than one quarter of families have grandparents who take care of grandchildren (Karsten Hank and Isabella Buber 2009). In China, more than 50 percent of people aged 45 to 79 years are taking care of their grandchildren (Pei-Chun Ko and Karsten Hank 2013). Research has revealed several determinants of grandchild care, including geographic proximity and co-residence with the grandchild (Lina Guzman 2004); demand for care by parents and family, such as demand caused by the number of grandchildren in or outside the household (Hank and Buber 2009; Ye Luo, Trancey A. LaPierre, Mary Elizabeth Hughes and Linda J. Waite, 2012) or that caused by the children's characteristics (Rboin L. Lumsdaine and Stephanie J. C.Vermeer 2015); and personal characteristics of the grandparents, such as gender, income, education and health (Luo, LaPierre, Hughes and Waite 2012; Anne Gray 2005). As a social norm, women bear the major responsibility for unpaid care, including caring for grandchildren (Beth. J Soldo and Martha S. Hill 1995; Xiao-yuan Dong and Xinli An 2015), although a considerable share of older men have been found to provide grandchild care as well (Claudine Attias-Donfut, Jim Ogg and Francois-Charles Wolff 2005; Guzman 2004).

With more women participating in the labor market and covered by public pension programs, retirement caused by pension eligibility is likely to result in more time allocated to grandchild care, and the effect may differ between men and women due to the social norms surrounding gender roles in childcare. However, no previous study has provided estimates of this causal effect. The lack of research is largely due to the reverse causality between care and retirement. Studies find that becoming a grandparent or the arrival of a new grandchild speeds up retirement, especially for women (Jan Van Bavel and Tom De Winter 2013; Lumsdaine and Vermeer 2015). We exclude the reverse causality and estimate the effect of retirement on grandchild care by exploiting exogenous changes in eligibility for retirement pension, given that people respond to financial incentives offered by public pension eligibility and choose to retire after reaching retirement age (Eric Bonsang, Stephane Adam and Sergio Perelman 2012; Peter Eibich 2015; PhilippHessel 2016).

We study the effect in urban China for the following reasons. First, childcare is a family task and especially a woman's task according to Chinese social norms, even after significant social economic development (Feinian Chen, Susan E. Short and Barbara Entwisle 2000; Fenglian Du and Xiaoyuan Dong 2013). According to China's Research Center on Aging, two thirds of urban children under six are being cared for by at least one grandparent, and an increasing number of grandparents are providing exclusive care. The traditional pattern is also being influenced by a high rate of co-residence between grandchildren and grandparents ((Feinian Chen, Guanya Liu and Christine A. Mair 2011). Second, very few studies have considered the effect of retirement policies. Public pension programs have expanded rapidly in the last 30 years. Currently, 65% employees are covered by a public pension program, and the coverage rate keeps increasing.[1] Retirement from a primary job is mandatory once an individual reaches retirement age, although it is possible to remain in the labor market in other ways. Third, the retirement age in China is relatively low: 60 years for males, 55 years for white-collar females and 50 years for blue-collar females. An increasing retirement age is inevitable due to population aging. Investigating the effect of retirement on grandchild care should have policy implications for the looming reform of retirement age.

Our findings contribute to the literature in the following ways. First, we identify the effect of retirement on grandchild care, taking advantage of the retirement age policy for employees in urban sectors in China. Our results show a significant increase of 29 percentage points in grandchild care after transition to retirement in females and 21 percentage-point increase in males. Second, we find gender differences in the mechanism through which grandchild care has increased. In males it is demand driven, while in females it is supply driven. Third, we identify the different effects in individuals with higher and lower education levels. We find that women with lower education levels have a lower probability of retiring after they reach the eligible age. However, they are more likely to provide grandchild care after retirement.

INSTITUTIONAL BACKGROUND

For employees in the urban sectors of China, the Basic Old Age Insurance (BOAI) system is the most important public pension framework in terms of number of participants and pension benefits. It was established in 1951 for urban employees in enterprises and reformed into a "multi-pillar" system in 1997. The first pillar of BOAI is a compulsory defined benefit scheme, according to which employers are obligated to contribute 20 percent of their employees' wages. The second pillar of BOAI is the individual account, according to which the individual contributes 8 percent of his or her wage. For a person who worked for 35 years and earned the average wage in his or her city (county), the level would be 59.2 percent of his or her average wage before retirement. However, the policy rule guarantees a higher pension income to those with higher wage earnings or longer duration of contributions.

BOAI covered more than 65 percent of all urban employees in 2013 (215 million employees and 68 million retirees). The total expenditure of BOAI increased to 4.76 percent of the GDP in 2013.[2] Another program, the Public Employee Pension (PEP), was established in 1953 for civil servants and employees in public sectors. It provides an average pension replacement ratio of 80 to 90 percent of wages before retirement. Participants in PEP are much fewer, with about 30 million people covered.

The mandatory retirement age policy is the same in the BOAI and PEP programs. The mandatory retirement age is 60 years for men. For women, it is 55 years for white-collar employees, i.e., civil servants, professionals and administrative staff in enterprises, etc., and 50 years for blue-collar employees. Only a small fraction of women qualify for the higher retirement age. Chinese urban household survey data from the National Bureau of Statistics shows that about 7 percent of women employees are eligible for a higher retirement age of 55 years, as only a small fraction of women work in white-collar jobs or the public sector.

The current retirement age policy was established at the beginning of the 1950s, when the life expectancy at birth was about 43 years. Due to a longer life expectancy and aging population, the dependency ratio in BOAI rose from 18.6 percent in 1990 to 32.5 percent in 2010, i.e., a reduction from 5.4 persons in working age supporting a retiree to 3 workers supporting a retiree. The present system is barely maintaining its financial balance with the help of government subsidies. The fiscal subsidy for BOAI stood at RMB265 billion in 2012, or about 0.5 percent of GDP, and this is likely to dramatically increase unless reforms occur in the near future.

In China, reaching retirement age means one must go through the retirement process, retire from one's current job and start receiving the public pension benefit. After that, the individual can stay in the labor market informally without losing the pension benefit, but the opportunity to find a job declines dramatically. A vast majority of employees comply with the retirement age policy and retire institutionally at the mandatory retirement age. Data from the China Health and Retirement Longitudinal Study (CHARLS), a nationally representative sample of Chinese residents aged 45 years and older, shows a jump in transition to retirement for men at age 60 and for women at age 50 (John Giles, Xiaoyan Lei, Yafeng Wang and Yaohui Zhao 2015).

However, compliance with the retirement age policy cannot be assumed. Some employees choose to retire earlier, while others find ways to retire later than the mandatory retirement age. Those of younger age, with lower pension income, with poor health or who have caregiving responsibilities are more likely to retire earlier (Giles, Wang and Cai 2011; Rachel Connelly, Margaret Maurer-Fazio and DandanZhang 2014). Bad health status is strongly associated with reductions in employment (Giles, Lei, Wang and Zhao, 2015). However, those who are highly skilled may delay leaving the labor market (Giles, Lei, Wang and Zhao 2015). There are several ways to remain in the labor market after retirement age. One common practice is for the original employer to offer job opportunities with an informal contract. According to the Aegon Retirement Readiness Survey conducted in 2015, 26 percent of Chinese workers 55 years of age and older said their employers would offer opportunities for them to move from full-time to part-time employment.[3]

DATA

We use the 2011 and 2013 waves of the CHARLS as our data sample. The CHARLS data cover 29 provinces and 150 counties in addition to 17,708 individuals in 2011 and 18,604 in 2013. Individuals with rural Hukou are excluded from the sample due to the huge disparity in retirement behavior and living arrangements.[4] This step reduces the number of observations to 3,859 in 2011 and 4,224 in 2013. We then divide the individuals into covered and uncovered samples according to whether they are covered by BOAI or PEP. Empirically, the coverage is determined by meeting one of four criteria: (1) employees in urban sectors with formal labor contracts, (2) individuals who reported that they have gone through the official retirement process, (3) individuals who reported they were currently participating in or receiving public pension benefits from BOAI or PEP and (4) individuals who reported they would officially retire from their current employers. We get 5,797 individuals in the covered sample and 2,204 individuals in the uncovered sample. To narrow our window to people close to the point of retirement, we limit the main sample to a +/- 10-year band from retirement age. The sample size of covered individuals becomes 3,658 and that of uncovered individuals becomes 1,244. We also exclude those individuals at the point of retirement age to avoid the noise created by unclear eligibility status. The final sample sizes are 3,438 and 1,180 for the covered and uncovered samples, respectively.

