Does Providing Informal Elderly Care Hasten Retirement? Evidence from Japan

Yoko Niimi
Asian Growth Research Institute

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March 2017

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 to address 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.

Keywords: Aging, caregiving, elderly care, informal care, Japan, labor supply, long-term care, parental care, retirement

JEL classification codes: D10, J14, J26

1. Introduction

Japan has experienced an unprecedented speed of population aging over the past few decades. The share of the population aged 65 and above in Japan (9.9%) was the lowest among the then member countries of the Organisation for Economic Co-operation and Development (OECD) until as recently as 1984, but it had become the highest (20.2%) by 2005.[3] It is estimated to be 27.5% in 2016 and expected to reach 30% by 2024 (National Institute of Population and Social Security Research, 2012). Moreover, the aged dependency ratio (the ratio of the elderly population to the working-age population) increased even more rapidly from 14.6% in 1984 to 42.4% in 2014 in Japan.[4] Improvements in longevity as well as a significant decline in the fertility rate over the years contributed to this rapid population aging in Japan.

Combined with changes in family structure with a downward trend in the parent-child co-residence rate,[5] 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.[6] This poses significant challenges to Japan where elderly care has traditionally taken place within the family setting. While Japan introduced a mandatory long-term care insurance (LTCI) program in 2000 to promote the greater independence of the elderly in their daily lives and to reduce the burden of elderly care on family members, some studies show that adult children continue to be the most common source of elderly care in Japan (e.g., Hanaoka and Norton, 2008; Long, Campbell and Nishimura, 2009).

One of the important costs of the increasing demand for elderly care is a possible reduction in the labor supply of family caregivers. Caregiving can, in principle, affect

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[3] OECD data (https://data.oecd.org/pop/elderly-population.htm, accessed on September 24, 2015).

[4] The data on aged dependency ratios are from the Statistics Bureau, the Ministry of Internal Affairs and Communications (http://www.stat.go.jp/data/jinsui/2.htm#annual, accessed on July 29, 2016).

[5] The share of elderly persons who live with their children (married and unmarried) decreased by more than 40% from 69.0% to 40.6% between 1980 and 2014 in Japan (Niimi, 2016).

[6] Throughout this paper, "caregivers" refer to those who provide informal elderly care, not to care workers who provide care as professional.

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 and 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 as well as lump-sum severance payments that are commonly paid upon retirement in the case of Japan. As a result, earlier retirement due to caregiving commitments is likely to have long-term repercussions on the livelihood of family caregivers. Such financial consequences are likely to be greater for women than for men as women are more likely to be the bearer of the burden of elderly care and the number of their working years tends to be shorter than that of men's as women tend to have more fragmented employment histories due to their other family responsibilities.

If elderly care provision increases the likelihood of family caregivers' early retirement, this could also cause serious conflicts with the government's policy of promoting the labor market participation of women as well as elderly persons in response to the shrinkage of the working-age population in Japan. It is therefore critical for policymakers to gauge the effect of elderly care provision on family caregivers' retirement decisions, and if caregiving indeed has a negative effect, to formulate appropriate measures for preventing family members from having to take early retirement in order to accommodate caregiving requirements.

Japan is an interesting case to study as the increasing use of formal care services since the launch of the LTCI program in 2000 provides an opportunity to examine whether the provision of formal care services helps alleviate or eliminate any adverse effects of caregiving on family caregivers' retirement plans. Moreover, it would be interesting to see whether or not previous findings obtained for other advanced economies hold in the case of Japan where filial obligation remains relatively strong and caring for elderly parents has therefore traditionally taken place within the family setting. Given that many Asian countries that share a common culture with Japan are expected to experience a significant aging of their populations over the next few decades, analyzing the Japanese case can also shed light on important issues that Asian countries need to take into account when preparing themselves for population aging and the advent of an aging society.

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. This paper examines specifically the effect of providing care to elderly parents on the planned retirement age of adult children in Japan. Such an analysis will help policymakers become better informed about the potential impact of caregiving on family caregivers' retirement decisions as well as on their retirement security. While there has been a growing literature that analyzes the effect of providing elderly care on family caregivers' labor market outcomes, empirical evidence on the effect of caregiving on their retirement remains limited not only in Japan but also in other parts of the world. This paper attempts to fill this gap in the literature using micro data from the "Preference Parameters Study" of Osaka University, a nationally representative survey conducted in Japan.

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 while Section 3 reviews the relevant literature. Section 4 describes the data and estimation strategy. Estimation results are presented in Section 5. Section 6 summarizes the main findings and discusses some policy implications.

2. Conceptual Framework

There have been an increasing number of empirical studies that examine the employment effects of elderly care provision in recent decades. Empirical analyses are based mainly on the idea that the utility maximization decision in the presence of care needs is in principle very similar to the standard labor market participation decision where labor market participation is observed if and only if the offered wage exceeds the reservation wage (Heitmueller and 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 and Charles, 1998, 2003). With time being scarce, caregiving responsibilities will 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).

In addition to these two main effects, there are additional effects of caregiving on the labor supply of family caregivers, namely respite and discrimination effects (Carmichael and Charles, 1998, 2003). The respite effect exists when family caregivers desire to take a break from caregiving responsibilities through their engagement in employment, provided that the hours and commitments are compatible with caregiving demands. The respite effect is likely to reduce the reservation wage and counteract the substitution effect with regard to the decision on labor market participation, though possibly not with regard to the decision on the number of hours of work (Carmichael and Charles, 1998). As for the discrimination effect, family caregivers may experience discrimination in terms of wages and/or promotion because of their higher flexibility requirements and lower reliability due to caregiving commitments (e.g., higher absence and sickness rates) and thus reduce their labor supply (Carmichael and Charles, 1998; Heitmueller and Inglis, 2007). Even without such discrimination, family caregivers themselves might prefer jobs with less demanding responsibilities and more flexible working arrangements, which enable them to combine work with caregiving responsibilities (Carmichael and Charles, 1998).

