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Does providing informal elderly care hasten retirement? Evidence from Japan

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Abstract
This paper examines the implications of providing care to elderly parents for adult children’s retirement plans using micro data from a Japanese survey. We find no significant effect of caregiving on family caregivers’ planned retirement age if we do not take into account caregiving intensity but find a negative and significant effect on retirement plans for intensive caregivers, particularly among women. These findings suggest that relying on family members to provide elderly care can pose a serious challenge to the ongoing efforts of the government to promote the labor supply of women and the elderly as a way of addressing the shrinkage of the working-age population in Japan. The estimation results suggest that ensuring access to formal care services can help family members reconcile their paid work with caregiving requirements, thereby alleviating the adverse effect of caregiving on their retirement plans. The results also suggest that the financial burden of formal care services could require caregivers to postpone retirement in some cases.

1 | INTRODUCTION

One of the important costs of the increasing demand for elderly care caused by population aging is a possible reduction in the labor supply of family caregivers.¹ Caregiving can, in principle, affect caregivers’ labor market behavior at the extensive or intensive margins. Changes at the extensive margin include quitting work temporarily or retiring early while changes at the intensive margin
include adjusting work hours (for example by switching from a full-time to a part-time job), taking on fewer responsibilities, and/or forgoing a promotion (Van Houtven, Coe, & Skira, 2013).

This paper examines adjustments at the extensive margin and pays particular attention to the effect of providing care to elderly parents on the retirement plans of adult children. Given that the demand for parental care provision tends to increase with age, it is possible that the need for adult children to provide care to their elderly parents is concentrated around the period when retirement is a possible option for labor market exit (Meng, 2012). Taking early retirement for caregiving reasons can cause serious financial costs to caregivers as it is likely to affect their lifetime income not only by making them forgo the income they could have earned until the mandatory retirement age but also by reducing pension entitlements.

The main aim of this paper is therefore to contribute to a better understanding of the impact of elderly care provision on family caregivers’ retirement plans. It examines specifically the effect of providing care to elderly parents on the planned retirement age of adult children using micro data from Japan. While there has been a growing literature that analyzes the effect of providing elderly care on family caregivers’ labor market outcomes, the effect of caregiving on their retirement behavior has been less explored not only in Japan but also in other parts of the world. In addition, the increasing use of formal care services since the launch of a mandatory long-term care insurance (LTCI) program in 2000 in Japan gives us an opportunity to examine whether the provision of formal care services helps alleviate or eliminate any adverse effect of caregiving on family caregivers’ retirement plans.

Population aging is a pressing issue not only for advanced economies but also for developing economies today. In particular, in many countries in Asia such as China, population aging is progressing relatively fast due partly to a significant decline in fertility rates. While the transition in the age structure of population took the advanced economies of the West more than a century, it is being played out over just a few decades in many countries in Asia (Asian Development Bank, 2011). The rapid pace of population aging and the fact that it is occurring at an earlier stage of development give such developing countries limited time and opportunity to prepare themselves for the needs of an aged society (United Nations Economic and Social Commission for Asia and the Pacific, 2017). This is resulting in a situation where public old-age support, including support for long-term care, is still underdeveloped and the heavy burden of old-age support is being borne instead by family members. By analyzing the case of Japan, which shares with other Asian countries similar social norms including a relatively strong sense of filial obligation, this paper can shed light on important issues that Asian countries need to take into account when preparing themselves for the advent of an aged society.

The rest of the paper is organized as follows. Section 2 provides a conceptual framework for analyzing the effect of elderly care provision on the labor supply of family caregivers. Section 3 briefly describes the current situation of elderly care in Japan. Section 4 reviews the relevant literature. Section 5 describes the data and estimation strategy. Section 6 presents estimation results. Section 7 summarizes the main findings and discusses some policy implications.

2 | CONCEPTUAL FRAMEWORK

Empirical analyses of the employment effects of elderly care provision are based mainly on the standard labor market participation decision where labor market participation is observed if and only if the offered wage exceeds the reservation wage (Heitmueller & Inglis, 2007). It is thus hypothesized that the effect of caregiving on labor supply will be the net impact of two opposing
forces, namely substitution and income effects (Carmichael & Charles, 1998, 2003). With time being scarce, caregiving responsibilities tend to increase family caregivers’ reservation wages and reduce their labor supply (substitution effect) while greater expenditures associated with elderly care may reduce their disposable incomes and induce them to remain in the labor market (income effect).

Apart from these two main effects, there are also respite and discrimination effects (Carmichael & Charles, 1998, 2003). The respite effect exists when family caregivers desire to take a break from caregiving responsibilities through their engagement in employment. The respite effect is likely to reduce the reservation wage and counteract the substitution effect with regard to the decision on labor market participation (Carmichael & Charles, 1998). As for the discrimination effect, family caregivers may experience discrimination at work in terms of wages and/or promotion because of their greater flexibility requirements and lower reliability owing to caregiving commitments (e.g., higher absence and sickness rates) and thus reduce their labor supply (Carmichael & Charles, 1998; Heitmueller & Inglis, 2007).

In sum, the employment effect of caregiving will be positive when the income effect dominates the substitution effect and negative when the latter dominates the former. Which effect outweighs the other is theoretically ambiguous and is an empirical question. The employment effect of caregiving will also depend on the size of the respite (positive) and discrimination (negative) effects as well as other factors including the degree of caregiving intensity, how strong caregivers are attached to the labor market, and the availability of formal care services.

3 | ELDERLY CARE IN JAPAN

Japan has experienced rapid population aging as well as significant changes in family structure with a downward trend in the parent–child co-residence rate since the mid-1970s (Niimi, 2016). These demographic trends are likely to reduce the availability of family members to provide elderly care and impose a greater burden on a smaller number of family caregivers per elderly person. In response, Japan introduced a mandatory LTCI program in 2000 to cover the long-term care of the elderly, which had previously been provided partly through the health insurance system and partly through welfare measures for the elderly.

It has a number of key characteristics. First, everyone aged 40 or above is required to participate in the program and to pay insurance premiums. Given its universal coverage, everyone aged 65 or above as well as those under 65 but with aging-related disabilities are entitled to receive necessary care services regardless of their income level or the availability of family caregivers as long as they are certified as requiring support or long-term care. Second, eligibility is thus needs-based, and applicants are evaluated through an objective assessment and assigned a care level based strictly on their physical and mental disabilities. Third, the Japanese LTCI program does not provide cash allowances to the elderly to support family caregivers, but it covers the cost of services purchased from the formal sector. A professional care manager provides a personal care plan, and care recipients can choose what services to receive and from which provider to receive them subject to a 10 percent co-payment (Tsutsui & Muramatsu, 2005).

In the case of Japan, it used to be the custom for the eldest son to take care of his elderly parents, and this essentially implied that his wife (i.e., daughter-in-law) took primary responsibility for elderly care. However, an LTCI program with universal coverage replaced the earlier stigmatized system of providing long-term care services on a means-tested basis in 2000 (Tsutsui & Muramatsu, 2005), and the use of formal care services under the LTCI program has increased
significantly since its launch (Niimi, 2016). As a result, such traditional norms have been changing in Japan since the introduction of the LTCI program (e.g., Tsutsui, Muramatsu, & Higashino, 2014). Nevertheless, some studies find that informal care by adult children continues to be the most common source of caregiving for elderly parents in Japan (e.g., Hanaoka & Norton, 2008), although Hanaoka and Norton (2008) suggest that the role of daughters-in-law in providing care to the elderly is becoming less important than that of unmarried children.

