

# **The effects of providing eldercare on daughters' employment and mental health in Japan**

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## **Abstract**

We examine the association between informal parental care and daughters' employment and mental health in Japan, using the 2008-2013 waves of the Longitudinal Survey of Middle-aged and Elderly Persons, a large and nationally representative panel survey of middle-aged Japanese people. We find that caregiving reduces the probability of employment by only 2.8 percent, after controlling for time-invariant individual heterogeneity, while caregiving is not associated with either hours or days worked per week for those who are working. We further observe that employment does not increase the psychological distress already experienced by the caregivers as a result of their caregiving role.

**Keywords:** informal caregiving; employment; work hours; labor supply; mental health; instrumental variable models; fixed-effects models.

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## 1 Introduction

The use of female labor is currently a major policy challenge in Japan due to the declining prime working-age population and the rapidly increasing elderly population, as a result of reduced fertility and the longevity of the elderly. Increasing the participation of women in the labor market is crucial for the growth of Japan's economy. However, Japan is a country in which approximately 70 percent of elderly care is provided at home, mainly by women (Cabinet Office, 2015). Therefore, it is essential to investigate whether and how informal caregiving by women might negatively affect their level of employment.

As discussed by Bauer and Sousa-Poza (2015) and Lilly et al. (2007), many previous studies conducted in advanced countries other than Japan (mainly in the US and European countries) have shown that the effect of informal caregiving on employment is relatively limited, despite the prevalence of a combination of caregiving and low levels of employment. However, the association between caregiving for elderly parents and the female labor supply in Japan has not yet been fully investigated.

We use the Longitudinal Survey of Middle-aged and Elderly Persons, which is a nationally representative sample of 33,615 Japanese people aged 50-59 years old when they were first surveyed in 2005. We find a large and negative association between caregiving for elderly parents and women's labor supply at both the extensive margin (employment probability) and the intensive margin (hours worked conditional on employment). However, after we control for time-invariant individual heterogeneity by fixed effects, informal parental care reduces the probability of employment only

modestly—by 2.8 percent. Furthermore, working women do not reduce their hours or days worked per week when they care for their elderly parents. These results suggest that women who continue to work do not change their working hours at the onset of caregiving for their elderly parents.

We further investigate how work affects the association between informal caregiving and caregivers' mental health. It is well known that informal caregiving has an adverse impact on caregivers' mental health (Coe and Van Houtven, 2009; Hiel et al., 2015; Oshio, 2014; Pinquart and Sörensen, 2003). However, whether work *amplifies* the adverse impact of caregiving has not been sufficiently studied either within or outside of Japan. We find that work neither increases nor decreases the adverse impact of caregiving on the mental health of caregivers.

Overall, informal parental care does not appear to be a significant deterrent to employment among middle-aged women in Japan. This may be because Japanese women tend to work short hours and to have limited responsibility at work. In many cases, they can participate in informal caregiving without needing to significantly adjust their labor force participation. This situation is consistent with our observation that employment does not add to caregivers' psychological distress.

The paper proceeds as follows. Section 2 reviews the literature on how providing informal parental care affects caretakers' level of employment and their mental health. Section 3 provides details about the data and descriptive statistics of the sample. Section 4 provides the main estimation results, including the effect of informal parental care on (1) employment, (2) hours of work conditional on working, and (3) caregivers' mental

health. The paper concludes in Section 5.

## **2 Background**

Many studies in the United States and Europe have examined the effect of informal caregiving on employment. These studies have raised the possibility that the observed large negative association between caregiving and employment may be biased for two reasons.

The first reason is endogenous selection into caregiving, as women with a weaker attachment to the labor market are more likely to take on the caregiving role. To control for the potential endogeneity of caregiving, we applied the instrumental variable (IV) approach. As instruments for informal caregiving, previous studies have used measures of parental health, such as health status and/or activities of daily living (Crespo and Mira, 2014; Meng, 2012; Nguyen and Connelly, 2014; Van Houtven et al., 2013), as well as the number of the woman's siblings (Coe and Van Houtven, 2009).