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. Moreover, the overall direction of the effect will depend on the degree of caregiving intensity (Carmichael and Charles, 1998, 2003), how strong caregivers are attached to the labor market (Carmichael and Charles, 2003), and the availability of formal care services (Kotsadam, 2012; Michaud, Heitmueller and Nazarov, 2010).

In the case of Japan, the LTCI program introduced in 2000 has universal coverage and everyone aged 65 and 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. The Japanese LTCI program does not provide cash allowances to the elderly to support their informal caregivers, but it covers the cost of services purchased from the formal sector once they are certified as requiring care. A professional care manager provides a personal care plan and care recipients can choose what services to receive and from which provider to receive these services subject to a 10% co-payment (Tsutsui and Muramatsu, 2005).

Reflecting the Japanese context, the key hypotheses that we will test in this paper are as follows: (i) adult children who provide care to their elderly parents and/or parents-in-law plan to retire at a younger age than those without such responsibilities; (ii) given that women are traditionally weakly attached to the labor market, the negative effect of caregiving on caregivers' retirement is greater for female caregivers than their male counterparts; (iii) the adverse employment effect of caregiving is greater for caregivers who play the main caregiving role than for those with less caregiving responsibilities; (iv) given the availability of formal care services under the LTCI program, the income effect of caregiving is limited in the case of Japan; and (v) the usage of formal care services by

care recipients helps alleviate or eliminate the negative effect of caregiving on their adult children's retirement.

3. Literature Review

There has been a growing literature that examines the employment effects of providing elderly care in recent decades.[7] The results from empirical studies have been somewhat mixed, but more consensus has been reached on the adverse effect of caregiving on labor supply (particularly in the case of women) for intensive caregivers or co-residential caregivers (e.g., Casado-Marín *et al*., 2011; Ettner, 1995; Heitmueller, 2007; Kotsadam, 2012; Lilly, Laporte and Coyte, 2010; Michaud, Heitmueller and Nazarov, 2010; Nguyen and Connelly 2014). Similar results have been obtained with respect to the effect of caregiving on wages (e.g., Carmichael and Charles, 1998, 2003; Heitmueller and Inglis, 2007). These findings suggest that caregivers are heterogeneous in both their caregiving inputs and associated labor market responses, thereby underscoring the importance of controlling for caregiving intensity when analyzing the employment effects of caregiving (Lilly, Laporte and Coyte, 2010).

Despite the growing literature on the employment effects of caregiving over the last few decades, there remain some gaps in the literature, particularly in terms of geographical coverage outside the United States (US) and European countries as well as empirical work on the effect of caregiving on family caregivers' retirement.

As far as the geographical coverage of the literature is concerned, most studies have so far been based largely on data on the US or European countries, and the number of studies that look at the issue outside these countries remains relatively limited (e.g., Berecki-Gisolf *et al.* (2008), Bittman, Hill and Thomas (2007), Leigh (2010), and Nguyen and Connelly (2014) on Australia; Schneider *et al*. (2013) on Austria; Lilly, Laporte and Coyte (2010) on Canada; and Do (2008) on South Korea). Japan is no exception and there is a

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[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.

paucity of empirical evidence on Japan. Sakai and Sato (2007) find, based on panel data analysis, 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 non-regular 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.

Shimizutani, Suzuki and Noguchi (2008) similarly assess the effect of the introduction of the LTCI program on female labor market participation. Their difference-in-difference estimates suggest that the introduction of the LTCI program had no effect in 2001 but had a large and positive effect in 2002 at both the extensive and intensive margins. In addition, Sugawara and Nakamura (2004) find that the LTCI program alleviates the negative effect of caregiving requirements (measured by the presence of an elder in need of care in the household) on the labor supply of women by comparing the estimated effects of caregiving using repeated cross-sectional data for 1998, 2004, and 2010.

Yamada and Shimizutani (2015) find an adverse effect of caregiving on the labor market outcomes of main caregivers at both the extensive and intensive margins by estimating an instrumental variable (IV) model using cross-sectional data. The negative effect of caregiving was found to be greater for female caregivers than for male caregivers. Their analysis also shows that the LTCI program helps mitigate the negative impact of caregiving on main caregivers' labor supply but only to a limited extent. On the other hand, Kan and Kajitani (2014) find that while the introduction of the LTCI program helps reduce the hours of caregiving among highly educated women, the reduction does not lead to an increase in their working hours, according to their difference-in-difference estimates. Finally, Oshio and Usui (2016) 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) who examine the labor market effect of caregiving requirements at the extensive margin among those aged 50 and above. Even outside Japan, there has been limited work that investigates this issue with few exceptions. Dentinger and Clarkberg (2002), for instance, examine how caregiving affects people's transition to retirement. Using US data, they find that the odds of retiring are five times higher for women caring for their husbands than non-caregiving women but find little evidence that caring for elderly parents makes caregiving children retire earlier. On the other hand, Van Houtven, Coe and Skira (2013) find for the US that female chore caregivers are more likely to be retired while a negative effect of providing personal care is found at the extensive margin in the case of paid employment among male caregivers.

By estimating discrete-time hazard models based on panel data for 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% 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 *et al*. (2013) also examine the employment effects of caregiving in Austria using data on caregivers' employment plans within the next two years. Their analysis shows that the intention of exiting the labor market appears to be 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. However, providing care to an elderly in need of supervision is found to make female workers less likely to exit the labor market, lending support to the argument that work can function as a respite from the burden of caregiving. In addition, Schneider *et al*. (2013) find that

flexible working arrangements heighten the job and labor market attachment of female workers with caregiving responsibilities but not for their male counterparts.

The main aim of this paper is to fill these gaps in the literature by analyzing the effect of caregiving on caregivers' retirement in the case of Japan for virtually the first time to the best of the author's knowledge. It takes a similar approach to that of Schneider *et al.* (2013) and examines the effect of caregiving on family caregivers' retirement intensions or more specifically on their planned retirement age. While there is a relatively large body of empirical literature on the ex-post analysis of the determinants of retirement, less research has been conducted on retirement planning (Riedel, Hofer and 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) also note that employees' turnover intentions have been found to be a good proxy for actual turnover behavior in the literature (e.g. Böckerman and Ilmakunnas, 2009; Steel and Ovalle, 1984).