In addition to the LTCI program, Japan has a Child Care and Family Care Leave Act to help prevent family caregivers from having to quit work to meet caregiving responsibilities. After the amendments of 2009 and 2016, family caregivers are currently entitled to take long-term (93 days per family member) as well as short-term leaves (5 days per year per family member) from work. They can also avail themselves of flexible working arrangements as well as an exemption from overtime work. Because of data limitations, it is not possible to analyze the effect of these measures, and we thus focus instead on the implications of the LTCI program for caregivers’ retirement behavior.

One of the important financial consequences of early retirement for family caregivers is that early retirement can result in a reduction in their pension entitlements, causing long-term repercussions on the livelihood of family caregivers. In the case of Japan, everyone aged 20 to 59 is required to participate in the National Pension Plan. Employees in the private sector are also required to participate in the Employees’ Pension Plan and receive earnings-related pensions in addition to the basic pension after retirement. As a result, if family caregivers retire early because of their caregiving responsibilities, not only do they have to forgo the income they could have earned until the mandatory retirement age, but they are also likely to face reductions in the earnings-related pensions they will receive in the future. Given that eligibility for the Employees’ Pension Plan is limited in the case of irregular employees, the financial cost of retiring early is likely to be greater for regular workers than for irregular workers in Japan.

4 | LITERATURE REVIEW

There has been a growing literature that examines the employment effect of providing elderly care since the mid-1990s. The results from empirical studies have been somewhat mixed, but more consensus has been reached on the adverse effect of caregiving on labor supply for (particularly female) intensive caregivers or co-residential caregivers (e.g., Casado-Marín, García-Gómez, & López-Nicolás, 2011; Ettner, 1995; Heitmueller, 2007; Kotsadam, 2012; Lilly, Laporte, & Coyte, 2010; Michaud, Heitmueller, & Nazarov, 2010; Nguyen & Connelly, 2014).

Despite the growing literature on the employment effect of caregiving in general, there remain some gaps in the literature, namely in terms of (i) geographical coverage outside the Western countries and (ii) analyses of the effect of caregiving specifically on caregivers’ retirement behavior.

The number of studies that look at this issue outside the Western countries remains relatively limited. There are also far fewer studies that look at the case of Japan than those that look at the case of other advanced economies. In addition, most existing studies on Japan focus mainly on the effect of caregiving on female labor supply, and in particular, on whether or not the LTCI program helps alleviate any adverse effect on women’s labor market outcomes. Shimizutani, Suzuki, and Noguchi (2008), for instance, show that the introduction of the LTCI program had no effect on female labor supply in 2001 but had a large and positive effect in 2002. Sugawara and Nakamura
(2014) similarly find that the LTCI program alleviates the negative effect of caregiving requirements on female labor supply.

Yamada and Shimizutani (2015) also find that the LTCI program helps mitigate the negative effect of caregiving on main caregivers’ labor supply but only to a limited extent. As for Kan and Kajitani (2014), they find that while the LTCI program helps reduce the number of hours of caregiving among highly educated women, the reduction does not lead to an increase in their working hours. Finally, Oshio and Usui (2017) find that elderly care provision has little impact on female labor supply after controlling for the endogeneity of caregiving or individual unobserved time-invariant heterogeneity.

Another gap in the literature is the limited empirical work on the effect of caregiving on caregivers’ retirement behavior. As reviewed above, existing studies on Japan hardly look at the effect of caregiving obligations on caregivers’ retirement. One exception, which is somewhat related, is the work of Sakai and Sato (2007), which examines the effect of caregiving requirements on labor market participation among those aged 50 or above. They find, based on logit and multinomial logit models using panel data, that while the presence of family members in need of care has a negative effect on the probability of having a regular job or being self-employed for the male sample, it has a negative effect on the probability of having a nonregular job for the female sample. They also examine whether the introduction of the LTCI program alleviates the adverse effect of caregiving on employment, but their difference-in-difference analysis does not generate any conclusive results as the results differ depending on the specification of their estimation model. While Sakai and Sato (2007) focus their analysis on those aged 50 or above, they do not look at the effect of caregiving on their retirement status per se.

Even outside Japan, the effect of caregiving on caregivers’ retirement behavior has been less explored so far, and there are only a few studies that look at this particular issue. The results from these studies are mixed, and it is still not clear whether providing elderly care hastens family caregivers’ retirement. Dentinger and Clarkberg (2002) examine how caregiving affects retirement timing by estimating logit models for discrete-time event history analysis using data on the United States (U.S.). They find that the odds of retiring are five times higher for women caring for their husbands than for noncaregiving women but find little evidence that caring for elderly parents makes caregiving children retire earlier. By contrast, Van Houtven et al. (2013) estimate fixed effects linear probability models for retirement status using U.S. data and find that caregiving of any type increases the probability of being retired by 2.4 percentage points for female caregivers, which is driven by their provision of assistance with chores to their parents and/or parents-in-law.

By estimating discrete-time hazard models based on panel data on Germany, Meng (2012) finds that the effect of caregiving on the retirement decision is much greater than its effect on the labor market outcomes of middle-aged individuals. Having to look after a care recipient (as measured by the presence of a care recipient) is found to increase the hazard of retirement for women by 74 percent compared with women without caregiving responsibilities. In the case of men, it is not the mere presence of a care recipient but the time intensity of caregiving that affects their retirement decisions (Meng, 2012).

Schneider, Trukeschitz, Mühlmann, & Ponocny (2013) examine the effect of caregiving on retirement plans in Austria by estimating multinomial logit models based on cross-sectional data on caregivers’ employment plans for the following two years. Their analysis suggests that the intention of exiting the labor market is driven by the burden of physical care provision rather than by time demands, particularly for male workers. In contrast, time-based conflicts between elderly care provision and paid work are found to be associated with a higher risk of intended job changes for female workers.
The main aim of this paper is to fill these gaps in the literature by analyzing the effect of caregiving on caregivers’ retirement behavior in the case of Japan for virtually the first time, to the best of the author’s knowledge. It takes an approach similar to that of Schneider et al. (2013) and examines the effect of caregiving on family caregivers’ retirement intentions or more specifically on their planned retirement age. While there is a relatively large body of empirical literature that conducts ex-post analyses of the determinants of retirement, less research has been conducted on retirement planning (Riedel, Hofer, & Wögerbauer, 2015), and the present analysis makes a contribution to the literature in this respect as well. Preparing for retirement generally takes time, and it would be worthwhile to analyze the implications of caregiving for caregivers’ retirement plans. Schneider et al. (2013) note that employees’ turnover intentions have been found to be a good proxy for actual turnover behavior in the literature (e.g., Böckerman & Ilmakunnas, 2009; Steel & Ovalle, 1984), and thus retirement plans are presumably a good proxy for actual retirement behavior.

5 | DATA AND ESTIMATION STRATEGY

5.1 | Data

The empirical analysis is undertaken using data from the “Preference parameters study” of Osaka University, which was conducted annually in Japan during the 2003 to 2013 period. This study surveys a sample of individuals aged 20 to 69 that was drawn to be nationally representative using two-stage stratified random sampling and has a panel component. Data from the 2011 wave are mainly used for the present analysis as the 2011 wave collects information on parental care provision and allows us to identify respondents who serve as the main caregiver for their parents and/or parents-in-law. In the case of the 2011 wave, 4,934 out of 5,316 individuals completed the questionnaire. For the present analysis, we restrict our sample to respondents who are aged 40 or above, employed, and have at least one parent or parent-in-law alive (which leaves us with 2,104 observations). In other words, the sample was restricted to those who currently work and are “at risk” of retiring owing to parental care responsibilities. After excluding observations with missing information on the variables used in our analysis, we are left with 970 observations. Note that among respondents who are already retired, there may be some who retired because of caregiving responsibilities, but given the limited availability of information on respondents’ employment and caregiving history, it was not possible to control for possible selection bias in the present analysis. For this reason, our estimates of the effect of caregiving on caregivers’ retirement plans should be considered as a lower bound.