We create the variable "retirement eligibility" based on the policy rule. If the individual is at or older than retirement age, this variable equals 1; otherwise, it equals 0. For women, the retirement age is 50 or 55 depending on occupation in ways that are highly correlated with educational attainment (Connelly, Maurer-Fazio and Zhang 2014). We use the question "At which age are you going to process retirement?" to determine a woman's retirement age. If the information is missing, we use her education level to determine her retirement age. For those with a high school education and below (including vocational school), the retirement age is 50 years. For those with a college education or above, the retirement age is 55 years.[5] The difference between current age and retirement age is the "distance to/from eligibility." A negative value means the individual has not reached retirement age, while a positive value means the individual is older than retirement age.

Following the work of Gustman and Steinmeier (2000), we use 20 working hours per week as a benchmark to assign retirement status. On the one hand, individuals are listed as not retired if they report they are not retired or if they report themselves as institutionally retired but still working at least 20 hours per week. On the other hand, individuals are considered retired if they are institutionally retired (having gone through the retirement procedure) and work fewer than 20 hours per week on average, or if they ever worked but are currently not working and did not actively search for a new job in the past month.

The hours spent per year on grandchild care are reported. The following question was asked: "Approximately how many weeks and how many hours per week did you spend last year taking care of this child's children or grandchildren?" Answers could be given as numbers of weeks and hours. If no care was provided, the value is zero. For each individual, we count the number of grandchild he or she cared for and sum up the care time provided to each grandchild. Individuals are considered to have provided grandchild care if they reported a positive number of grandchildren cared for in the past year; otherwise, they are considered to have provided no care.

In addition to this information, which we use in our baseline analysis, we include several control variables widely used in the literature for robustness checks. To obtain values for the number of grandchildren, we use the childrearing information from the questionnaire to sum up the number of children younger than age 16 belonging to each child of the respondent. If the grandchild normally lives in the household, he or she is counted as a grandchild co-resident with grandparents.[6]

Education is measured based on the highest degree of the respondent, including no formal education, primary school, middle school, high school, vocational school and college or above.

We create a variable “good health” using the self-assessed health status of the respondent. If the reported health is “excellent,” “very good” or “good,” then the value is 1. If the reported health is “fair,” “poor” or “very poor,” the value is 0.

There are three dummy variables indicating spouse status. “No spouse” equals 1 when the respondent’s marital status is “divorced,” “separated,” “widowed” or “never married”; otherwise, this variable equals 0. “Spouse not retired” equals 1 if “no spouse” equals 0 and the spouse is not retired. “Spouse retired” equals 1 if “no spouse” equals 0 and the spouse is retired.

Household income is the total annual income of the household members. If the value is negative, we treat it as a missing value. We also change the top 1% income households, where the income is more than 12 times the mean value, into a missing value.

Summary statistics of the main variables for covered individuals are listed in Table 1. For the covered sample, retirees are more involved in grandchild care than workers. On average, 11 percent of female workers and 34 percent of female retirees are caring for grandchildren. The average annual care time for female workers is about 216 hours, and the figure for female retirees is 810 hours. Furthermore, 20 percent of male workers and 36 percent of male retirees are caring for grandchildren. The average annual care time for male workers is about 364 hours, and the figure for male retirees is 751 hours.[7]

Male workers 10 years before retirement reported engaging in more care behavior and care time than female workers. The main reason for the disparity is that men retire later and are older than women 10 years before retirement; hence, they have more grandchildren. The average ages of female workers and retirees are 49.80 and 55.71 years, respectively, while the average ages for males are 55.98 and 63.70 years, respectively. The average numbers of grandchildren for female workers and retirees are 0.35 and 0.82, respectively. For male workers and retirees, the numbers are 0.98 and 1.76, respectively. Figure 1 compares women and men of the same age and shows that in the 50-60 age bracket more women provide grandchild care than men, women spend more time on grandchild care than men on average and women and men have similar numbers of grandchildren.

<Insert Table 1 here (full page)>

<Insert Figure 1 here (half page)>

In the uncovered sample listed in Table 2, the contrast of grandchild care between workers and retirees is far different from that in the covered sample. For females, workers' involvement in grandchild care is only a little higher than that of retirees as measured by the proportion of individuals caring for grandchildren and the average annual care time. For males, there is almost no difference in grandchild care between workers and retirees.

<Insert Table 2 here (full page)>

75 percent of individuals are covered by public pension programs for urban employees. The program coverage keeps increasing according to data from the National Bureau of Statistics. We study the retirement effect for the covered sample, taking advantage of the retirement age policy and the large policy coverage. We subject the uncovered sample to falsification tests.

EMPIRICAL STRATEGY

In this section, we explain the empirical strategies we adopt to estimate the effect of retirement on grandchild care.

First, the exogenous retirement behavior induced by retirement eligibility age allows us to identify the causal effect of retirement on grandchild care within a fuzzy parametric regression discontinuity (RD) design framework. The main idea behind RD is that individuals who are marginally younger than the retirement benefit eligibility age compare well with individuals who are just above the age (David S. Lee and Thomas Lemieux 2010). The only difference between the two groups is their eligibility for retirement benefits. The probability of retirement for those aged above the eligibility age is higher due to the policy rule, but the difference in retirement decision across the eligibility threshold is unrelated to the outcome variable, which in this case is grandchild care.

The discontinuity in the probability of retirement near the eligibility threshold is well acknowledged in the literature, and retirement benefit eligibility has been widely used as an instrument to identify the effect of retirement consumption and health (e.g., Erich Battistin, Agar Brugiavini, Enrico Rettore and Guglielmo Weber 2009; Eric Bonsang, Stephane Adam and Sergio Perelman 2012; Peter Eibich 2015).

Due to the retirement policy in China, the discontinuity of retirement probability around retirement age should be more obvious. Yet, an individual may not necessarily retire at the retirement age. Empirically, the probability of retirement below retirement age is more than zero, while the probability of retirement above retirement age is less than one (Figure 2). A fuzzy RD can be used to address noncompliance with the retirement age.