4. Data and Estimation Strategy

4.1 Data

The empirical analysis will be conducted using data from the "Preference Parameters Study" of Osaka University. This survey was conducted annually in Japan during the 2003-2013 period by the 21st Century Center of Excellence (COE) Program "Behavioral Macrodynamics Based on Surveys and Experiments" and the Global COE Project "Human Behavior and Socioeconomic Dynamics" of Osaka University. A sample of individuals aged 20-69 was drawn to be nationally representative using two-stage stratified random sampling. The sample has a panel component although fresh observations were added in 2004, 2006, and 2009 to overcome the problem of attrition.

It would have been ideal to conduct a panel data analysis to take into account individual

unobserved time-invariant heterogeneity, but unfortunately, questions regarding parental care provision were included only in the 2011 and 2013 waves and the way the key questions were phrased differed between these two waves. The advantage of using the 2011 data is that the data allow us to identify who is the main caregiver for respondents' parents and parents-in-law while data from the 2013 wave contain information only on whether or not respondents provide at least some care to their parents and/or parents-in-law. Given the importance of taking into account the intensity of caregiving when analyzing the employment effects of providing elderly care, as suggested in the literature, the empirical analysis in this paper will be conducted using data from the 2011 wave.

In addition to information on parental care provision, this survey contains basic information on respondents including their educational attainment and employment as well as on their households such as household composition, consumption, income, wealth and other socio-economic characteristics. By exploiting this rich dataset, it is possible to test the key hypotheses outlined above.

In the case of the 2011 wave, 4,934 out of 5,316 individuals completed the questionnaire (the response rate was about 93%). 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. In other words, the sample was restricted to those who currently work and are "at risk" of retiring due to parental care responsibilities. After excluding observations with missing information on the variables used in our analysis, we were left with 970 observations. Among respondents who are already retired, there may be some who retired because of caregiving responsibilities. Given the limited information on respondents' employment or caregiving history, it was not possible to control for possible selection bias in the present analysis. For this reason, our estimates for the effect of caregiving on caregivers' retirement plans should be considered as a lower bound.

4.2 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. In general terms, this can be expressed as:

$$y_i = (CG_i, FC_i, X_i, \epsilon_i) \tag{1}$$

where y_i is the planned retirement age of respondent i; CG_i is a caregiving indicator variable; FC_i is a formal care usage indicator variable; X_i is a vector of demographic, socio-economic, and employment-related variables; and ϵ_i is an error component.

One of the key methodological challenges of analyzing the employment effects of caregiving is that care provision is potentially endogenous to the process determining labor supply. Individuals with limited labor market opportunities or less attachment to the labor force in the first place might be more likely to become a caregiver. Similarly, individuals who would like to continue working may make use of formal care services instead of providing parental care by themselves. It is thus important to test and account for the endogeneity of the caregiving and formal care usage variables as failure to do so can lead to biased estimates of their effects on caregivers' planned retirement age. Hence, we will test for the endogeneity of the caregiving and formal care usage variables, and if they are found to be endogenous, we will adopt instrumental variable (IV) techniques. On the other hand, if they are found to be exogenous, we will resort to ordinary least squares (OLS) instead since OLS estimates are said to be more efficient than IV estimates.

While the older literature tended to ignore the potential problem of endogeneity, more recent work attempts to address it through a variety of techniques, including simultaneous equations (e.g., Johnson and Lo Sasso, 2006; Wolf and Soldo, 1994), difference-in-difference estimation (e.g., Spiess and Schneider, 2003), dynamic panel data methods (e.g., Casado-Marín *et al.*, 2011; Michaud, Heitmueller and Nazarov, 2010; Moscarola, 2010), and IV approaches (e.g., Bolin, Lindgren and Lundborg, 2008; Ciani, 2012; Ettner, 1995, 1996; Heitmueller, 2007; Kotsadam, 2012; Meng, 2013; Nguyen and Connelly, 2014). However, 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 and Lundborg, 2008; Kotsadam, 2012; Nguyen and 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, Coe and Skira, 2013).

One complication we need to take into account in the present analysis is the fact that our potentially endogenous variables (i.e., caregiving and formal care usage variables) are binary. In such a case, IV estimation using standard two-stage least squares (2SLS) estimation would generate inconsistent estimates (Wooldridge, 2002). The following three-stage procedure will therefore be used instead: (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 equation (1) 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 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, due to the limited number of men who serve as the main caregiver to at least one of their parents or parents-in-law in the sample, it is not possible to conduct a regression analysis using the male sample only. Instead, we will estimate equation (1) using the full and female samples and compare the regression results to infer the heterogeneous effects of caregiving on caregivers' retirement plans.

Note that our analysis is restricted to a cross-sectional data analysis due to data limitations, as discussed above. We recognize the potential limitations of this strategy and the fact that conducting a more rigorous analysis using longitudinal data to take into account individual time-invariant characteristics is left as one of the key agendas for future research.

4.3 Empirical Specification

The main aim of the present study is to assess the impact of elderly care provision on caregivers' retirement plans, but we will also examine the role of employment-related factors as well as individual characteristics in predicting their anticipated retirement timing.

(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.[8]

(2) Explanatory Variables

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. In the Preference Parameters Study, there are two questions relating to parental care provision. One of the questions asks respondents who is the main caregiver to their father, mother, father-in-law, and mother-in-law (in case they are married), respectively. The other question asks respondents whether or not respondents and/or their spouses provide at least some care to their father, mother, father-in-law, and mother-in-law, respectively.[9] 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 the respondent's parents or parents-in-law and zero otherwise. The second variable equals one only if the respondent serves

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[8] It may be possible that people, for instance regular workers versus irregular workers, have a different concept of the "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.

[9] 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.

as the main caregiver to at least one of his/her parents or parents-in-law and zero otherwise.

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 and Charles, 1998; Heitmueller and Inglis, 2007; Van Houtven, Coe and Skira, 2013), there is no consensus on what should be the level of this threshold. 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 and Charles, 2003; Lilly, Laporte and Coyte, 2010; Nguyen and Connelly, 2014). We would expect the respondent's planned retirement age to be negatively associated with parental care provision, assuming that the substitution effect outweighs the income effect. This negative effect is expected be greater for those with higher caregiving intensity.