5.2 | Estimation strategy

To investigate the effect of providing elderly care on family caregivers’ retirement plans, we conduct a regression analysis of the determinants of respondents’ planned retirement age. One of the key methodological challenges of analyzing the employment effect of caregiving is that care provision is potentially endogenous to the process determining labor supply. Hence, we first test for the endogeneity of the caregiving and formal care usage variables by estimating instrumental variables (IV) models. Note, however, that previous studies reach mixed conclusions regarding the endogeneity of caregiving, with several studies finding little evidence of endogeneity and treating caregiving as exogenous (e.g., Bolin, Lindgren, & Lundborg, 2008;
Kotsadam, 2012; Nguyen & Connelly, 2014), particularly when unobserved individual fixed effects are taken into account using panel data analysis (e.g., Casado-Marín et al., 2011; Ciani, 2012; Meng, 2013; Van Houtven et al., 2013).

Given that our potentially endogenous variables (i.e., caregiving and formal care usage variables) are binary, the following three-stage procedure is used instead of standard two-stage least squares (2SLS): (i) estimate binary response models (in this case probit models) of caregiving and formal care usage on instruments and other control variables; (ii) compute the fitted probabilities; and (iii) estimate the determinants of planned retirement age by IV with 2SLS using the fitted probabilities as instruments for caregiving and formal care usage (Wooldridge, 2002).

Given that a greater burden of parental care tends to be shouldered by women than by men and that women are generally more weakly attached to the labor market than men in Japan, as in many other countries, it would be interesting to see whether the adverse effect of caregiving on caregivers’ retirement plans is greater for women than for men. Unfortunately, owing to the limited number of men who serve as the main caregiver in the sample, it is not possible to conduct a regression analysis using the male sample only. Instead, we conduct regression analyses using the full and female samples and compare the regression results to infer the heterogeneous effects of caregiving on caregivers’ retirement plans.

5.3 | Empirical specification

5.3.1 | Dependent variable

The dependent variable is the planned retirement age of the respondent. This information was collected in the survey by asking respondents until what age they intend to work.\textsuperscript{10}

5.3.2 | Explanatory variables

\textit{Parental care provision}: The main variable of interest in the present analysis is a dummy variable capturing whether or not the respondent provides care to his/her elderly parents and/or parents-in-law.\textsuperscript{11} In the “Preference parameters study” there are two questions relating to parental care provision. One of the questions asks respondents whether or not respondents and/or (in case they are married) their spouses provide at least some care to their father, mother, father-in-law, and mother-in-law, respectively.\textsuperscript{12} The other question asks respondents who is the main caregiver to their father, mother, father-in-law, and mother-in-law, respectively. To shed light on the importance of accounting for the intensity of caregiving, we construct two caregiving variables based on respondents’ responses to these two questions. The first variable equals one if the respondent and/or his/her spouse provides some care to at least one of their parents or parents-in-law and zero otherwise. The second variable equals one only if the respondent serves as the main caregiver to at least one of his/her parents or parents-in-law and zero otherwise.\textsuperscript{13}

\textit{Formal care usage}: To examine the income effect of caregiving on respondents’ retirement plans, we construct a variable that equals one if formal care services (nursing homes, assisted living homes, or home helpers) play the main caregiving role for at least one of the respondent’s parents or parents-in-law and zero otherwise.\textsuperscript{14} We also interact this variable with the caregiving variables to investigate whether the use of formal care services help alleviate any adverse effect of caregiving on caregivers’ retirement plans.
Instruments: When estimating IV models, we use parental health as an instrument for the caregiving and formal care usage variables as it is a commonly used instrument in analyses of caregiving (e.g., Bolin et al., 2008; Ettner, 1996; Kotsadam, 2012; Van Houtven et al., 2013). There is the possibility of the intergenerational transmission of poor health, but this can be alleviated by accounting for the health status of respondents, as commonly done in the literature (e.g., Bolin et al., 2008; Van Houtven et al., 2013). In the “Preference parameters study” respondents were asked whether or not their parents and parents-in-law are certified as belonging to one of the seven Support/Care Levels under the LTCI program, which is presumably a good proxy for their health status. Using this information, we construct a dummy variable that equals one if at least one of the respondent’s parents or parents-in-law is certified as requiring long-term care under the LTCI program and zero otherwise.

Since the existing literature suggests that the number of siblings is a strong instrument for informal parental care provision (e.g., Bolin et al., 2008; Ettner, 1995, 1996), we use the total number of the respondent’s brothers and brothers-in-law as an additional instrument.\textsuperscript{15} In the case of Japan, the number of brothers and brothers-in-law essentially captures the number of daughters-in-law, who traditionally take primary responsibility for elderly care. We also tried using the total number of the respondent’s sisters and sisters-in-law, but the coefficient on this variable was never significant. This suggests that the role of daughters-in-law in parental care remains relatively important in the case of Japan.

Other instruments include a dummy variable that equals one if the respondent and/or his/her spouse is the eldest child and zero otherwise and another dummy variable that equals one if both of the respondent’s parents and/or parents-in-law are alive and zero otherwise. Finally, we use the availability of facilities that provide institutional care in the prefecture where the respondent’s parents and parents-in-law reside as an instrument for the formal care usage variable. More specifically, we use the aggregate admission capacity of facilities that provide institutional care based on data from the “Survey of institutions and establishments for long-term care.”\textsuperscript{16} We express this as a share of the population aged 65 or above in each prefecture.

Respondents’ employment: We include a categorical variable capturing the respondent’s employment status, namely (i) self-employed (including those who assist with a family business), (ii) a regular worker, or (iii) an irregular worker.\textsuperscript{17} We also include the respondent’s wage expressed as the logarithm of his/her hourly wage.\textsuperscript{18}

Respondents’ basic characteristics: A set of individual characteristics capturing the respondent’s age,\textsuperscript{19} gender, educational attainment,\textsuperscript{20} self-assessed health status,\textsuperscript{21} marital status as well as the number of respondents’ children aged 18 or less is included. We also include variables that reflect the respondent’s preferences such as his/her degree of time preference and risk aversion as well as his/her view toward gender roles within the household.\textsuperscript{22}

Wealth- and income-related information: Retirement timing is also inevitably closely related to the wealth and income level of the household. We therefore include in the estimation model the level of the respondent’s household wealth expressed as quintiles of net worth, a home-ownership dummy, the level of household income net of the respondent’s own income, and a dummy variable that equals one if the respondent expects to receive inheritances (including inter vivos transfers) from his/her parents and/or parents-in-law. We also include a variable that indicates the share of living expenses after retirement that the respondent expects to be able to cover using public pensions.\textsuperscript{23}

In addition to the above explanatory variables, regional dummies as well as a dummy variable for residing in a major (ordinance-designated) city are included to control for geographical variation.
6 | EMPIRICAL RESULTS

6.1 | Descriptive statistics

Table 1 provides the summary statistics of the dependent and explanatory variables for the full and female samples. The full sample includes all observations while the female sample includes only female observations. To obtain an overview of the characteristics of caregivers, statistics are provided for caregivers and noncaregivers separately for each sample. Note that the term “caregivers” here refers to respondents who provide care of any intensity to at least one of their parents or parents-in-law (including those who serve as the main caregiver) while noncaregivers refer to respondents who do not provide any parental care. Table 1 also provides separate summary statistics for respondents who serve as the main caregiver.