In equation (1), the eligibility is described using a running variable r and a dummy variable E, where E equals 1 when the individual has reached the retirement eligibility age and 0 otherwise. The running variable r is the difference between the individuals' age and their eligibility age. r is positive when the individual is older than his or her retirement eligibility age, and negative if younger.

$$E_i = \begin{cases} 1 \; if \; r_i \geq 0 \\ 0 \; if \; r_i < 0 \end{cases} \qquad (1)$$

The probability of retirement given the running variable r_i is described using equation (2), where the act of retirement is represented by the binary variable $R_i = 1$ and the probability of retirement is represented by two functions of the running variable $g_1(r_i)$ and $g_2(r_i)$.

$$\mathrm{P}[R_i = 1|r_i] = \begin{cases} g_1(r_i)\ if\ E_i = 1 \\ g_2(r_i)\ if\ E_i = 0 \end{cases} \quad (2)$$

Equation (2) is also the first-stage relationship between eligibility and retirement, which is translated into an executable estimation equation (3).

$$\mathrm{R}_i = \pi_0 + \pi_1 E_i + \pi_2 r_i + \pi_3 r_i * E_i + X_i \rho + \zeta_i \qquad (3)$$

where, following the previous equations, R_i indicates whether individual i has retired and E_i indicates retirement benefit eligibility. In the basic specification, we use the linear interaction functional form, which is a linear split-trend function that assumes two different slopes on either side of the discontinuity threshold. These results are available in Table 3. Results using other functional forms are available in the "Robustness checks" section.

In addition to our basic specification, we test the robustness of the coefficients by including additional covariates (X) that may affect both retirement and grandchild care decisions. X includes the survey year, the county of residence and a set of household characteristics that can affect both retirement and grandchild care provision. The detailed definitions of these variables are introduced in the "Data" section.

The first set of characteristics includes controls of human capital in terms of both health capital and education attainment, which are captured by the self-reported health and education attainment fixed effects. Education affects the timing of retirement because it is related to both accumulated wealth and the potential current returns available in the labor market, and the effect is unpredictable (Giles, Lei, Wang and Zhao 2015). However, education is a determinant of grandchild care (Lou, LaPierre, Hughes and Waite 2012). Healthier grandparents may also be more likely to work after retirement age and be more capable of providing grandchild care (Connelly, Maurer-Fazio and Zhang 2014). The second set of controls are the spouse's presence in the household and, if present, his or her retirement status. Some of the literature finds a coincidence of spouses retiring together, despite the younger ages of wives, suggesting explicit efforts at coordination (Gustman and Steinmeier, 2000; Gustman and Steinmeier, 2004). As such, a spouse's retirement status can affect both the respondent's retirement and grandchild care decisions. The third additional control is the elderly respondent's household income; a lower income may decrease one's tendency to leave the labor market, and may also reduce one's opportunity cost to care for the grandchild.

We present our main results in an instrumented regression (equation 4).

$$Y_i = \tilde{\beta}_0 + \tilde{\beta}_1 \widetilde{R}_\iota + \tilde{\beta}_2 t_i + \tilde{\beta}_3 t_i * \widetilde{R}_\iota + X_i \tilde{\gamma} + \tilde{\varepsilon}_i \qquad (4)$$

where $\widetilde{\mathrm{R}}_i$ is the fitted value from the first stage regression of equation (3). The coefficient of the key explanatory variable $\tilde{\beta}_1$ is interpreted as the causal effect of retirement.

Outcome variable Y_i represents a set of outcome variables that measure care provision, including a dummy variable for care provision and variables for total care time, having at least one grandchild and the total number of grandchildren. These outcome variables reveal changes in both the care time provided by grandparents and the fertility response of the second generation, who may time their pregnancies according to the time of retirement of the grandparents (Pieter Eibich and Thomas Siedler 2016; Erich Battistin, Michele De Nadai, Mario Padula 2014). This type of fertility response creates an increase in the amount of care demanded from the grandparents, which we call demand-driven care. The mechanism is different than increasing the amount of time spent caring for existing grandchildren, which we call supply-driven care. We explore how the demand- and supply-driven mechanisms factor into the total change in care time by controlling for one of the mechanisms, and evaluate the change in coefficients before and after.

RESULTS

In this section, we report on the first-stage relationship between retirement benefit eligibility and retirement, as well as the second-stage results for grandchild care using the two-stage method. We also present a rich set of robustness tests.

First-stage effects of retirement benefit eligibility on retirement

Figure 2 graphically illustrates the basic first-stage results. The *x-axis* depicts the running variable, which comprises the years to and from retirement eligibility. The *y-axis* is the mean retirement rate at each level of the running variable. A linear trend is fitted to the retirement rates on either side of the threshold, which matches the functional form of our main specification. For both females and males, the figure suggests that after reaching retirement age, the retirement rate increases significantly and discontinuously. In Figure 2, for females, the retirement rates one year before and after retirement age are 29% and 71%, respectively. For males, the two figures are 35% and 80%, respectively.

The first-stage results also show that not all individuals covered by pension programs comply with the retirement age policy. The size of the discontinuity in retirement probability is 42 percentage points for females and 45 percentage points for males.

<Insert Figure 2 here (half page)>

<Insert Table 3 here (half page)>

Table 3 presents the regression analog to the results in Figure 2. The results using the female subsample are presented in columns 1-4, and the parallel results using the male subsample are presented in columns 5-8. The first column follows the basic linear split-trend regression introduced in equation (3). Being eligible for retirement benefits increases female retirement by 46 percentage points and male retirement by 40 percentage points. The results are significant at the 1% level.

Thereafter, the table gradually adds characteristics of the grandparent household in equation (3) as explained in the "Empirical strategy" section. If the identification strategy is valid, we do not expect significant changes in the size of the coefficients when the control variables are included. The results are very robust, which indicates that the retirement benefit eligibility is plausibly exogenous to the elderly respondents' retirement decisions.

Effect of retirement on grandchild care provision

Table 4 presents instrumented regression results, while Table 5 exploits the interesting behavioral differences between men and women.

<*Insert Table 4 here (full page)*>

In Table 4, the results show that females and males both increase their grandchild care after transition to retirement. Females are slightly more likely to provide care and care for more grandchildren than males and have a higher chance of becoming grandparents for the first time.[8] However, the difference between males and females is never larger than one standard deviation for any outcome. Retirement increases the probability of females becoming involved in some type of grandchild care by 29 percentage points and results in 608 hours per year more care time, which translates into roughly 1.7 hours more per day or 11.7 hours per week. In the last three columns of Table 4, we conduct a parallel analysis for elderly males, who show a pattern similar to that of females. Grandfathers have a 21-percentage-point higher chance of providing grandchild care, and their total care time increases by roughly the same amount as that of their female counterparts: 631 hours per year, or 1.7 hours per day.

Although men and women show similar increases in total hours of grandchild care per year, the behavior that leads to these changes differs by gender. Table 5 discusses these mechanisms by controlling for the demand channel—the total number of grandchildren—and the remaining effect captured by the new set of coefficients reflects the supply channel. Unlike the females who increase their care time regardless of the number of grandchildren demanding it, after controlling for the number of grandchildren, we no longer observe a significant increase in any care-related outcome among males. Instead, the number of grandchildren increases when the grandfather retires (column 4 of Table 5), which in turn leads to longer total care time. In Appendix Table 1, we also look at households with at least one grandchild, and an identical pattern holds in these households.

<Insert Table 5 here (full page)>

Figures 3-5 present graphical evidence of the same story. We depict the probability of providing care, the number of grandchildren potentially demanding care and the hours of grandchild care per year before and after reaching retirement eligibility. The pattern is consistent with the results in Tables 4 and 5.

<Insert Figure 3 here (one-third page)>

<Insert Figure 4 here (one-third page)>

<Insert Figure 5 here (one-third page)>

Results by education attainment

Individuals with higher education levels accumulate more wealth and have more pension income, and they also have more opportunity to provide grandchild care. To observe the size of this distinction between individuals with high or low human capital near retirement age, it is useful to divide them by educational attainment.