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. If respondents need to work more to cover the cost of formal care, we would expect the coefficient on this variable to have a positive sign, providing evidence for the income effect of caregiving. However, if the financial burden of formal care usage is limited either because of the universal coverage of the LTCI program in Japan or because the financial burden is mainly borne by care recipients themselves, we may not observe a positive association between formal care usage by elderly parents and adult children's planned retirement age.

Instruments: Given that the caregiving and formal care usage variables could be endogenous, as discussed above, we will test for their endogeneity by estimating IV models. We will use parental health as an instrument for the caregiving variable. It should be directly associated with the demand for parental care and thus the caregiving status of respondents but should not directly affect respondents' retirement plans other than

through the parental care path. Parental health is a commonly used instrument in the analysis of caregiving (e.g., Bolin, Lindgren and Lundborg, 2008; Crespo and Mira, 2014; Ettner, 1996; Kotsadam, 2012; Van Houtven, Coe and Skira, 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, Lindgren and Lundborg, 2008; Van Houtven, Coe and Skira, 2013). We also use parental health as an instrument for the formal care usage variable. We would expect parents/parents-in-law in poor health to be more likely to use formal care services than those in better health.

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 system.[10] Given that this needs level is assigned based strictly on physical and mental disabilities, this variable should be a good proxy for the health status of elderly parents. 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 classified as belonging to one of the five Care Levels (the degree of disability is more severe than those who are classified as belonging to one of the two Support Levels) 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, Lindgren and Lundborg, 2008; Ettner, 1995, 1996), we use the total number of the respondent's brothers and brothers-in-law as an additional instrument.[11] The number of brothers and brothers-in-law indicates the number of potential alternative caregivers for parents and parents-in-law. More specifically, it captures the number of daughters-in-law who traditionally take primary responsibility for elderly care in Japan, though some studies find that their role in elderly

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[10] Under the LTCI system, the computer aided standardized needs-assessment system categorizes people into seven levels of needs. The Care Needs Certification Board, a local committee consisting of health, medical, and welfare experts, then reviews this initial assessment and determines its appropriateness (Tsutsui and Muramatsu, 2005). 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 1-5). This support/care level determines the amount of benefits that each person is entitled to receive.
[11] We define "brothers-in-law" to include only the brothers of respondents' spouses not the brothers of respondents' own siblings throughout this paper.

care has been declining in recent years (e.g., Hanaoka and Norton, 2008). We would expect that having a greater number of brothers and brothers-in-law reduces the demand for parental care that one faces. 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. Similarly, we also use as an additional instrument for parental care provision a dummy variable that equals one if the respondent and/or his/her spouse is the eldest child and zero otherwise. Given that it used to be the custom in Japan for the eldest child to take care of his/her elderly parents, we would expect being the eldest child to increase one's probability of providing parental care.

We also construct a dummy variable that equals one if both of the respondent's parents and/or parents-in-law are alive and zero otherwise as an instrument for the caregiving and formal care usage variables. If both parents and/or both parents-in-law are still alive, when one parent or parent-in-law becomes in need of care, his/her spouse is likely to serve as the main caregiver, reducing the demand for elderly care that adult children need to provide and/or the demand for formal care services. We would therefore expect having both parents and/or both parents-in-law alive to be negatively associated with the probability of providing parental care and with that of using formal care services.

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, which is conducted annually by the Ministry of Health, Labour and Welfare.[12, 13] We express this as a share of the population aged 65

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[12] 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.

[13] We use data from the 2010 Survey of Institutions and Establishments for Long-term Care given that, in our empirical analysis, we use data from the 2011 wave of the Preference Parameters Study that was conducted in January-March 2011. The data are taken from the website of the Ministry of Health, Labour

and above in each prefecture. We would expect parents/parents-in-law who reside in a prefecture with a greater availability of such facilities to be more likely to use formal care services than those in a prefecture with limited availability of such facilities.

Respondents' employment: Work-related factors are likely to affect people's retirement plans. We therefore include a categorical variable capturing the respondent's employment status. This variable indicates whether the respondent is (1) self-employed (including those who assist with a family business), (ii) a regular worker, or (iii) an irregular worker.[14] Given that there is in principle no retirement age for those who are self-employed, we would expect self-employed individuals to retire later in comparison with those with regular employment. As for irregular workers, given that irregular jobs tend to be characterized by more flexible working arrangements (e.g., shorter working hours), those with irregular jobs may be able to continue working until a more advanced age. It is also possible that irregular workers may not be able to retire earlier given that their jobs tend to be low paid and insecure and that they are likely to receive less pensions than regular workers.[15] For either reason, we would expect irregular workers to retire later than regular workers, though they may still retire earlier than self-employed individuals. We also include the respondent's wage expressed as the logarithm of his/her hourly wage. Whether higher wages induce earlier retirement is an empirical question.

Respondents' basic characteristics: A set of individual characteristics capturing the respondent's age,[16] gender, educational attainment, self-assessed health status,[17] marital

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and Welfare (http://www.mhlw.go.jp/toukei/saikin/hw/kaigo/service10/index.html, accessed on February 22, 2017).

[14] Irregular employees include those who are working 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.

[15] Note that this employment status variable is based on information on respondents' current employment status. It is therefore possible that some of 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.

[16] 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.

[17] While health is found to be an important determinant of retirement decision, retirement is also expected to affect health (e.g., Coe and Zamarro, 2011), causing a possible endogeneity problem. Using planned

status as well as the number of respondents' children aged 18 or less is included. Women and those in poor health are expected to plan earlier retirement than men and those in good health, respectively. Given that unmarried (divorced, widowed, or never married) individuals do not have a spouse to count on, their planned retirement age may be older than that of married individuals.