The figures at the bottom of the table indicate that about 14 percent and 18 percent of the full and female samples are found to be engaged in parental care, respectively. In the case of the full sample, we find that about 32 percent of caregivers serve as the main caregiver and that this figure is greater for the female sample (about 51 percent), underscoring the fact that women tend to make greater caregiving commitments than men.

Regarding the outcome of interest, we do not find a statistically significant difference in the planned retirement age between caregivers and noncaregivers in either the full or female sample. We find a marginally significant difference (significant at the 10 percent level) between main caregivers and nonmain caregivers (their statistics are not shown in the table) in the case of the full sample.

The table also shows that the share of respondents whose parents and/or parents-in-law avail themselves of formal care services as their main caregiver is significantly greater among caregivers than among noncaregivers for both the full and female samples. In addition, as expected, the share of respondents who have both parents and/or both parents-in-law alive is significantly lower among caregivers than among noncaregivers, and the share is particularly low among respondents who serve as the main caregiver for both samples. This suggests that spouses tend to play an important role in elderly care if they are still alive. We also find that the number of brothers and brothers-in-law that respondents have is significantly lower among those who serve as the main caregiver than among nonmain caregivers for the full sample, as expected.

6.2 | Endogeneity of caregiving and formal care usage variables

We now turn to our regression analysis of the determinants of the planned retirement age to investigate the effect of caregiving on family caregivers’ retirement plans.

We first test for the endogeneity of the caregiving and formal care usage variables by estimating IV models. A different combination of the instruments described in Subsection 5.3 is employed for each probit model to ensure that all the instruments used in the estimation are significantly correlated with the endogenous variables. As far as the estimated coefficients of the instruments are concerned, they all have the expected signs (see Table A1). The coefficients on these identifying instruments are jointly significant at the 1 percent level in all cases.

We then estimate the first stage of the 2SLS using the fitted probabilities obtained from the probit models as instruments. The coefficients on these predicted probabilities for providing at least some parental care, for serving as the main caregiver, and for formal care usage are estimated to be highly significant in all relevant regressions (see Table A2). In addition, the obtained F-statistic
**Table 1** Summary statistics

|                  | Full sample |                       | Female sample |                       |
|------------------|-------------|------------------------|---------------|------------------------|
|                  | Caregivers  | Main caregivers only   | Noncaregivers  | Caregivers  |
|                  | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Dependent variable | Planned retirement age | 63.94 | 4.91 | 62.84 | 3.95 | 64.22 | 5.38 | 62.48 | 4.21 | 62.50 | 3.69 | 62.26 | 5.53 |
| Explanatory variables | Caregiving variables |                     |               |                       |
| Main caregiver | 0.32 | 1.00 | 0.00 | 0.51 | 1.00 | 0.00 |                       |               |
| Use of formal care services | 0.34 | 0.07 | 0.06 | 0.32 | 0.06 | 0.06 |                       |               |
| Instruments |                     |                       |               |                       |
| Poor parental health | 0.78 | 0.80 | 0.12 | 0.80 | 0.78 | 0.10 |                       |               |
| Number of brothers and brothers-in-law | 1.43 | 1.18 | 0.98 | 1.50 | 1.21 | 1.35 | 1.23 | 1.17 | 1.03 | 1.43 | 1.25 |
| Being the eldest child | 0.70 | 0.66 | 0.68 | 0.75 | 0.67 | 0.70 |                       |               |
| Both parents and/or parents-in-law alive | 0.41 | 0.25 | 0.63 | 0.32 | 0.17 | 0.63 |                       |               |
| Availability of institutional care | 3.84 | 0.54 | 3.73 | 0.52 | 3.82 | 0.55 | 3.83 | 0.57 | 3.79 | 0.55 | 3.82 | 0.56 |
| Respondent’s characteristics | Age | 53.51 | 6.12 | 54.32 | 5.58 | 49.86 | 7.03 | 53.63 | 5.90 | 54.44 | 5.83 | 48.31 | 6.12 |
| Female | 0.51 | 0.82 | 0.40 | 1.00 | 1.00 | 1.00 |                       |               |
| Marital status |                     |                       |               |                       |
| Married | 0.91 | 0.80 | 0.88 | 0.86 | 0.78 | 0.83 |                       |               |
| Divorced/Widowed | 0.03 | 0.09 | 0.06 | 0.06 | 0.11 | 0.11 |                       |               |
| Never married | 0.07 | 0.11 | 0.06 | 0.08 | 0.11 | 0.06 |                       |               |
| No. of children aged 18 or younger | 0.45 | 0.82 | 0.43 | 0.73 | 1.02 | 1.08 | 0.35 | 0.78 | 0.36 | 0.68 | 1.03 | 1.08 |
| Education |                     |                       |               |                       |
| Junior high school | 0.06 | 0.05 | 0.04 | 0.04 | 0.03 | 0.03 |                       |               |
| High school | 0.46 | 0.50 | 0.48 | 0.51 | 0.53 | 0.52 |                       |               |
| Junior college | 0.16 | 0.18 | 0.15 | 0.23 | 0.22 | 0.28 |                       |               |
| University or above | 0.32 | 0.27 | 0.34 | 0.23 | 0.22 | 0.17 |                       |               |
| Poor health | 0.20 | 0.14 | 0.15 | 0.20 | 0.17 | 0.17 |                       |               |
| Employment |                     |                       |               |                       |
| Regular job | 0.52 | 0.39 | 0.56 | 0.34 | 0.25 | 0.30 |                       |               |

(Continues)
is greater than 10 in all cases, which suggests that the instruments are empirically strong according to the commonly used rule of thumb criterion (Staiger & Stock, 1997). Despite the rejection of weak instruments, the test results suggest that the null hypothesis of the exogeneity of the caregiving and formal care variables cannot be rejected in any case (see Table A3). This is consistent with the findings of previous studies based on cross-sectional data (e.g., Bolin et al., 2008; Kotsadam, 2012; Nguyen & Connelly, 2014). We therefore treat our caregiving and formal care usage variables as exogenous in the retirement age equation and estimate it by ordinary least squares (OLS) to examine the effect of caregiving on family caregivers’ retirement plans. However, note that when we compare the OLS estimates (Table 2) with the more conservative IV estimates (Table A3), we find that they are broadly similar. The only major difference