Second, researchers have been concerned that time-invariant unobserved individual heterogeneity may be negatively related to caregiving because caregivers may differ in human capital investment or experience. To control for individual heterogeneity, previous studies have used a fixed-effects (FE) approach (Leigh, 2010; Meng, 2012; Van Houtven et al., 2013).

Studies in the US and European countries that have used these two approaches have found a limited association between caregiving and women's probability of working. These studies have also found that caregiving is associated with a relatively moderate reduction in work hours (Bolin et al., 2008; Lilly et al., 2010; Meng, 2012; Van Houtven

et al., 2013). Therefore, studies from the US and European countries imply that caregivers may be able to adjust their working hours and may not need to completely leave the labor force to care for elderly parents.

However, the link between informal caregiving and work has not been studied extensively in Japan. Using repeated cross-sectional data from the Comprehensive Survey of Living Conditions released by the Ministry of Health, Labour and Welfare, Sugawara and Nakamura (2014) show that the presence of co-residing elderly parents who require care reduces the probability of co-residing middle-aged women continuing as regular workers. Using repeated cross-sectional data from the Labor Force Survey and the Employment Status Survey, Kondo (2016) finds that the availability of long-term care (LTC) facilities is not related to the labor force participation of middle-aged women. However, neither of these studies focuses directly on the way that caregivers' employment decisions are affected by caregiving activities, because the data utilized by these two studies lack information on (1) whether all of the elderly parents (namely, father, mother, father-in-law, and mother-in-law) are alive, and (2) whether middle-aged people who have surviving elderly parents actually care for their frail elderly parents.

Two studies use panel data to control for individual heterogeneity in Japan. Shimizutani et al. (2008) observe that the introduction of a public long-term care insurance (LTCI) scheme in 2010 increased the probability of female caregivers being employed and increased the number of days per week and hours per day worked by female caregivers.<sup>1</sup> In contrast, Fukahori et al. (2015) find that the LTCI system does

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<sup>1</sup> A public long-term care insurance (LTCI) system was initiated in 2000 to relieve family caregivers of the burdens associated with their roles (Tamiya et al., 2011).

not mitigate the adverse impact on the employment of middle-aged individuals who reside with an elderly person who needs care. Because of these mixed results regarding the impact of informal caregiving on caregivers' employment, it is of interest to investigate this issue using a large and nationally representative sample in Japan.

As noted earlier, a growing number of studies have demonstrated that informal caregiving increases the psychological distress experienced by caretakers (Coe and Van Houtven, 2009; Hiel et al., 2015; Oshio, 2014; Pinquart and Sörensen, 2003; Sugihara et al., 2004). However, these studies have not examined the effects, if any, of working on caregivers' mental health. One might suspect that caregivers would feel more stressed if they continue to work, because of reduced leisure and personal time. However, it has also been shown that the multiple roles performed by people have positive mental health outcomes (Adelmann, 1994; Moen et al., 1992).<sup>2</sup> Hence, it is interesting to examine whether work amplifies or reduces caregivers' psychological distress. Caregiving in combination with continuing work may amplify psychological distress due to less leisure time, but it may reduce psychological distress through the performance of multiple fulfilling roles.