We also include variables that reflect the respondent's preferences, such as his/her degree of time preference and risk aversion. While it is a challenge to control for these unobserved time-invariant aspects of individuals in a cross-sectional analysis, we construct variables that can serve as their proxies using the best available data from the Preference Parameters Study. [18] Our measure of the degree of time preference is constructed using responses to a question about whether or not respondents generally prefer getting their work done before having a good time. Our measure of the degree of risk aversion is constructed using responses to a question asking respondents to rate their behavioral pattern on a scale of 0-10 with "10" being completely in agreement with the proverb "nothing ventured, nothing gained" and "0" being completely in agreement with the proverb "a wise man never courts danger." We regard this variable as a proxy for the degree of risk preference and treat it as cardinal. We also include a variable that reflects the respondent's view toward gender roles within the household. This variable equals one if the respondent agrees or strongly agrees with the statement that wives should not work if their husbands earn a sufficient income. We would expect those with such a traditional view to plan to retire earlier than those without, particularly among women.

Wealth- and income-related information: Retirement timing is also inevitably closely related to the level of accumulated wealth. Unless people have sufficient financial resources for their lives after retirement, they cannot afford to retire. We therefore include a variable that indicates the level of the respondent's household wealth, which is expressed as quintiles of net worth, defined as the total amount of financial and non-

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retirement age as our dependent variable, rather than actual retirement status or age, should help avoid such concerns (Hall and Johnson, 1980).

[18] We extract information on the degree of the respondent's time and risk preferences from data from the 2010 wave of the Preference Parameters Study as such information was not available in the 2011 wave.

financial assets net of liabilities. A variable that captures whether or not the respondent owns a house or an apartment is also included. Moreover, we include a variable that indicates the level of household income net of the respondent's own income, which essentially indicates the minimum amount of income that the respondent can fall back on within their household if he/she exits from the labor market. 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 (or the actual share if the respondent already receives pensions). [19] Finally, we include 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 and zero otherwise. All these wealth and income-related variables are expected to be negatively associated with the respondent's planned retirement age.

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.

5. Empirical Results

5.1 Descriptive Statistics

Table 1 provides the summary statistics of the dependent and explanatory variables for the full and female samples. To obtain an overview of the characteristics of caregivers, the statistics are provided for caregivers and non-caregivers separately for each sample. Note that caregivers here refer 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 non-caregivers refer to respondents who do not provide any parental care. Unfortunately, given that this caregiving variable is constructed based on respondents' responses to the question about whether or not they and/or their spouses provide at least

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[19] We extract information on pensions from data from the 2012 wave of the Preference Parameters Study as such information was not available in the 2011 wave.

some parental care, we cannot determine whether it is the respondent and/or his/her spouse who provides parental care in the case of married respondents. However, since women tend to take primary responsibility for parental care in Japan, we can assume that it is primarily the respondent who provides parental care, at least in the case of the female sample. 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% and 18% 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% of caregivers serve as the main caregiver to at least one of their parents or parents-in-law and that this figure is greater for the female sample (about 51%), 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 non-caregivers in either the full or female sample. We find a marginally significant difference (significant at the 10% level) between main caregivers and non-main caregivers (their statistics are not shown in the table) in the case of the full sample. It is therefore not clear whether providing care to elderly parents makes their adult children retire earlier than those without caregiving responsibilities and we will investigate this issue more rigorously through a regression analysis in the next subsection.

Table 1. Summary Statistics

	Full sample						Female sample					
	Caregivers				Non-caregivers Mean/S.D.		Caregivers				Non-caregivers Mean/S.D.	
	Caregivers Mean/S.D.		Main caregivers only Mean/S.D.				Caregivers Mean/S.D.		Main caregivers only Mean/S.D.			
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	
Formal care usage	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	1.14	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	54.51	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	

	Full sample						Female sample					
	Caregivers				**Non-caregivers**		**Caregivers**				**Non-caregivers**	
	Caregivers Mean/S.D.		**Main caregivers only Mean/S.D.**		**Mean/S.D.**		**Caregivers Mean/S.D.**		**Main caregivers only Mean/S.D.**		**Mean/S.D.**	
Employment												
Regular job	0.52		0.39		0.56		0.34		0.25		0.30	
Irregular job	0.29		0.45		0.28		0.48		0.56		0.53	
Self-employed	0.19		0.16		0.16		0.18		0.19		0.17	
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
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
Homeownership	0.94		0.91		0.90		0.92		0.92		0.89	
Expected receipt of inheritances	0.57		0.61		0.57		0.58		0.64		0.54	
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
Wealth quintiles												
1st quintile	0.14		0.09		0.22		0.14		0.11		0.22	
2nd quintile	0.19		0.25		0.19		0.25		0.25		0.20	
3rd quintile	0.20		0.18		0.22		0.15		0.17		0.20	
4th quintile	0.24		0.23		0.18		0.21		0.22		0.20	
5th quintile	0.24		0.25		0.19		0.24		0.25		0.19	
Gender roles	0.10		0.02		0.15		0.08		0.03		0.10	
Low time preference	0.53		0.57		0.50		0.55		0.56		0.53	
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
Residing in a major city	0.20		0.27		0.25		0.20		0.28		0.24	
Number of observations	138		44		832		71		36		333	

S.D. = standard deviations.

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

According to Table 1, 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 non-caregivers for both the full and female samples. This suggests that parental care provided by adult children and formal care services are complementary, at least if we do not take into account the intensity of care that adult children provide. Once we take into account the intensity of caregiving, we find that formal care services act as a substitute for parental care that adult children provide among respondents who serve as the main caregiver. This is shown by the fact that the share of respondents whose parents and/or parents-in-law use formal care services as their main caregiver is much lower among those who serve as the main caregiver of a parent or parent-in-law.

It is not surprising to find that the share of respondents with at least one parent or parent-in-law who is certified as requiring care under the LTCI program (i.e., having parents and/or parents-in-law in poor health) is significantly greater among caregivers than among non-caregivers 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 non-caregivers, 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 non-main caregivers for the full sample, as expected.