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\begin{array}{|c|c|c|c|c|c|c|}
\hline
\text{TABLE 1} & \text{Full sample} & \text{Female sample} \\
\hline
\text{Caregivers} & \text{Main caregivers only} & \text{Noncaregivers} & \text{Caregivers} & \text{Main caregivers only} & \text{Noncaregivers} \\
\hline
\text{Irregular job} & 0.29 & 0.45 & 0.28 & 0.48 & 0.56 & 0.53 \\
\text{Self-employed} & 0.19 & 0.16 & 0.16 & 0.18 & 0.19 & 0.17 \\
\text{Log of hourly wage} & 7.24 & 0.56 & 7.09 & 0.50 & 7.35 & 0.61 & 6.94 & 0.40 & 6.93 & 0.38 & 6.93 & 0.51 \\
\text{Log of other household income} & 0.97 & 0.83 & 1.06 & 0.84 & 0.86 & 0.83 & 1.35 & 0.79 & 1.16 & 0.82 & 1.36 & 0.76 \\
\text{Homeownership} & 0.94 & 0.91 & 0.90 & 0.92 & 0.92 & 0.89 \\
\text{Expected receipt of inheritances} & 0.57 & 0.61 & 0.57 & 0.58 & 0.64 & 0.54 \\
\text{Pensions} & 0.54 & 0.21 & 0.57 & 0.20 & 0.47 & 0.25 & 0.54 & 0.21 & 0.59 & 0.20 & 0.45 & 0.26 \\
\hline
\text{Wealth quintiles} & \text{1st quintile} & 0.14 & 0.09 & 0.22 & 0.14 & 0.11 & 0.22 \\
\text{2nd quintile} & 0.19 & 0.25 & 0.19 & 0.25 & 0.25 & 0.20 \\
\text{3rd quintile} & 0.20 & 0.18 & 0.22 & 0.15 & 0.17 & 0.20 \\
\text{4th quintile} & 0.24 & 0.23 & 0.18 & 0.21 & 0.22 & 0.20 \\
\text{5th quintile} & 0.24 & 0.25 & 0.19 & 0.24 & 0.25 & 0.19 \\
\text{Gender roles} & 0.10 & 0.02 & 0.15 & 0.08 & 0.03 & 0.10 \\
\text{Low time preference} & 0.53 & 0.57 & 0.50 & 0.55 & 0.56 & 0.53 \\
\text{Risk preference} & 4.14 & 1.78 & 4.25 & 1.71 & 4.17 & 1.94 & 4.11 & 1.76 & 4.19 & 1.72 & 3.94 & 1.93 \\
\text{Residing in a major city} & 0.20 & 0.27 & 0.25 & 0.20 & 0.28 & 0.24 \\
\text{Number of observations} & 138 & 44 & 832 & 71 & 36 & 333 \\
\hline
\end{array}
\]

Note: SD = standard deviation.
Source: Calculations based on data from the 2011 Preference Parameters Study.
we observe is that while the OLS results show a negative and significant effect of serving as the main caregiver on caregivers’ planned retirement age for both the full and female samples, the IV results show such an effect only for the female sample. Nevertheless, this is unlikely to change the key findings of this paper that the adverse effect of caregiving on caregivers’ retirement plans is found only when caregivers serve as the main caregiver and that the adverse effect is found to be greater for women than for men.

6.3 | Main results

Table 2 shows the OLS regression results for the determinants of respondents’ planned retirement age for the full and female samples. Model (1) examines the effect of providing at least some parental care on respondents’ retirement plans while model (2) looks at the effect of serving as the main caregiver.

We find that providing parental care of any intensity does not have a significant effect on respondents’ retirement plans for both the full and female samples. However, once we take into account the degree of respondents’ caregiving intensity by using the main caregiver variable instead, we find a significant effect of caregiving on respondents’ retirement. This is consistent with previous findings, which commonly find a more severe adverse employment effect of caregiving for caregivers with greater caregiving responsibilities than for those with less (e.g. Carmichael & Charles, 2003; Heitmueller, 2007; Kotsadam, 2012; Lilly et al., 2010; Nguyen & Connelly, 2014). The planned retirement age of respondents who serve as the main caregiver is estimated to be, ceteris paribus, 1.2 years and 1.3 years earlier than that of those without such responsibilities for the full and female samples, respectively.

As far as the income effect of caregiving is concerned, the insignificant coefficient of the formal care usage variable for both the full and female samples suggests that the income effect of caregiving is relatively limited in the case of Japan. This suggests that the financial burden of formal care usage is limited either because formal care services are available at reasonable cost under the LTCI program in Japan and/or because the financial burden is mainly borne by care recipients themselves.

Note that the use of formal care services is likely to have another effect, which is to attenuate or eliminate the negative effect of caregiving on caregivers’ retirement plans. To examine this possibility, we try interacting the caregiving variables with the formal care usage variable. It should, however, be noted that our formal care usage variable equals one if formal care services play the main caregiving role for at least one of the respondent’s parents or parents-in-law. Hence, in the case of model (2) where the main caregiver variable is used, the interaction term indicates a situation where the respondent takes primary responsibility for providing care to at least one of his/her parents or parents-in-law while formal care services play the main caregiving role for at least one of the rest of his/her parents or parents-in-law (i.e., there is more than one person in need of care in the household).

Table 3 shows that the coefficient on the interaction term between the caregiver variable and the formal care usage variable is found not to be statistically significant (model 1) while the coefficient on the interaction term between the main caregiver variable and the formal care usage variable is positive and significant (model 2) for both the full and female samples. In the case of the full sample, the estimates indicate that serving as the main caregiver to at least one of his/her parents or parents-in-law reduces, ceteris paribus, the planned retirement age of the respondent by 1.5 years. However, if formal care services take primary responsibility for parental care for at least one of the rest of his/her parents or parents-in-law, serving as the main caregiver increases his/her
### Table 2: OLS regression results for the determinants of planned retirement age

|                          | Full sample |        |        | Female sample |        |        |
|--------------------------|-------------|--------|--------|---------------|--------|--------|
|                          | (1)         | (2)    | (1)    | (2)           |        |        |
| Caregiver                | –0.686      | [0.427]| –0.703 | [0.615]       |        |        |
| Main caregiver           | –1.162**    | [0.577]|        | –1.333**      | [0.649]|        |
| Use of formal care services | –0.126      | [0.451]| –0.132 | [0.424]       | 0.369  | [0.764]| –0.007 | [0.742]|
| Age                      | 0.220***    | [0.029]| 0.221***| [0.030]       | 0.218***| [0.053]| 0.228***| [0.053]|
| Female                   | –2.674***   | [0.399]| –2.612***| [0.407]      |        |        |
| Marital status           |             |        |        |               |        |        |
| (Married)                |             |        |        |               |        |        |
| Divorced/Widowed         | 1.443**     | [0.601]| 1.492**| [0.602]       | 2.070**| [0.805]| 2.120***| [0.807]|
| Never married            | 1.123*      | [0.636]| 1.172* | [0.629]       | 1.146  | [0.941]| 1.206   | [0.922]|
| No. of children aged 18 or younger | 0.235      | [0.206]| 0.249  | [0.205]       | 0.196  | [0.320]| 0.220   | [0.321]|
| Education                |             |        |        |               |        |        |
| (Junior high school)     |             |        |        |               |        |        |
| High school              | 0.043       | [0.601]| 0.065  | [0.598]       | –1.143*| [0.852]| –1.318  | [0.843]|
| Junior college           | –0.288      | [0.752]| –0.291 | [0.752]       | –1.767*| [0.960]| –1.671* | [0.951]|
| University or above      | –0.111      | [0.638]| –0.093 | [0.636]       | –0.905 | [1.043]| –0.824  | [1.040]|
| Poor health              | –0.419      | [0.385]| –0.456 | [0.384]       | –0.154 | [0.660]| –0.152  | [0.661]|
| Employment               |             |        |        |               |        |        |
| (Self-employed)          |             |        |        |               |        |        |
| Regular job              | –4.934***   | [0.528]| –4.945***| [0.527]      | –4.767***| [0.876]| –4.807***| [0.868]|
| Irregular job            | –3.949***   | [0.543]| –3.938***| [0.544]      | –4.155***| [0.806]| –4.142***| [0.803]|
| Log of hourly wage       | 0.114       | [0.400]| 0.132  | [0.399]       | 0.892  | [0.682]| 0.877   | [0.682]|
| Log of other household income | –0.666***  | [0.197]| –0.674***| [0.197]      | –0.608*| [0.315]| –0.650**| [0.316]|
| Homeownership            | –0.271      | [0.599]| –0.281 | [0.602]       | 0.295  | [0.903]| 0.307   | [0.907]|
| Expected receipt of inheritances | –0.500   | [0.305]| –0.492 | [0.305]       | –0.582 | [0.488]| –0.544  | [0.489]|
| Pensions                 | –1.561**    | [0.658]| –1.547**| [0.657]      | –0.892 | [1.105]| –0.808  | [1.096]|
| Wealth quintiles         |             |        |        |               |        |        |
| (1st quintile)           |             |        |        |               |        |        |
| 2nd quintile             | –0.480      | [0.493]| –0.465 | [0.493]       | –1.108 | [0.820]| –1.115  | [0.819]|
| 3rd quintile             | –1.118**    | [0.466]| –1.113**| [0.467]      | –0.814 | [0.877]| –0.842  | [0.878]|