### **3 Data and descriptive statistics**

#### **3.1 Data**

We use panel data from the Longitudinal Survey of Middle-Aged and Older Adults,

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<sup>2</sup> Many studies have shown that participating in the labor force has a favorable impact on the mental health of middle-aged and elderly individuals (Hao, 2008), and that retirement tends to have a negative effect on one's health (Kim and Moen, 2002).

conducted by the Japanese Ministry of Health, Labour and Welfare. The survey began in early November 2005 with a sample of 34,240 individuals aged 50 to 59 years.<sup>3</sup> These individuals are surveyed annually every November. The initial response rate of the survey was 83.8 percent, with a subsequent attrition rate of 1.2 percent to 9.8 percent. Because of the large sample size and low attrition rate, as well as the availability of information on (i) which parents or parents-in-law are still living, (ii) those elderly parents' care needs, and (iii) which of those elderly parents are being cared for by the respondent, this survey is one of the most effective ways to study the association between informal parental caregiving and the employment and mental health of middle-aged women in Japan.

We focus on women, who are usually considered reliable resources for providing informal care for elderly parents, especially in Japan. Japanese women often face a situation of having to choose whether to provide care for their elderly parents and/or whether to continue working in the labor market. They may do both simultaneously or may stop doing one in order to do the other. We restrict our sample to female respondents between the ages of 50 and 59 who have at least one living parent or parent-in-law.<sup>4</sup> We limit our sample to the years 2008 to 2013, because the data from the earlier waves (between 2005 and 2007) do not include information on which of the family members require care.<sup>5</sup> We are left with a total of 21,399 observations for 7,405 female

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<sup>3</sup> A two-stage random sampling procedure was used to randomly select the participants.

<sup>4</sup> We exclude women over age 60 from our sample. This is because workers in Japan can claim pensions starting at age 60, and the mandatory retirement age is often between the ages of 60 and 65. Work decisions are affected by these pension and retirement policies.

<sup>5</sup> In 2008 and subsequent years, the survey asks respondents whether each of their family members (specifically, father, mother, father-in-law, and mother-in-law) are alive, and if

respondents in the sample.

Regarding employment, the respondents are asked whether they have a paid job. The indicator variable for employment is defined as 1 if the respondent has a paid job and 0 otherwise. Those who have a paid job are then asked about (1) their average hours worked per week and (2) their average days worked per week during October of the survey year, which is the most recent month because the survey is conducted in early November.

Regarding parental caregiving, the survey asks whether the respondents provide care to their immediate family (including father, mother, father-in-law, and mother-in-law) and if so, for whom the respondents provide care. We consider a respondent an informal caregiver if she cares for at least one of her parent(s) and/or parent(s)-in-law.

As instrumental variables for the caregiving decision, we use four indicator variables for the demand for care for the father, mother, father-in-law, and mother-in-law. “Care” in this survey means all activities such as formal, informal, at-home and/or institutionalized care, although these are not specified in detail in the questionnaire given to the respondents. The elderly parent’s need for care is negatively related to how healthy that parent is and is likely to affect the respondent’s involvement in parental care in a largely exogenous way.<sup>6</sup>

The survey assesses the respondents’ mental health problems using the Kessler

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so, whether they need care.

<sup>6</sup> We cannot eliminate the possibility that those who have weaker attachment to the labor force tend to care for their elderly parents, even if their parents are not so frail. As we will discuss in Section 4, the null hypothesis of over-identifying restrictions is not rejected for any of our specifications, suggesting that all instruments satisfy the exclusion restriction.

Screening Scale for Psychological Distress (K6). The K6 is a standardized and validated measure of nonspecific psychological distress (Kessler et al., 2002, 2010).<sup>7</sup> Higher K6 scores indicate higher levels of psychological distress of the respondent.

### **3.2 Descriptive Statistics**

Table 1 provides summary statistics of the key variables by caregiving status using the pooled sample of the 2008-2013 waves. Among women who have at least one living parent and/or parent-in-law, 18.0 percent (= 3,839/21,339) provide informal care to at least one parent and/or parent-in-law. When caregivers and non-caregivers are compared, caregivers tend to have somewhat poorer health and fewer children younger than 18 years old.