Table 1 also shows that caregivers are on average older than non-caregivers, and the differences are statistically significant at the 1% level for both the full and female samples. This is as expected since the demand for caregiving tends to increase with the age of parents and hence with the age of adult children. In addition, caregivers tend to have fewer children aged 18 or younger than non-caregivers for both samples. This might be due to the fact that caregivers tend to be older and thus are less likely to have children of this age group and/or to the fact that those with relatively young children might be more preoccupied with their parenting role and thus be less likely to be engaged in elderly care

than those without young children. Moreover, we find that main caregivers are less likely to have a traditional view toward gender roles, that they are likely to earn lower wages, and that they are less likely to have a regular job (more likely to have an irregular job) than non-main caregivers in the case of the full sample. These observed differences might be caused by the fact that women with such attributes are more likely to serve as the main caregiver than men. It is interesting to find that the share of living expenses that respondents expect to be able to cover using public pensions is significantly greater among caregivers than among non-caregivers for both samples. The differences are statistically significant at the 10% and 1% level for the full and female samples, respectively.

As for the rest of the explanatory variables listed in Table 1, we do not find a statistically significant difference between caregivers and non-caregivers for either the full or female sample.

5.2 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. As noted earlier, one potential problem is that our caregiving and formal care usage variables might be endogenous to the retirement decision process. We therefore test for the endogeneity of these variables by estimating IV models. To see whether the intensity of caregiving matters for the way in which caregiving affects caregivers' retirement plans, we use the (more general) caregiver as well as main caregiver variables, as explained earlier.

Following the estimation procedure outlined in Section 4.2, we first estimate binary models to obtain the fitted probabilities for providing some care to at least one parent or parent-in-law, for serving as the main caregiver to one of them, and for the use of formal care services.[20] We use the health status of the respondent's parents and parents-in-law,

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[20] Selected 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 number of the respondent's brothers and brothers-in-law, a variable that indicates whether or not the respondent and/or his/her spouse is the eldest child, a variable that indicates whether or not both parents and/or both parents-in-law of the respondent are alive, and the availability of institutional care as instruments. As shown in Table A1, a different combination of these instruments 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. The results show that having at least one parent or parent-in-law in need of care is positively associated with the probability of providing at least some parental care, of serving as the main caregiver, and of using formal care services for both the full and female samples. We also find that the number of the respondent's brothers and brothers-in-law is negatively associated with the probability of providing at least some parental care for the full sample and of serving as the main caregiver for both samples, while the fact that the respondent and/or his/her spouse is the eldest child increases their probability of providing parental care in the case of the female sample. Moreover, having both parents alive and/or both parents-in-law alive is negatively associated with the probability of providing at least some parental care, of serving as the main caregiver, and of using formal care services for both the full and female samples, as expected. Finally, the greater availability of institutional care is positively associated with the probability of using formal care services. The coefficients on these identifying instruments are jointly significant at the 1% 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 for both the full and female samples (see Table A2). In addition, the obtained F-statistic 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 and Stock, 1997). Despite the

rejection of weak instruments, Wooldridge's (1995) score test results suggest that the null hypothesis of the exogeneity of the caregiving and formal care variables cannot be rejected in any case for both the full and female samples (see Table A3). This is consistent with the findings of some previous studies based on cross-sectional data (e.g., Bolin, Lindgren and Lundborg, 2008; Kotsadam, 2012; Nguyen and Connelly, 2014). We will therefore treat our caregiving and formal care usage variables as exogenous in the retirement age equation and estimate it by OLS to examine the effect of caregiving on family caregivers' retirement plans.

5.3 Main Results

5.3.1 Full Sample

Table 2 shows the OLS regression results 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. Looking first at the regression results for the full sample, we find that providing parental care of any intensity does not have a significant effect on respondents' retirement plans. 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 and Charles, 2003; Heitmueller, 2007; Kotsadam, 2012; Lilly, Laporte and Coyte, 2010; Nguyen and Connelly, 2014). The planned retirement age of respondents who serve as the main caregiver to at least one of their parents or parents-in-law is estimated to be, *ceteris paribus*, 1.2 years earlier than that of those without such responsibilities. This is a non-trivial cost to family caregivers if we consider the financial consequences of retiring earlier in terms of the loss of current income as well as the reduction in pension entitlements and possibly in lump-sum severance payments.

Table 2. OLS Regression Results

	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]
Formal care usage	-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]
4th quintile	-1.188**	[0.488]	-1.201**	[0.488]	-1.630*	[0.868]	-1.656*	[0.866]
5th quintile	-1.135**	[0.524]	-1.158**	[0.526]	-1.844**	[0.890]	-1.903**	[0.888]

	Full sample				Female sample			
	(1)		(2)		(1)		(2)	
Gender roles	-0.803*	[0.422]	-0.816*	[0.425]	-1.820*	[0.987]	-1.849*	[0.990]
Low time preference	0.338	[0278]	0.336	[0.277]	0.548	[0.468]	0.534	[0.464]
Risk preference	0.089	[0.081]	0.089	[0.081]	0.224	[0.137]	0.229*	[0.137]
Residing in a major city	1.262***	[0.351]	1.278***	[0.351]	0.822	[0.574]	0.868	[0.574]
Constant	56.69***	[3.653]	56.46***	[3.655]	48.35***	[6.068]	47.86***	[6.060]
No. of observations	970		970		404		404	
R^2	0.351		0.351		0.278		0.281	

Note: ***, ** and * denote statistical significance at the 1%, 5% and 10% levels. Robust standard errors are in parentheses. Regional dummies are included in all regressions.
Source: Estimation based on data from the 2011 Preference Parameters Study.

Table 3. OLS Regression Results (Role of Formal Care Services)

	Full sample				Female sample			
	(1)		(2)		(1)		(2)	
Caregiver/Main caregiver	-0.686	-0.741	-1.162**	-1.461**	-0.703	-0.871	-1.333**	-1.565**
	[0.427]	[0.515]	[0.577]	[0.582]	[0.615]	[0.678]	[0.649]	[0.661]
*Formal care usage		0.220		4.056**		0.734		3.444*
		[0.896]		[1.642]		[1.432]		[1.917]
Formal care usage	0.126	0.042	-0.132	-0.265	0.369	0.035	-0.007	-0.178
	[0.451]	[0.589]	[0.424]	[0.427]	[0.764]	[1.107]	[0.742]	[0.756]
No. of observations	970	970	970	970	404	404	404	404
R^2	0.351	0.351	0.351	0.353	0.278	0.279	0.281	0.282

Note: ** and * denote statistical significance at the 5% and 10% levels. Robust standard errors are in parentheses. 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.