(Continues)
planned retirement age by 2.6 years instead. Similar results are obtained for the female sample, but the adverse effect of caregiving on caregivers’ retirement plans is larger and the attenuation effect of formal care usage on the negative effect of caregiving is smaller than for the full sample. These results suggest that formal care services attenuate the need for adult children to retire earlier owing to caregiving commitments.

However, given that the positive effect of formal care usage more than offsets the negative effect of serving as the main caregiver on caregivers’ retirement plans, the use of formal care

| TABLE 2 (Continued) | Full sample | Female sample |
|----------------------|-------------|---------------|
|                      | (1)         | (2)           | (1)         | (2)           |
| 4th quintile         | –1.188**    | [0.488]       | –1.201**    | [0.488]       |
| 5th quintile         | –1.135**    | [0.524]       | –1.158**    | [0.526]       |
| Gender roles         | –0.803*     | [0.422]       | –0.816*     | [0.425]       |
| Low time preference  | 0.338       | [0.0278]      | 0.336       | [0.0277]      |
| Risk preference      | 0.089       | [0.081]       | 0.089       | [0.081]       |
| Residing in a major city | 1.262*** | [0.351]       | 1.278***    | [0.351]       |
| Constant             | 56.69***    | [3.653]       | 56.46***    | [3.655]       |
| No. of observations  | 970         | 970           | 404         | 404           |
| $R^2$                | 0.351       | 0.351         | 0.278       | 0.281         |

Note: ***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Robust standard errors are in brackets. Regional dummies are included in all regressions.

Source: Estimation based on data from the 2011 Preference Parameters Study.

| TABLE 3 OLS regression results for the determinants of planned retirement age (role of formal care services) | Full sample | Female sample |
|----------------------------------------------------------------------------------------------------------------|-------------|---------------|
|                                                                  | (1)         | (2)           | (1)         | (2)           |
| Caregiver/Main caregiver                                        | –0.686      | [0.427]       | –1.162**    | [0.577]       |
|                                                                | –0.741      | [0.515]       | –1.461**    | [0.582]       |
| Caregiver/Main caregiver × Use of formal care services          | 0.220       | [0.896]       | 4.056**     | [1.642]       |
|                                                                |             |               | 0.734       | [1.432]       |
| Use of formal care services                                    | 0.126       | [0.451]       | –0.132      | [0.424]       |
|                                                                | 0.042       | [0.589]       | –0.265      | [0.427]       |
| No. of observations                                             | 970         | 970           | 970         | 970           |
| $R^2$                                                            | 0.351       | 0.351         | 0.351       | 0.353         |

Note: ***, **, * denote statistical significance at the 5% and 10% levels, respectively. Robust standard errors are in brackets. The set of explanatory variables listed in Table 1 as well as regional dummies are also included in the regressions.

Source: Estimation based on data from the 2011 Preference Parameters Study.
services seems to not only attenuate the adverse effect on retirement of taking primary responsibility for parental care but also to cause additional effects, namely the income effect of caregiving. The results thus suggest that it may be costly to have more than one parent or one parent-in-law in need of care in the household and that this may require adult children to delay their retirement in order to meet the financial cost of formal care services. In other words, the positive coefficient on the interaction term is likely to represent the combined effect of both the income effect as well as the effect of offsetting the negative effect of being the main caregiver on caregivers’ retirement plans.

6.4 | Caregiving effect and employment status

In the case of Japan, the adverse economic consequences of retiring earlier owing to caregiving commitments is likely to be greater for regular workers than for irregular workers because of the limited job re-employment opportunities for regular employment in this country as well as the Japanese pension system, as described in Section 3. We therefore examine whether the adverse effect of serving as the main caregiver remains significant even if we remove the self-employed or irregular workers from the estimation sample. To investigate this, we restrict our full and female samples to (i) wage earners only (regular and irregular workers only, excluding the self-employed) and (ii) regular workers only. The relevant results are reported in Table 4.27

Once we restrict our sample to wage earners or regular workers only, the effect of serving as the main caregiver on caregivers’ retirement plans becomes insignificant in the case of the full sample. In the case of the female sample, by contrast, the negative effect of serving as the main caregiver on caregivers’ retirement plans is still observed even if we restrict our sample to wage earners only, but it becomes insignificant if we further restrict our sample to regular workers only. These results imply that the adverse effect of caregiving on caregivers’ retirement plans is mainly observed for the self-employed in the case of men and for the self-employed and irregular workers in the case of women. Since working as a self-employed worker tends to involve greater responsibilities and longer working hours than regular employment, it might be more difficult for adult children to combine their work with primary caregiving responsibilities if they are self-employed.

Nevertheless, since more than half of the female sample is engaged in irregular employment (see Table 1), the negative and significant effect of caregiving on intensive caregivers’ retirement plans becomes statistically significant for the female sample. The relevant results are reported in Table 4.27.

| TABLE 4 | OLS regression results for the determinants of planned retirement age (wage earners only) |
| --- | --- | --- | --- | --- |
|  | Full sample |  | Female sample |  |
|  | Regular and irregular workers only | Regular workers only | Regular and irregular workers only | Regular workers only |
| Main caregivers | −0.904 | −0.765 | −1.351* | −0.217 |
|  | [0.605] | [0.922] | [0.720] | [1.179] |
| No. of observations | 808 | 538 | 333 | 124 |
| $R^2$ | 0.260 | 0.201 | 0.243 | 0.328 |

Note: *denotes statistical significance at the 10% level. Robust standard errors are in brackets. The set of explanatory variables listed in Table 1 as well as regional dummies are also included in the regressions.

Source. Estimation based on data from the 2011 Preference Parameters Study.
plans for the self-employed and irregular workers in the case of women remains cause for concern. In addition, the fact that the adverse effect of caregiving on adult children’s retirement was found to be greater for women than for men suggests that caregiving may put disproportionately more women at risk of having to retire earlier in order to meet their caregiving responsibilities, which could also put them at risk of living in poverty during their later years.

7 | CONCLUSIONS

In this paper, we examined the effect of providing parental care on adult children’s retirement plans using micro data from Japan. Our regression results show no significant effect of caregiving on family caregivers’ planned retirement age if we do not take into account caregiving intensity. However, once we account for the intensity of caregiving, we find that serving as the main caregiver has a negative and significant effect on adult children’s retirement plans. A comparison of the estimates based on the full sample with those based on the female sample indicates that the adverse effect of caregiving tends to be greater for female caregivers than for their male counterparts. Finally, the negative effect of caregiving on caregivers’ retirement timing is found to be relatively limited for regular and irregular workers in the case of men and for regular workers in the case of women.