Columns 1 and 5 of Table 6 document the first-stage results for females and males, respectively. Higher educational attainment is clearly associated with a higher compliance with retirement age, especially for men. Despite these disparities, the gender-specific fertility pattern illustrated in Tables 4 and 5 still holds. Columns 2 and 6 shows that men experience a much larger fertility response upon retirement.

Grandmothers who have less than a high school education supply slightly more grandchild care after transition to retirement than grandmothers with a high school education or above, although the differences are not very big (columns 3 and 4). Regardless of educational attainment, grandfathers do not significantly increase their grandchild care in response to retirement after the demand-driven response is controlled (columns 7 and 8).

<*Insert Table 6 here (full page)*>

ROBUSTNESS CHECKS

As discussed earlier, these results can be further strengthened by a series of robustness checks.

Additional household characteristics controls

In this section, we include a large set of household characteristics (X in equation (4)) to the basic results. As mentioned previously, X includes county of residence, educational attainment, self-reported health, the presence of a spouse, the retirement status of the spouse, household income and survey year. The robustness tests in Tables 7A and 7B show that the significance and magnitude of the coefficients remain similar when more household characteristics are added.[9]

In panel E of Tables 7A and 7B, we control for co-residence with grandchildren, which is a form of care that greatly increases care time. As expected, the coefficient on females' total care time decreases by 10% and is no longer significant at the 10% level if co-residence is controlled for.

Falsification tests

We conduct falsification tests based on the uncovered sample. As these individuals are not subject to the same retirement policy as the individuals in the covered sample, we use these individuals as falsification tests to determine whether the childcare effects found in the study are the results of other confounding factors that change across the discontinuity threshold, rather than the causal effects of retirement benefit eligibility. If our identification strategy is valid and retirement is the channel through which changes in grandchild care occur, then we expect to find no significant connections between retirement eligibility and retirement or grandchild care. Table 8 shows these results. As expected, there is no connection between retirement eligibility and the retirement behavior or grandchild care choices among the individuals who are not subject to these retirement laws.

Due to the insignificant first stage, it would be inappropriate to test the remainder of the regressions with the two-stage least squares method. Therefore, we use the reduced-form regression, where we regress the outcome variables directly on the eligibility indicator. The functional form follows:

$$Y_i = \beta_0 + \beta_1 E_i + \beta_2 t_i + \beta_3 t_i * E_i + X_i \gamma + \varepsilon_i \qquad (5)$$

Although the reduced-form regressions show large and significant responses to retirement eligibility in grandchild care,[10] the same pattern is nowhere to be found in the falsification tests.

CONCLUSIONS

Our results show that grandparents' retirement has a significant effect on grandchild care provision and care time in urban China. A grandmother's likelihood of providing grandchild care increases by about 29 percentage points after retirement, and a grandfather's likelihood increases by 21 percentage points. The urban social insurance system in China serves about 5 million new retirees each year. The results imply that an average 1.25 million people start domestic childcare work in urban China every year.

We also reveal an interesting pattern difference by gender. When grandmothers retire, they assume many more childcare responsibilities regardless of whether more effort is demanded. When grandfathers retire, however, most of the increase in grandchild care is driven by the increase in demand. This result speaks to the different roles that women and men play in care work, i.e., women bear more responsibility for domestic care work, especially when they are not in the labor market. In urban China, the retirement age for women is five to ten years younger than that of men, which leads to lower pension incomes after retirement. In our sample, women make half the average pension of men, due in part to their fewer years of contribution and lower wages. The additional care work they provide is also a result of the low level of pension income, particularly for women with lower education levels, as providing grandchild care may act as compensation to supplement pension income. However, due to the unpaid nature of domestic care work, grandmothers' responsibilities have been undervalued.

Our findings suggest a number of policy implications for increasing the retirement age. First, in an era of population aging, increasing the retirement age would ease issues such as a dwindling labor force and a potential pension fund crisis (Jonathan Gruber and David Wise 2005). Increasing the retirement age would imply an increase in the eligibility age for pension benefits, which in turn would cause a delay in retirement and have a countervailing effect on grandchild care. Second, although increasing the retirement age would increase the labor supply of older workers, it may have a negative effect on the labor supply of the younger generation, as grandparents' care provision can promote young parents' labor participation (e.g., Compton and Pollak 2014; Maureer-Fazio, Connelly, Lan and Tang 2011). Given that grandparents' productivity in the labor market is lower than that of young parents, who are more energetic and usually better educated, the outcome of increasing the retirement age can be discounted. This negative effect may be reinforced by the new birth control policy. Young parents may have two children and decide to birth their first child at an earlier age (Menghan Zhao and Hans-PeterKohler 2016). Therefore, policies aimed at increasing the retirement age may need to be matched with comprehensive policies that improve the public provision of care.

ONLINE APPENDIX

Tests for other functional forms and other data choices

Our data are limited because CHARLS surveys only people older than 45. As such, females 6 to 10 years younger than a 50-year-old retirement eligibility age are not recorded in the sample. Therefore, we perform a robustness check by reducing the age groups the sample includes on either side of the retirement age. We reduce the data from 10 years on each side of the retirement age to 9, 7 or 5 years in Appendix Table 2. The estimated parameters are generally not affected by the age band choice and stay close to our primary estimates. Although we lose some precision in our estimates with the total care time coefficients, the standard errors increase by one third and the coefficients remain stable.

Appendix Table 2 also shows the same regression with other functional forms. The results are very similar to what we present here. Our preferred specification is the more flexible linear split trend model used in all of the other tables.

Tests for balance across discontinuity thresholds using household characteristics

We control for a number of household characteristics in addition to retirement. Including them in the regression does not alter our coefficients. Here, we once again show that they do not exhibit a sharp discontinuity across the eligibility age threshold. Appendix Figure 1 shows these checks. Taking health as an example, graphic analysis shows that self-reported health decreases smoothly over the threshold for both females and males (panel A of Appendix Figure 1), suggesting the large increase in care provided by grandmothers is not the result of better health status after retirement. A similar smoothness in transition across the threshold is shown in co-residence and spouse retirement decision in the other panels of Appendix Figure 1.

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NOTES

[1] Source of data: China Statistic Yearbook, 2015

[2] China also has a special arrangement for the military. Military personnel do not make any contributions toward their pension benefits. They usually receive higher remuneration and pension payments than civil servants of equivalent rank. Both military cadres (including officers and non-ranking officers) and soldiers (excluding volunteers) can retire from the army with entitlement to a monthly military pension after transition to retirement as long as certain criteria are met. Military personnel can also transfer to the civil/public sectors or enterprises before retirement while receiving a certain amount of compensation. (For details, refer to Leckie, 2011).

[3] Source: Aegon Retirement Readiness Survey 2015. http://aegon.com/en/Home/Research/Aegon-Retirement-Readiness-Survey-2015.

[4] Technically, employees in an urban sector with rural Hukou can be covered, but it is harder to know the real situation. Based on criteria (1)-(4), the share of individuals with rural Hukou in workers is almost four times as high as that in retirees, which is not reasonable. To avoid making noise, we drop those individuals with rural Hukou.

[5] We use 50 as the retirement age in all of the samples to create the instrument variable and obtain similar results.

[6] Co-residence information was gathered in different ways in the two waves. In 2011, some questions asked about the relationship of all household members with the respondent, from which information about the cohabitating grandchild could be gleaned. In 2013, the questions asked for information about where the child normally lived. If the child was living in the household or the same courtyard, we treat his or her child (grandchild) as a cohabitant. As such, there may be some inconsistency in the variable.