The insignificant effect of caregiving of any intensity together with the negative and significant effect of serving as the main caregiver on retirement plans imply that, if measures, such as ensuring access to formal care services, allow adult children to escape from being the primary caregiver to their elderly parents and/or parents-in-law, they can help adult children to juggle their employment and caregiving responsibilities and thus save them from having to retire earlier in order to meet their caregiving responsibilities. Note that our regression results also show that the usage of formal care services by respondents' parents and/or parents-in-law has no significant effect on respondents' retirement plans. The insignificance of this effect seems to indicate that the income effect of caregiving is relatively limited in the case of Japan.

To further examine the possibility of formal care services attenuating or eliminating the adverse effect of caregiving on caregivers' planned retirement age, we try interacting the caregiving variables with the formal care usage variable. If the coefficient on the interaction term is positive and significant, this will constitute additional evidence that formal care services help alleviate or eliminate the negative effect of caregiving on caregivers' retirement plans. 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 the relevant results for the full and female samples.[21]

As far as the results for the full sample are concerned, the coefficient on the interaction term between the caregiver variable and the formal care usage variable is found not to be

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[21] 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.

statistically significant. However, the coefficient on the interaction term between the main caregiver variable and the formal care usage variable is positive and significant, and in fact the magnitude of this coefficient is larger than that of the coefficient on the main caregiver variable. 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 planned retirement age by 2.6 years instead. These results provide support for the view that formal care services attenuate the need for adult children to retire earlier due 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 services may not only attenuate the adverse effect on retirement of taking primary responsibility for parental care but also cause additional effects, namely the income effect of caregiving. It may be costly to have more than one parent or parent-in-law in need of care in the household, and this may require adult children to delay their retirement in order to meet the financial cost of formal care services.

As for the rest of the regression results for the full sample, as expected, it is found that women expect to retire earlier than men and that unmarried (divorced, widowed, or never married) respondents expect to retire later than their married counterparts. The latter might be due to the fact that unmarried people may face greater financial insecurity than married people, and hence they may not be able to afford to retire earlier. We also find that respondents with a regular or irregular job expect to retire earlier than those who are self-employed, as expected. The size of the negative effect on the planned retirement age is greater for regular employment than for irregular employment, implying that the extent to which regular workers retire earlier than the self-employed is greater than in the case of irregular workers, *ceteris paribus*. As in the case of unmarried people, irregular workers may not be able to afford to retire earlier given that they may also face greater financial insecurity in their later years than regular workers. On the other hand, irregular

jobs may have more flexibility in terms of working conditions and it might therefore be easier for irregular workers to continue working until a more advanced age than regular workers.

As expected, the level of household income net of respondents' personal incomes as well as the level of household wealth are negatively associated with respondents' planned retirement age. In addition, respondents who expect to receive inheritances (including *inter vivos* transfers) are found to retire earlier than those without such expectations. We also find that respondents who expect to receive a greater amount of public pensions relative to their living expenses are likely to retire earlier. These findings suggest that respondents with greater financial resources can afford to retire earlier than those with less, as expected. It is interesting to find that those with traditional views toward gender roles plan to retire earlier than those without.

5.3.2 Female Sample

We now turn to the results for the female sample (see Table 2). Even when we restrict the sample to female respondents only, we do not find a significant effect of providing parental care of any intensity on respondents' retirement plans. However, we find a slightly larger negative effect of serving as the main caregiver on the planned retirement age for the female sample than for the full sample. In the case of female respondents, those who are the main caregiver to at least one of their parents or parents-in-law are, *ceteris paribus*, estimated to plan to retire 1.3 years earlier than those who are not. The fact that caregiving is found to have a greater adverse effect for the female sample than for the full sample underscores the fact that women are likely to bear a greater share of the burden of parental care than men, which is consistent with previous findings (e.g., Ettner, 1996; Yamada and Shimizutani, 2015). On the other hand, as in the case for the full sample, we do not find a significant effect of formal care usage on respondents' retirement plans.

As for the results for the interaction terms between the caregiving variables and the formal

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care usage variable (see Table 3), the results are similar to those for the full sample. If we use the general caregiver variable, the coefficient on the interaction term is again not statistically significant. Table 3 also shows that if female respondents serve as the main caregiver to at least one of their parents or parents-in-law, their planned retirement age decreases by 1.6 years. In contrast, if formal care services play the main caregiving role for at least one of the rest of their parents or parents-in-law, serving as the main caregiver to their parents and/or parents-in-law increases female caregivers' planned retirement age by 1.9 years. These results are similar to those obtained for the full 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 (and/or the income effect of caregiving) is smaller for the female sample than for the full sample.

The rest of the results are similar to those obtained for the full sample except that the amount of public pensions that respondents expect to receive relative to their living expenses no longer has a significant effect on the planned retirement age in the case of the female sample.

Table 4. OLS Regression Results (for 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]
Irregular job	1.187***		0.966	
	[0.432]		[0.680]	
No. of observations	808	538	333	124
R^2	0.260	0.201	0.243	0.328

Note: *** and * denote statistical significance at the 1% and 10% levels. Robust standard errors are in parentheses. 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.

5.3.3 Caregiving Effect and Employment Status

In the case of Japan, the adverse economic consequences of retiring earlier due to

caregiving commitments is likely to be greater for regular workers than for irregular workers due to the limited job re-employment opportunities for regular employment in this country. The concept of retirement may also differ between regular (or irregular) workers and those who are self-employed. We would therefore like to 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.[22]

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. As for the female sample, 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.

The above results also suggest that the adverse effect of caregiving on caregivers' retirement timing is relatively limited in the case of regular workers for both men and women in the case of Japan. This might be due to the fact that regular workers try not to retire earlier, if possible, for caregiving responsibilities given that the opportunity cost of retiring earlier is relatively high for them in terms of the consequent reduction in pension entitlements as well as lump-sum severance payments in comparison with irregular

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[22] 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.

workers or those who are self-employed.