Our finding that caregiving has an adverse effect on caregivers’ retirement plans only when adult children serve as the main caregiver seems to suggest that, if ensuring access to formal care services can allow family members to escape from taking primary responsibility for providing parental care, it can help adult children to reconcile their paid work with caregiving responsibilities, thereby alleviating the adverse effect of caregiving on their retirement plans. Our regression results indeed indicate that formal care services could help alleviate or eliminate the negative effect of serving as the main caregiver on adult children’s retirement plans.

Moreover, our regression results indicate that the income effect of caregiving on adult children’s retirement is relatively limited in most cases. This may be partly due to the existence of the LTCI program in Japan, which allows those certified as requiring care to use formal care services at relatively low cost, or to the fact that the cost of formal care services may be borne by elderly parents themselves and not by their children. Nevertheless, we also find some evidence for the possibility that the financial burden of formal care services may require caregivers to postpone retirement in some cases, for instance, when there is more than one person in need of care in the household.

Our analysis is certainly not without its caveats. Data limitations did not allow us to control fully for individual unobserved time-invariant characteristics. Conducting a more rigorous analysis using longitudinal data to take account of such effects is required to confirm our findings. Moreover, we have examined the employment effect of caregiving only at the extensive margin, but analyzing it at the intensive margin is equally important as people may reduce their workload before exiting from the labor market as part of their transition into retirement.

Despite these limitations, this paper is one of the first to examine the effect of providing parental care on adult children’s retirement plans in Japan and generated some key findings that have important policy implications. Our finding that intensive caregivers are likely to plan to retire earlier than those without such responsibilities suggests that caregiving responsibilities are likely to impose long-term financial costs on family caregivers in terms of the loss in current earnings as well as reduced pension entitlements. This in turn implies that relying on family members to provide elderly care can pose a serious challenge to the ongoing efforts of the government to promote
the labor supply of women and the elderly as a way of addressing the shrinkage of the working-age population in Japan in addition to possibly reducing income tax revenue as well as contributions to public pension funds.

It is therefore critical to ensure that family members have ways to reconcile their paid work with caregiving requirements, for instance, through the availability of formal care services as well as creating flexible working environments. In terms of the latter, efforts are being made to make working environments flexible enough for workers to combine their paid work with caregiving responsibilities by amending the Child Care and Family Care Leave Act, as described in Section 3. While the 2016 amendment expanded eligibility for taking caregiver leave for irregular workers, it remains restrictive for many irregular workers. Our finding that caregiving has a negative effect on caregivers’ retirement timing for irregular workers in the case of women suggests that further efforts are needed to ensure that working environments become flexible enough for irregular workers as well.

The challenge of addressing the increasing demand for elderly care is faced not only by advanced economies but also increasingly by developing countries in Asia where population aging is rapidly progressing. Most of these countries still do not have LTCI programs and rely on family members to address this challenge. However, the findings of this paper highlighted the importance of measures such as the availability of formal care services at reasonable cost and flexible working arrangements as a way of preventing family members from retiring earlier to meet their caregiving responsibilities. Given that earlier retirement could increase family caregivers’ risk of falling into poverty in their own old age and that old-age support programs are still underdeveloped in developing Asia, it is critical for governments in the region to recognize and address the increasing burden of elderly care as they prepare for the advent of an aged society.

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ENDNOTES

1 Throughout this paper, the term “caregivers” refers to those who provide informal elderly care, not to care workers who provide care as professionals.

2 There are currently two levels for those who require support only (Support Levels 1 and 2) and five levels for those who require long-term care (Care Levels 1 to 5). This support/care level determines the amount of benefits that each person is entitled to receive.

3 See Ikeda (2017) for more details on the Child Care and Family Care Leave Act and amendments thereto.

4 In the case of government employees, they participate in the Mutual Aid Pension Plan instead.

5 Irregular employees include those who work as a part-time worker, temporary worker, fixed-term worker, or dispatched worker from a temporary agency. These irregular jobs tend to be low paid and insecure in comparison with regular jobs in Japan.

6 On average, only about 52 percent of irregular employees were found to have participated in the Employees’ Pension Plan in 2014 according to data from the Ministry of Health, Labour and Welfare (http://www.mhlw.go.jp/toukei/tirou/roudou/koyou/keitai/14/index.html). However, the Employees’ Pension Plan was expanded to part-time workers in October 2016 as part of the Comprehensive Reform of Social Security and Tax, which was enacted in 2012.

7 See Bauer and Spousa-Poza (2015) and Lilly, Laporte, and Coyte (2007) for a comprehensive survey of the literature on the impact of caregiving on caregivers’ employment.

8 Only the 2011 and 2013 waves include questions on parental care provision, and only the 2011 wave collects information on the intensity of caregiving.

9 We acknowledge the reduced size of the sample, but the t-test results show that the values of the dependent variable (i.e., the planned retirement age of respondents) as well as of the key explanatory variables such as the caregiving variables and income- and wealth-related variables are not statistically different between the original sample before removing observations with missing information and the estimation sample used for this analysis.

10 It may be possible that people, for instance regular workers vs. irregular workers, have a different concept of “retirement age.” However, given that the survey simply asks respondents until what age they would like to work, instead of using the word “retirement,” this may be less of a concern for the current analysis. Nevertheless, we also try dropping the self-employed and irregular workers from the sample in some variants.

11 Note that those who are in a common-law marriage are classified as being married in this analysis. However, it is possible that some unmarried people, particularly those who are widowed, may provide care to the parents of their late spouses. Unfortunately, we do not have information on parental care provision in those cases and could not take them into account in this analysis.

12 Unfortunately, given the way the question was phrased, we cannot separate out the respondent’s role from that of his/her spouse in parental care provision in the case of married respondents.

13 Although some previous studies measure the intensity of caregiving in terms of a dummy variable based on an arbitrary threshold of the number of hours spent on caregiving (e.g., 20 hours per week) (e.g., Carmichael & Charles, 1998; Heitmueller & Inglis, 2007; Van Houtven et al., 2013), there is no consensus on what the level of this threshold should be. Others instead use a simpler variable such as the one used here based on self-identification as the main caregiver, which can be much more informative (e.g., Carmichael & Charles, 2003; Lilly et al., 2010; Nguyen & Connelly, 2014).

14 According to the survey on the cost of at-home care conducted by the Institute for Research on Household Economics in 2016, people, on average, spend about 16,000 Japanese yen (about U.S.$140) per month for formal care services (the out-of-pocket portion) and about 34,000 Japanese yen (about U.S.$300) per month for caregiving-related expenses (such as the cost of diapers, medical expenses, etc.) other than formal care services (Tanaka, 2017). This is just the average and the cost is likely to be greater as the level of disability increases. In addition, the cost of institutional care is likely to be much greater than these figures for the cost of at-home care.

15 We define “brothers-in-law” to include only the brothers of respondents’ spouses, not the husbands of respondents’ own sisters, throughout this paper.
These institutions include facilities covered by public aid providing long-term care to the elderly, long-term care health facilities, sanatorium-type medical care facilities for the elderly requiring care, facilities that provide communal daily long-term care for dementia patients (group homes), community-based specified facilities that provide daily life long-term care, and specified facilities that provide daily life long-term care. We use data from the 2010 “Survey of institutions and establishments for long-term care” conducted by the Ministry of Health, Labour and Welfare, which are taken from the Ministry’s website (http://www.mhlw.go.jp/toukei/saikin/hw/kaigo/service10/index.html).