We then compare whether the employment and mental health variables differ by caregiving status in the upper panel of Table 2. The proportion of caregivers who have paid jobs is 62.2 percent, and the proportion of non-caregivers who have paid jobs is 68.8 percent. Furthermore, caregivers who have paid jobs work an average of 31.59 hours per week and 4.69 days per week, whereas non-caregivers who have paid jobs work an average of 33.41 hours per week and 4.84 days per week. However, the K6 score, which measures psychological distress on a scale of 0 to 24, is 10.74 for caregivers and 9.52 for non-caregivers. Overall, we observe that caregivers tend to have no paid job, work fewer

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<sup>7</sup> The K6 contains six questions that ask about the following feelings during the past 30 days: a) nervousness, b) hopelessness, c) restlessness or fidgeting, d) depression, e) feeling that everything was an effort, and f) worthlessness. These items are rated on a 5-point scale from 0 (none of the time) to 4 (all of the time). The items are summed to provide a score that ranges from 0 to 24. The reliability and validity of this tool have been demonstrated for a Japanese sample (Furukawa et al., 2008; Sakurai et al., 2011).

hours when they work, and report a higher K6 score.

In the lower panel of Table 2, we examine the relationship between care demand and the prevalence of actual caregiving for each of the parents and parents-in-law. Having parent(s) and/or parent(s)-in-law who need care is positively related to a daughter's becoming a caregiver. Note, however, that this relationship is not one-to-one. Table 2 shows that among non-caregivers, 4.5 percent, 10.4 percent, 3.1 percent, and 10.6 percent have a father, mother, father-in-law, or mother-in-law, respectively, who requires care. This finding implies that caregiving is provided not only by women but also by other family members and/or institutions.

## **4 Estimation Results**

### **4.1 Caregiving and work on the extensive margin (employment probability)**

We estimate a linear probability model in which the dependent variable is the indicator of having a paid job. The independent variables include an indicator of providing care to at least one parent and/or parent-in-law, in addition to a set of control variables. In line with the literature, the control variables consist of the woman's age and its square, self-assessed health, physical functional limitations, education, marital status, the number of children, whether the respondent is living with a child younger than 18 years old, whether the household has a home mortgage, and year. First, we estimate the model by ordinary least squares (OLS). Second, we estimate the model, treating informal parental care as endogenous. We use four indicator variables of each parent and parent-in-law's need for care. Third, we estimate the model using fixed effects to control

for time-invariant individual heterogeneity.

Table 3 reports the estimation results. The OLS coefficient estimate on caregiving is  $-0.053$  (0.012), which is negative and significant at the one percent level, a result consistent with the finding that the proportion of workers among caregivers is 6.6 percent lower than among non-caregivers, as shown in Table 2.

After we control for the endogeneity of caregiving, the IV estimate on caregiving is  $-0.072$  (0.023), which is significant and somewhat larger than the OLS estimate. Regarding the first-stage regression results reported in the left panel of Table 4, the instruments used in the first-stage regression (specifically, the four variables of the demand for care) are significantly and positively associated with caregiving, and the  $p$ -value of the  $F$ -statistics in the first stage is close to 0, leading us to reject the hypothesis that the instruments are not significant in the first stage. We also do not reject the null hypothesis of over-identifying restrictions; therefore, the instruments used in the estimation satisfy the exclusion restriction. However, we cannot reject the hypothesis that caregiving is exogenous; this result is consistent with the results in a number of studies that estimate the model by IV (e.g., Bolin et al., 2008; Crespo and Mira, 2014; Nguyen and Connelly, 2014; Van Houtven et al., 2013). Informal caregiving appears to be largely exogenous in terms of the relationship with employment status among Japanese middle-aged women: they are equally likely to provide informal care regardless of their employment status. This may be why the IV estimate on caregiving is as large as that of the OLS estimate.

The FE estimate is  $-0.028$  (0.009), which is significant at the one percent level but

small in magnitude. Because the FE estimate is half the size of the OLS and IV estimates, time-invariant individual heterogeneity overstates the negative association between caregiving and work.