[7] In the covered female sample, 40 percent of individuals are not retired and do not provide care, 5 percent are not retired and provide care, 36 percent are retired and do not provide care and 19 percent are retired and provide care. The retired respondents are more likely to provide care than not to provide care. The non-retired respondents are more likely not to provide can than provide it. The male sample shows a similar pattern.

[8] As the retirement age for women is relatively young, their children are younger. The age at which young parents birth their first child has been delayed due to the one-child policy (Zhao and Kohler 2016). As such, the fertility decisions of their children are likely to increase the number of grandchildren from zero to one instead of from a non-zero base.

[9] The results specific to each type of household identified by educational attainment are also very robust to these controls. These results are available upon request.

[10] The reduced-form results of the main sample have the same significance and magnitude patterns as the two-stage results. They are available upon request.

Figure 1 Compare Male and Female at the Same Age

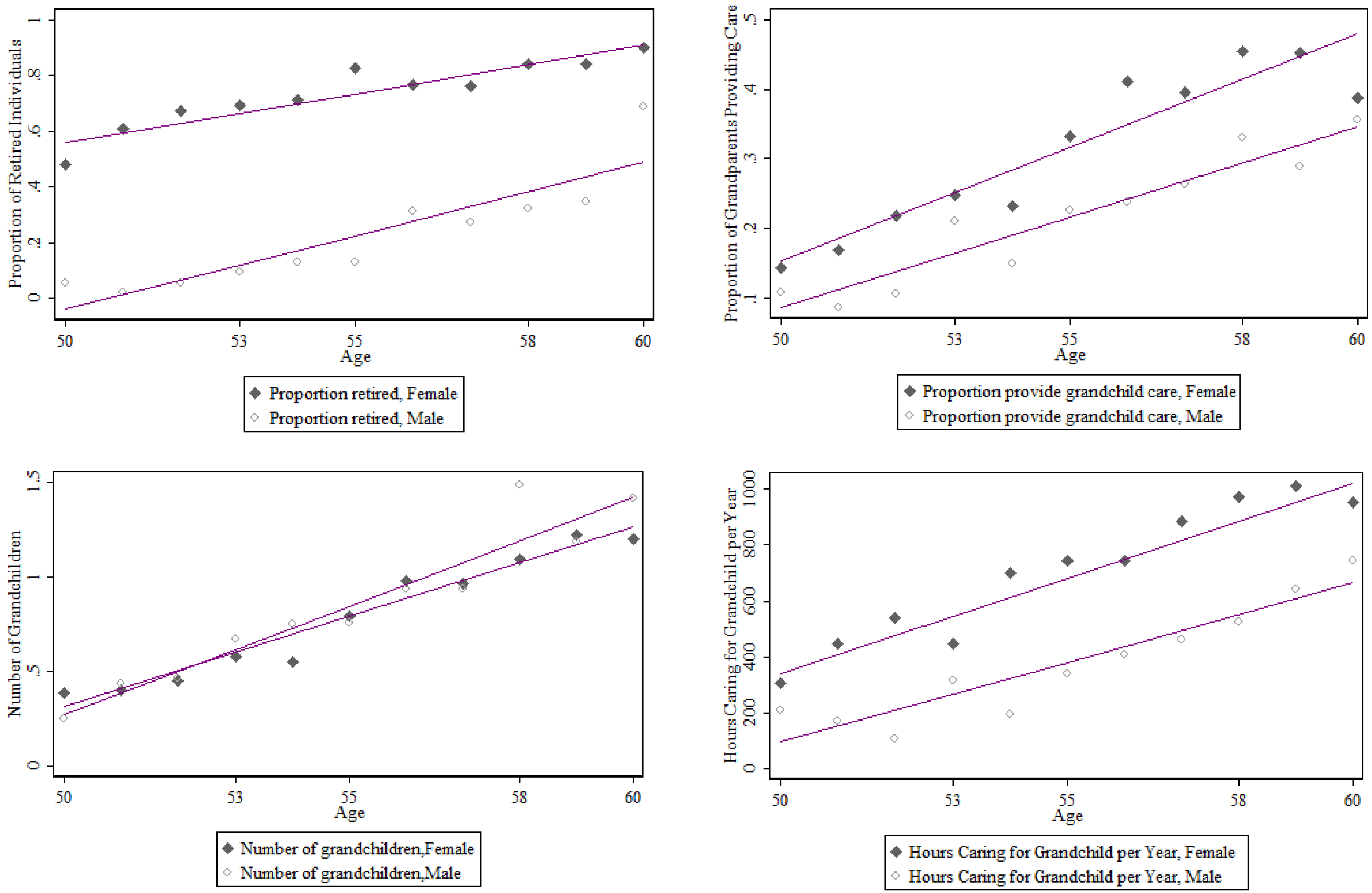
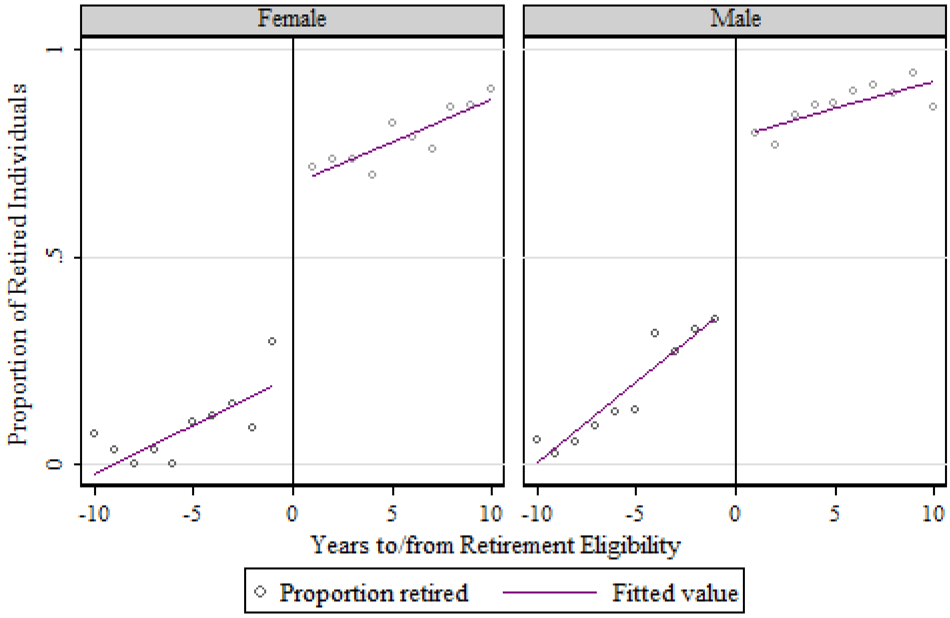