Note that this employment status variable is based on information on respondents’ current employment status. It is therefore possible that some irregular workers may have already retired from their regular jobs and switched to irregular jobs prior to the survey. Unfortunately, given the limited information on respondents’ employment histories contained in the data, it is not possible to identify such respondents.

This includes business income for those who are self-employed.

To examine whether the effect of caregiving on caregivers’ retirement timing differs depending on the life stage of caregivers, we tried interacting the caregiving variables with age group dummies. However, the coefficients on these interaction terms were not significant in either the full or female sample.

This is defined as the highest level of education completed by respondents and is expressed as a categorical variable, as shown in Table 1.

While health is found to be an important determinant of the retirement decision, retirement is also expected to affect health (e.g., Coe & Zamarro, 2011), causing a possible endogeneity problem. Using planned retirement age as our dependent variable, rather than actual retirement status or age, should help avoid such concerns (Hall & Johnson, 1980).

See the working paper version of this paper (Niimi, 2017) for a detailed description of how these variables are constructed.

We extract information on pensions from the 2012 wave of the “Preference parameters study” as such information was not available in the 2011 wave.

The reason for the relatively small share of female observations in our sample (about 42 percent of the full sample) is due to the fact that we include only those who are employed in our estimation sample, as described earlier, and the employment rate for women is lower than that for men.

The key regression results of the IV models as well as the specification test results are shown in the Appendix. The full results are available from the author upon request.

The rest of the regression results are very close to those reported in Table 2 in terms of the sign, significance, and size of the coefficients. The full regression results are available from the author upon request.

After the 2016 amendment that came into force on January 1, 2017, fixed-term employees became eligible to apply for caregiver leave if they have been with the company for at least one year and it is not clearly anticipated that their contract will expire and not be renewed on or before the day falling 6 months after the 93rd day (the maximum duration of long-term caregiver leave).

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## APPENDIX: IV ESTIMATION RESULTS

**TABLE A1** First-stage binary (probit) model estimation (for the determinants of providing parental care, serving as the main caregiver, and the use of formal care services)

|                        | Full sample |                       | Female sample |                       |
|------------------------|-------------|------------------------|---------------|------------------------|
|                        | Caregivers  | Main caregivers | Use of formal care services | Caregivers  | Main caregivers | Use of formal care services |
| Poor parental health   | 0.422***    | 0.132***              | 0.346***       | 0.529***    | 0.225***              | 0.338*** |
|                        | [0.038]     | [0.025]               | [0.037]        | [0.057]     | [0.043]               | [0.048] |
| Number of brothers and brothers-in-law | –0.019**   | –0.015**             | –0.020*        | [0.008]     | [0.006]               | [0.012] |
| Being the eldest child | 0.060**     |                       |               | 0.071**     |                       |       |
|                        | [0.028]     |                       |               | [0.027]     |                       |       |
| Both parents and/or parents-in-law alive | –0.039*    | –0.043***             | –0.036*        | –0.101***   | –0.128***             | –0.071** |
|                        | [0.022]     | [0.014]               | [0.020]        | [0.036]     | [0.032]               | [0.030] |
| Availability of institutional care | 0.053**     |                       |               | 0.054**     |                       |       |
| Jointly significant at 1% | ✔           | ✔                     | ✔             | ✔           | ✔                     | ✔       |
| No. of observations    | 970         | 970                   | 970           | 404         | 404                   | 404     |
| Pseudo $R^2$            | 0.381       | 0.448                 | 0.380         | 0.520       | 0.504                 | 0.511   |

*Note:* The estimated results are reported in terms of average marginal effects. ***, **, * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Standard errors are in brackets. The set of explanatory variables listed in Table 1 as well as regional dummies are also included in the regressions.

*Source:* Estimation based on data from the 2011 Preference Parameters Study.
|                  | Full sample          |                      |                      | Female sample          |                      |                      |
|------------------|----------------------|----------------------|----------------------|------------------------|----------------------|----------------------|
|                  | IV (1)               | IV (2)               |                      | IV (1)                 | IV (2)               |                      |
|                  | Caregiver            | Use of formal care services | Main caregiver        | Use of formal care services | Caregiver            | Use of formal care services | Main caregiver | Use of formal care services |
| Predicted probability of being caregivers | 1.104*** | –0.024 |                      | 0.952*** | 0.004 |                      | 1.040*** | 0.059 |                      | 1.021*** | —1.182 |                      | 1.011*** | 0.013 |                      | 0.889*** | —0.102 | 1.031*** |
|                  | [0.185]              | [0.183]              |                      | [0.151]              | [0.165]              |                      | [0.136]              | [0.133]              |                      | [0.141]              | [0.135]              |                      | [0.099]              | [0.117]              |                      |
| Predicted probability of being main caregivers | –0.117 | 1.040*** | –0.013 | 1.011*** | –0.042 | 0.889*** | –0.102 | 1.031*** |
|                  | [0.223]              | [0.230]              | [0.055]              | [0.108]              | [0.195]              | [0.180]              | [0.099]              | [0.117]              |
| No. of observations | 970                 | 970                 | 970                 | 970                 | 404                 | 404                 | 404                 | 404                 |
| Adjusted $R^2$   | 0.359                | 0.304                | 0.261                | 0.304                | 0.502                | 0.376                | 0.357                | 0.382                |
| Instrumental variable strength ($F$-statistics) | 102.07*** | 64.92*** | 24.22*** | 64.51*** | 84.49*** | 35.98*** | 28.78*** | 41.82*** |

*Note:* ***denotes statistical significance at the 1% level. Robust standard errors are in brackets. The set of explanatory variables listed in Table 1 as well as regional dummies are also included in the regressions.

*Source:* Estimation based on data from the 2011 Preference Parameters Study.
### TABLE A3  Second-stage results for IV estimation (2SLS) (for the determinants of planned retirement age)

|                  | Full sample |            | Female sample |            |
|------------------|-------------|------------|---------------|------------|
|                  | IV (1)      | IV (2)     | IV (1)        | IV (2)     |
| Caregiver        | –1.003      | –0.255     | –2.207*       |            |
|                  | [1.537]     | [1.296]    | [1.245]       |            |
| Main caregiver   | –0.947      | –2.207*    | –0.523        | 0.017      |
|                  | [1.428]     | [1.245]    | [1.875]       | [1.252]    |
| Use of formal care services | 0.802 | 0.011 | –0.523 | 0.017 |
|                  | [1.850]     | [0.914]    | [1.875]       | [1.252]    |
| No. of observations | 970        | 970        | 404           | 404        |
| Wald \(\chi^2\)  | 472.24      | 474.34     | 165.34        | 166.09     |
| Prob > \(\chi^2\) | 0.000      | 0.000      | 0.000         | 0.000      |
| \(R^2\)          | 0.350       | 0.351      | 0.276         | 0.279      |
| Exogeneity test (\(\chi^2\) (\(p\) values))\(^a\) | 0.312 (0.856) | 0.151 (0.927) | 0.329 (0.848) | 0.928 (0.629) |

*Note:* *denotes statistical significance at the 10% level. Robust standard errors are in brackets. The set of explanatory variables listed in Table 1 as well as regional dummies are also included in the regressions. *Wooldridge’s (1995) score test

**Source.** Estimation based on data from the 2011 Preference Parameters Study.