Nevertheless, since more than half of the female sample is engaged in irregular employment, the negative and significant effect of caregiving on intensive caregivers' retirement plans for regular and irregular workers among women remains cause for concern for the Japanese government, which has recently been trying to promote the labor supply of women as well as the elderly to address the shrinkage of the working-age population. Since no indications of endogeneity were detected, the provision of elderly care is unlikely to reflect the fact that those who provide elderly care face limited labor market opportunities or are less attached to the labor market. 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.

On the other hand, the insignificant effect of caregiving of any intensity on caregivers' planned retirement age seems to indicate that adult children may still be able to juggle their employment and caregiving responsibilities and thus may not have to retire earlier to meet their caregiving responsibilities as long as they do not have to take primary responsibility for parental care, i.e., if they perform only a supplementary role in parental care. This finding underscores the important role that the availability of formal care services can play not only in determining the amount of parental care that adult children need to provide but also the way caregiving responsibilities affect adult children's labor market outcomes (e.g., Kotsadam, 2012; Michaud, Heitmueller and Nazarov, 2010).

Our regression results indeed suggest that the use of formal care services may help attenuate or eliminate the adverse effect of taking primary responsibility for parental care on adult children's retirement timing. This is in line with the argument that more formal care leads to more choices for family members and therefore less adverse effects on their employment (Kotsadam, 2012). However, given that the positive effect of formal care usage is found to more than offset the negative effect of serving as the main caregiver on

caregivers' retirement plans, it seems more plausible to assume that the use of formal care services also generates an income effect of caregiving on caregivers' planned retirement age.

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 avail themselves of 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, the finding of the possible presence of an income effect in cases in which respondents act as the main caregiver to at least one of their parents or parents-in-law while formal care services take primary responsibility for parental care for the rest of their parents or parents-in-law suggests that the financial burden of formal care services may require caregivers to postpone their retirement when there is more than one person in need of care in the household.

6. Conclusions

In this paper, we used micro data from a Japanese survey to examine the effect of providing parental care on adult children's retirement plans, a topic which has received relatively little attention so far. 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 to parents and/or parents-in-law has a negative and significant effect on adult children's planned retirement age. The comparison of the estimates based on the full sample with those based on the female sample also indicates that the adverse effect of providing parental care on adult children's retirement plans tends to be greater for female caregivers than for their male counterparts. On the other hand, 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.

These findings seem to suggest that, if ensuring access to formal care services can allow family members to escape from taking primary responsibility for providing care to their parents and/or parents-in-law, 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. However, our results also suggest the possibility that the use of formal care services could also generate an income effect of caregiving. While our findings suggest a limited income effect of caregiving in most cases, we find some evidence for the possibility that the financial burden of formal care services may require caregivers to postpone requirement 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 into account such effects is required to confirm our findings. Moreover, we have examined the employment effects 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. Effects at the intensive margin may have implications for current earnings as well as retirement income that could affect the livelihood of family caregivers even long after caregiving responsibilities end.

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 has significant

potential costs to society in terms of not only reduced labor supply but also a reduction in income tax revenue as well as contributions to 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. Unless the cost of informal elderly care on family members in terms of, among other things, earlier retirement is recognized and addressed, the increasing burden of elderly care will pose a serious challenge to the ongoing efforts of the Japanese government to promote the labor market participation of women and the elderly as a solution to the shrinkage of the working-age population.

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Appendix: IV Estimation Results

Table A1. First-stage Binary (Probit) Model Estimation

	Full sample						Female sample					
	Caregivers		Main caregivers		Formal care		Caregivers		Main caregivers		Formal care	
Poor parental health	0.422***	[0.038]	0.132***	[0.025]	0.346***	[0.037]	0.529***	[0.057]	0.225***	[0.043]	0.338***	[0.048]
Number of brothers and brothers-in-law	-0.019**	[0.008]	-0.015**	[0.006]					-0.020*	[0.012]		
Being the eldest child							0.060**	[0.028]				
Both parents and/or parents-in-law alive	-0.039*	[0.022]	-0.043***	[0.014]	-0.036*	[0.020]	-0.101***	[0.036]	-0.128***	[0.032]	-0.071**	[0.030]
Availability of institutional care											0.053**	[0.027]
Jointly significant at 1%	✓		✓		✓		✓		✓		✓	
No. of observations	970		970		970		404		404		404	
LR chi2	302.57		160.55		246.03		195.34		122.38		139.92	
Prob > chi2	0.000		0.000		0.000		0.000		0.000		0.000	
Log likelihood	-245.50		-98.81		-201.01		-90.14		-60.20		-67.00	
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. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels. Standard errors are in parentheses. 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 A2. First-stage Results for IV Estimation (2SLS)

	Full sample				Female sample			
	IV (1)		IV (2)		IV (1)		IV (2)	
	Caregiver	Formal care use	Main caregiver	Formal care use	Caregiver	Formal care use	Main caregiver	Formal care use
Predicted probability of being caregivers	1.104*** [0.185]	-0.024 [0.183]			1.040*** [0.136]	0.059 [0.133]		
Predicted probability of being main caregivers			0.952*** [0.151]	0.004 [0.165]			1.021*** [0.141]	-1.182 [0.135]
Predicted probability of formal care usage	-0.117 [0.223]	1.040*** [0.230]	-0.013 [0.055]	1.011*** [0.108]	-0.042 [0.195]	0.889*** [0.180]	-0.102 [0.099]	1.031*** [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 parentheses. 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)

	Full sample				Female sample			
	IV (1)		IV (2)		IV (1)		IV (2)	
Caregiver	-1.003	[1.537]			-0.255	[1.296]		
Main caregiver			-0.947	[1.428]			-2.207*	[1.245]
Formal care services	0.802	[1.850]	0.011	[0.914]	-0.523	[1.875]	0.017	[1.252]
No. of observations	970		970		404		404	
Wald chi2	472.24		474.34		165.34		166.09	
Prob > chi2	0.000		0.000		0.000		0.000	
R^2	0.350		0.351		0.276		0.279	
Exogeneity test (chi2 (p-values))※	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 parentheses. 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.