Figure 2 Retirement Rate and Years to Retirement Eligibility

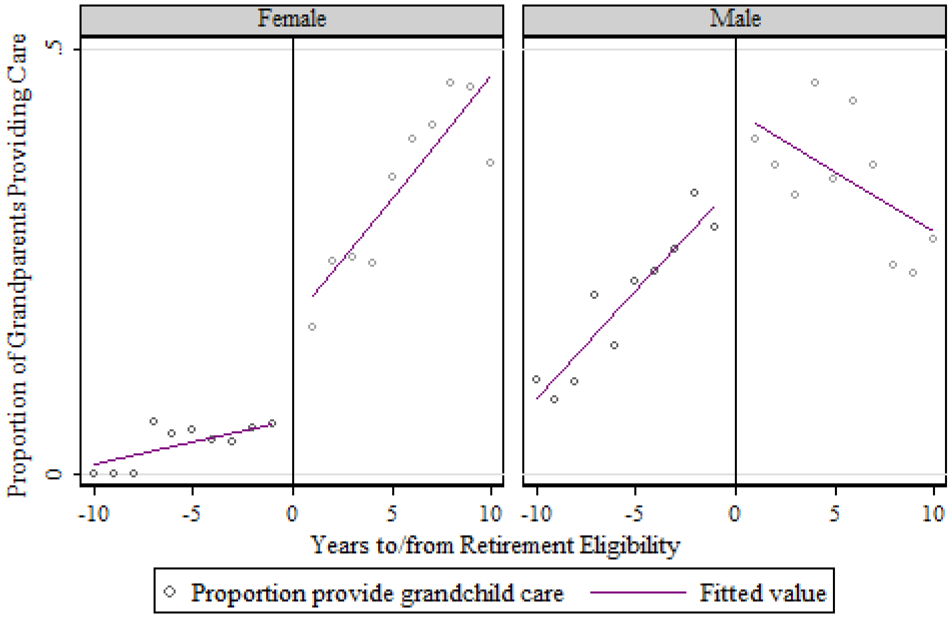


Note: The fitted value is derived from a linear interacted model, which is weighted by the number of people represented by each point in the graph.

Figure 3 Number of Grandchildren and Years to Retirement Eligibility

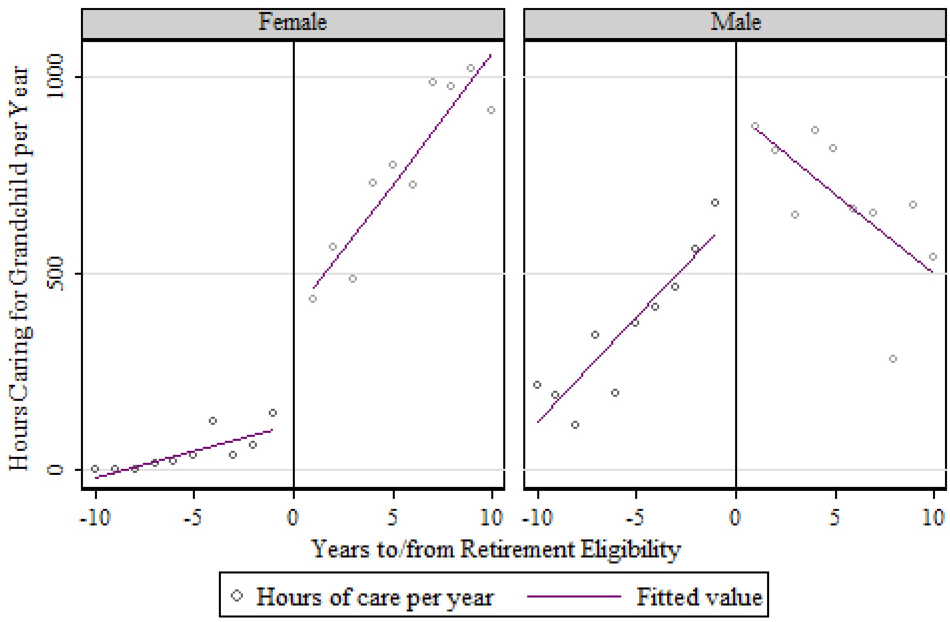
Note: The fitted value is derived from a linear interacted model, which is weighted by the number of people represented by each point in the graph.

Figure 4 Grandchildren Care Provision and Years to Retirement Eligibility



Note: The fitted value is derived from a linear interacted model, which is weighted by the number of people represented by each point in the graph.

Figure 5 Total Care Time and Years to Retirement Eligibility



Note: The fitted value is derived from a linear interacted model, which is weighted by the number of people represented by each point in the graph.

Table 1 Statistic Summary of Covered Sample

	Female		Male	
	Workers	Retirees	Workers	Retirees
Age	49.795	55.709	55.980	63.704
	(4.073)	(3.603)	(4.635)	(4.230)
Retirement eligibility	0.294	0.924	0.156	0.826
	(0.456)	(0.265)	(0.363)	(0.379)
Years to/from eligibility	-1.546	5.266	-4.020	3.704
	(4.919)	(3.566)	(4.635)	(4.230)
Care provision	0.108	0.343	0.204	0.357
	(0.311)	(0.475)	(0.403)	(0.479)
Total care time (hours/year)	216.244	809.918	363.974	750.503
	(948.640)	(1655.725)	(1153.187)	(1609.804)
Have at least 1 grandchild	0.227	0.558	0.520	0.784
	(0.419)	(0.497)	(0.500)	(0.412)
No. of grandchildren aged 0-16	0.350	0.816	0.978	1.760
	(0.781)	(0.942)	(1.322)	(1.615)
No. of grandchild aged 0-16 Cohabit with grandparents	0.127	0.337	0.364	0.537
	(0.440)	(0.589)	(0.717)	(0.884)
No Spouse	0.203	0.189	0.136	0.184
	(0.403)	(0.392)	(0.343)	(0.387)
Spouse retired	0.091	0.451	0.363	0.650
	(0.287)	(0.498)	(0.481)	(0.477)
Good health	0.402	0.232	0.345	0.277
	(0.491)	(0.422)	(0.476)	(0.448)
Education less than high school	0.419	0.524	0.471	0.626
	(0.494)	(0.500)	(0.499)	(0.484)
Household income	56201.900	54027.680	52921.360	49596.890
	(50253.310)	(42500.620)	(42592.650)	(41492.960)
Observations	630	767	947	1094

Note: The dataset consists of 2011 and 2013 CHARLS individuals with urban Hukou who meets the eligible for retirement benefit coverage criteria and were no more than 10 years to or from retirement age at the time they were observed. Standard deviations in the parenthesis.

Table 2 Statistic Summary of Uncovered Sample

	Female		Male	
	Workers	Retirees	Workers	Retirees
Age	51.567	53.289	57.723	58.243
	(4.751)	(4.863)	(5.602)	(5.435)
Retirement eligibility	0.532	0.668	0.319	0.353
	(0.500)	(0.472)	(0.467)	(0.479)
Years to/from eligibility	1.529	3.250	-2.277	-1.757
	(4.778)	(4.929)	(5.602)	(5.435)
Care provision	0.287	0.371	0.243	0.260
	(0.453)	(0.484)	(0.430)	(0.440)
Total care time (hours/year)	700.534	935.148	512.345	430.763
	(1662.053)	(1840.966)	(1436.642)	(1175.479)
Have at least 1 grandchild	0.552	0.648	0.684	0.676
	(0.498)	(0.478)	(0.466)	(0.469)
No. of grandchildren aged 0-16	1.282	1.402	1.547	1.826
	(1.561)	(1.523)	(1.618)	(1.887)
No. of grandchild aged 0-16 Cohabit with grandparents	0.506	0.543	0.654	0.570
	(0.887)	(0.825)	(1.017)	(0.968)
No Spouse	0.179	0.160	0.144	0.156
	(0.384)	(0.368)	(0.352)	(0.364)
Spouse retired	0.683	0.527	0.655	0.295
	(0.466)	(0.500)	(0.476)	(0.457)
Good health	0.285	0.211	0.251	0.249
	(0.452)	(0.409)	(0.434)	(0.433)
Education less than high school	0.788	0.805	0.794	0.711
	(0.409)	(0.397)	(0.405)	(0.455)
Household income	31177.660	30499.620	28662.370	30212.300
	(37949.060)	(39513.680)	(39052.450)	(39324.810)
Observations	397	256	354	173

Note: The dataset consists of 2011 and 2013 CHARLS individuals with urban Hukou who are not covered by employee pension programs and were no more than 10 years to or from retirement age at the time they were observed. Standard deviations in the parenthesis.

Table 3. The First Stage Effect of Retirement Benefit Eligibility on Retirement Decisions

	Female				Male			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Retirement Eligibility	0.464*** (0.044)	0.464*** (0.044)	0.467*** (0.051)	0.476*** (0.052)	0.399*** (0.039)	0.398*** (0.039)	0.391*** (0.045)	0.385*** (0.045)
Number of Grandchild		Y	Y	Y		Y	Y	Y
Survey Year FE			Y	Y			Y	Y
County FE			Y	Y			Y	Y
Education Level			Y	Y			Y	Y
Health			Y	Y			Y	Y
Spouse Present				Y				Y
Spouse Retired				Y				Y
Household Income				Y				Y
Observations	1397	1395	1395	1351	2041	2037	2037	1980
R-squared	0.441	0.440	0.570	0.593	0.476	0.476	0.601	0.622

Notes: See notes under Table 1 for information on the data source. The baseline regressions in column 1 and 5 include an indicator for retirement eligibility and two linear trends of the running variable, number of years to retirement eligibility, on either side of the threshold. Standard errors are in the parentheses and are clustered by county. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

Table 4. Effects of Retirement on Grandchildren Care

	Female			Male		
	(1) Grandchild Care Provision	(2) Total Care Time (Hours/yr)	(3) Have at Least One Grandchild	(4) Grandchild Care Provision	(5) Total Care Time (Hours/yr)	(6) Have at Least One Grandchild
Retirement	0.289***	607.972**	0.181*	0.210*	630.844**	0.123
	(0.089)	(260.990)	(0.103)	(0.110)	(321.562)	(0.110)
Observations	1397	1397	1395	2041	2041	2037

Notes: See notes under Table 1 for information on the data source. The sample of the first (last) 3 columns is restricted to females (males) only. The coefficients reported in this table are the second stage of the two-stage least square estimates. The specification follows equation (4), while none of the household characteristics is controlled. Clustered robust standard errors are in the parentheses. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

Table 5. Effects of Retirement on Grandchildren Care
Control for the Demand-Driven Mechanism

	Female			Male		
	(1) Total Number of Grandchild	(2) Grandchild Care Provision	(3) Total Care Time (Hours/yr)	(4) Total Number of Grandchild	(5) Grandchild Care Provision	(6) Total Care Time (Hours/yr)
Retirement	-0.032	0.296***	621.648**	0.757**	0.134	495.468
	(0.176)	(0.083)	(254.561)	(0.335)	(0.102)	(314.174)
Control for Total Number of Grandchild		Y	Y		Y	Y
Observations	1395	1395	1395	2037	2037	2037

Notes: See notes under Table 1 for information on the data source. The sample of the first (last) 3 columns is restricted to females (males) only. The coefficients reported in this table are the second stage of the two-stage least square estimates. The specification follows equation (4), where total number of grandchild is controlled. Clustered robust standard errors are in the parentheses. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

Table 6. Estimation Results for the Effect of Retirement on Grandchildren Care
Subgroup Analysis by Education Attainment

	Female				Male			
	(1) First Stage Retired	(2) Total Number of Grandchild	(3) Grandchild Care Provision	(4) Total Care Time (Hours/yr)	(5) First Stage Retired	(6) Total Number of Grandchild	(7) Grandchild Care Provision	(8) Total Care Time (Hours/yr)
Panel A: High School or Above								
Retirement	0.475***	0.234	0.287***	581.337*	0.505***	0.533	0.134	737.429
	(0.062)	(0.205)	(0.097)	(307.029)	(0.068)	(0.482)	(0.146)	(461.868)
Control for Total Number of Grandchild			Y	Y			Y	Y
Observations	731	730	730	730	910	910	910	910
Panel B: Less Than High School								
Retirement	0.415***	-0.386	0.371**	585.903	0.342***	0.998*	0.197	404.847
	(0.084)	(0.405)	(0.176)	(512.079)	(0.050)	(0.537)	(0.152)	(468.946)
Control for Total Number of Grandchild			Y	Y			Y	Y
Observations	666	665	665	665	1131	1127	1127	1127

Notes: See notes under Table 1 for information on the data source. The education-level subsamples of the first (last) 3 columns are restricted to female (male). The coefficients reported are two-stage least squares estimates. The specification follows equation (4), where total number of grandchild is controlled in the indicated columns. Clustered robust standard errors are in the parentheses. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

Table7A: Robustness Check
Grandchild Care Effects, Female Subsample

	(1) Grandchild Care Provision	(2) Total Care Time (Hours/yr)	(3) Total Number of Grandchild
A. Add Number of Grandchild	0.296***	621.648**	
	(0.083)	(254.561)	
Observations	1395	1395	
B. Add Survey Year and	0.316***	627.020***	0.071
County Fixed Effects	(0.042)	(124.528)	(0.180)
Observations	1395	1395	1395
C. Add Education and Health	0.355***	760.350***	0.046
	(0.043)	(124.509)	(0.176)
Observations	1395	1395	1395
D. Add Spouse Retirement and	0.309***	496.991**	-0.010
Household Income	(0.044)	(117.900)	(0.178)
Observations	1351	1351	1351
E. Add Co-residence	0.302***	465.849	-0.023
	(0.105)	(354.180)	(0.208)
Observations	1028	1028	1028

Notes: See notes under Table 1 for information on the data source. Each cell in this table is a separate regression. The outcome variable is stated in the column heads. The coefficients reported in this table are the second stage of the two-stage least square estimates. The specification follows equation (4). Each role of regressions adds control variables (X) to the regressions in the previous role. The change in X is stated in the first column. Only the coefficient of retirement is reported for each regression. Standard errors are in the parentheses and are clustered by county. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

Table 7B: Robustness Check

Grandchild Care Effects, Male Subsample

	(1) Grandchild Care Provision	(2) Total Care Time (Hours/yr)	(3) Total Number of Grandchild
A. Add Number of Grandchild	0.134	495.468	
	(0.102)	(314.174)	
Observations	2037	2037	
B. Add Survey Year and County Fixed Effects	0.115	522.923	0.728***
	(0.106)	(320.074)	(0.291)
Observations	2037	2037	2037
C. Add Education and Health	0.118	525.423	0.731***
	(0.106)	(321.840)	(0.295)
Observations	2037	2037	2037
D. Add Spouse Presence, Retired, Household Income	0.146	577.797*	0.811***
	(0.109)	(336.129)	(0.298)
Observations	1980	1980	1980
E. Add Co-residence	0.138	329.770	0.928***
	(0.120)	(408.742)	(0.318)
Observations	1441	1441	1441

Notes: See notes under Table 1 for information on the data source. Each cell in this table is a separate regression. The outcome variable is stated in the column heads. The coefficients reported in this table are the second stage of the two-stage least square estimates. The specification follows equation (4). Each role of regressions adds control variables (X) to the regressions in the previous role. The change in X is stated in the first column. Only the coefficient of retirement is reported for each regression. Standard errors are in the parentheses and are clustered by county. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

Table 8. Falsification Test for the Effect of Retirement Eligibility on Grandchildren Care

	First Stage	Reduced-form			
	(1)	(2)	(3)	(4)	(5)
	Retired	Total Number of Grandchild	Grandchild Care Provision	Total Care Time (Hours/yr)	Have at Least One Grandchild
Panel A: Female					
Eligible for Retirement Benefits	-0.049	0.172	0.079	163.506	0.083
	(0.081)	(0.181)	(0.066)	(226.631)	(0.069)
Observations	653	653	653	653	653
R-squared	0.030	0.232	0.092	0.029	0.293
Panel B: Male					
Retirement	0.001	0.349	0.010	-65.457	0.009
	(0.106)	(0.364)	(0.088)	(275.663)	(0.085)
Observations	527	525	527	527	525
R-squared	0.003	0.098	0.033	0.014	0.082

Notes: See notes under Table 2 for information on the data source. The coefficients reported in this table are reduced-form estimates. The specification are the reduced-form regressions of the two-stage least squares in equation (4), while none of the characteristics in X is controlled. Clustered robust standard errors are in the parentheses. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

Appendix Table 1. Robustness Check of the Detailed Effects of Retirement on Grandchildren Care
Subsample: Have at Least One Grandchildren

	Female			Male		
	(1) First Stage Retired	(2) Grandchild Care Provision	(3) Total Care Time (Hours/yr)	(4) First Stage Retired	(5) Grandchild Care Provision	(6) Total Care Time (Hours/yr)
Panel A: Reduced-form Results						
Eligible for	0.539***	0.473***	762.290*	0.365***	0.061	217.099
Retirement Benefits	(0.109)	(0.142)	(450.248)	(0.047)	(0.055)	(186.654)
Control for Total Number of Grandchild		Y	Y		Y	Y
Observations	569	569	569	1346	1346	1346
R-squared	0.248	0.024	0.020	0.414	0.007	0.008
Panel B: Second-Stage Results of the Instrumented Regressions						
Retirement		0.877***	1413.117		0.167	595.436
		(0.322)	(907.545)		(0.149)	(508.257)
Control for Total Number of Grandchild		Y	Y		Y	Y
Observations		569	569		1346	1346

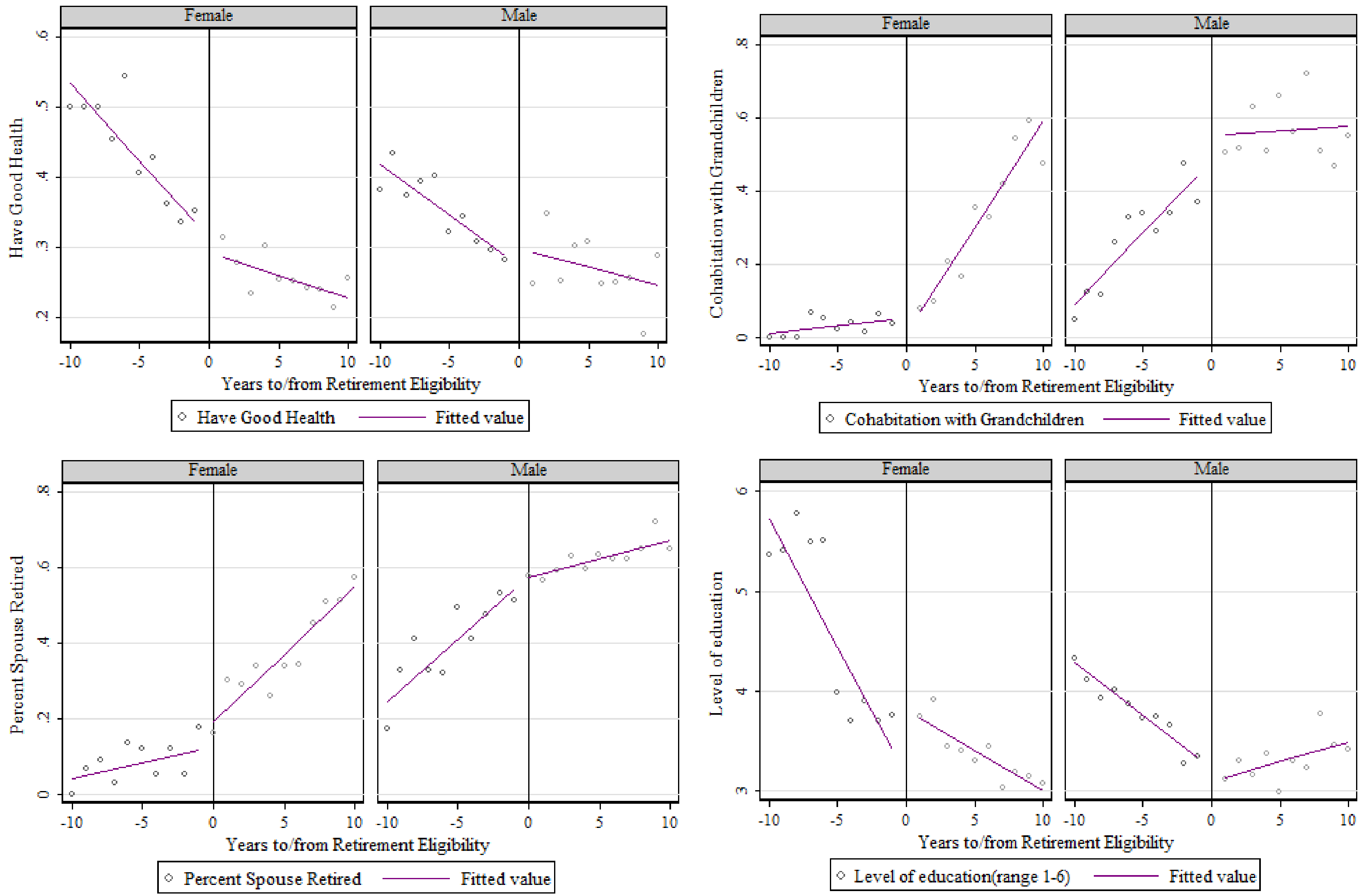
Notes: See notes under Table 1 for information on the data source. The sample of the first (last) 4 columns is restricted to females (males) with at least one grandchildren. The coefficients reported in this table are the second stage of the two-stage least square estimates. The specification follows equation (4), where total number of grandchild is controlled. Clustered robust standard errors are in the parentheses. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

Appendix Table 2. Robustness Check Using Different Years of Data to/from the Eligibility Year

	First Stage	Second Stage		
	(1)	(2)	(3)	(4)
	Retired	Total Number of Grandchild	Grandchild Care Provision	Total Care Time (Hours/yr)
Panel A: Change the Years of to/from the Eligibility Age				
+/- 9 Years	0.461***	-0.094	0.227**	514.723*
	(0.047)	(0.184)	(0.091)	(272.996)
Observations	1301	1299	1301	1301
+/- 7 Years	0.468***	-0.069	0.215**	465.63
	(0.058)	(0.213)	(0.107)	(326.833)
Observations	1046	1045	1046	1046
+/- 5 Years	0.443***	-0.061	0.207*	493.674
	(0.070)	(0.282)	(0.122)	(402.448)
Observations	797	796	797	797
Panel B: Functional Forms				
Linear Trend	0.467***	-0.198	0.199***	490.422*
	(0.045)	(0.188)	(0.096)	(280.994)
Observations	1397	1395	1397	1397
Quadratic Trend	0.468***	-0.009	0.249***	611.592**
	(0.044)	(0.171)	(0.086)	(253.706)
Observations	1397	1395	1397	1397

Notes: Robustness test for table 3. Standard errors are in the parentheses and are clustered by county. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

Appendix Figure 1 Continuity of Household Characteristics



Note: The fitted value is derived from a linear interacted model, which is weighted by the number of people represented by each point in the graph.