#### **4.2 Caregiving and work on the intensive margin (hours and days worked conditional on employment)**

Next, we examine how caregiving is associated with the labor supply on the intensive margin. Specifically, for individuals who have paid jobs, we regress informal caregiving on working hours (hours worked per week and days worked per week, separately) along with a set of covariates described in Section 4.1.

Table 5 reports the estimation results. Caregiving reduces hours worked per week by 1.939 (0.454) hours in the OLS model, which is largely consistent with the results from Table 2, showing that hours worked per week for caregivers are fewer by 1.824 hours compared to hours for non-caregivers. The IV estimate provides a somewhat larger estimate, a reduction of 2.056 (0.885) hours, although the hypothesis that caregiving is exogenous cannot be rejected.<sup>8</sup> By contrast, caregiving reduces hours worked per week by only 0.208 (0.326) in the FE model, which is small and insignificant. Therefore, after we control for individual heterogeneity, caregiving has no association with hours worked per week.

We obtain similar results when we examine the relationship between caregiving and days worked per week, as shown in Table 6. Caregiving reduces days worked per week

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<sup>8</sup> The p-value of the F-statistics in the first-stage regression is close to 0. The first-stage regression results for the sample restricted to those with positive labor hours are similar to those reported in Table 4.

by 0.120 (0.041) in the OLS model and 0.161 (0.076) in the IV model (numbers similar to the result in Table 2, which is 0.143 days shorter among caregivers than among non-caregivers), while the possibility that caregiving is exogenous cannot be ruled out. By contrast, the FE estimate of caregiving on days worked per week is 0.031 (0.029), which is small and insignificant, indicating little association between caregiving and days worked per week.

A significantly negative (but small) association between caregiving and employment, along with little association between caregiving and working hours among working individuals, suggests that caregivers in Japan usually remain in the labor force with the same working hours as before or leave the labor force completely without the opportunity of reducing working hours to adapt to caregiving. This may be due to the inflexibility of working hours in Japan, where workers are not allowed to adjust their working hours in response to family circumstances.<sup>9</sup> At the same time, the proportion of those who leave the labor force due to caregiving is small in magnitude, suggesting that the majority of middle-aged women are able to perform caregiving and maintain their employment without reducing their working hours, and are not obliged to leave the labor force. Thus, there is little conflict between employment and caregiving for middle-aged women in Japan. This may be because many middle-aged women are not working as permanent regular workers, who represent only 29.3 percent of middle-aged working women in our sample. This finding may suggest that many middle-aged women who

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<sup>9</sup> Constructing the overemployment and underemployment indicators as in Altonji and Paxson (1988, 1992) and Altonji and Usui (2007), Usui (2016) and Usui et al. (2016) show that a significant proportion of Japanese workers are not satisfied with their working hours and that they are either overemployed or underemployed.

work may not be overly burdened with work responsibilities.<sup>10</sup> Thus, they can flexibly adjust their work to family circumstances, perhaps in combination with reducing their leisure time.

### **4.3 Combination of caregiving and work on mental health**

Lastly, we consider how caregiving is associated with mental health, and examine whether employment amplifies the impact of caregiving on psychological distress. We regress psychological distress, measured by the K6 scores, on caregiving, employment, and the interaction between caregiving and employment, along with a set of control variables described in Section 4.1 (excluding measures for self-assessed health).<sup>11</sup> Although many studies find a positive association between psychological distress and caregiving, few studies have examined how psychological distress is related to the situation in which employment and caregiving co-exist. If the coefficient estimate on the interaction between employment and caregiving is positive, then employment amplifies caregivers' psychological distress; however, if it is negative, employment moderates caregivers' psychological distress.

Table 7 presents the estimation results. In the OLS model, the estimate on caregiving is 1.088 (0.173), which is significantly positive, and the estimate on employment is

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<sup>10</sup> The similarity between the OLS and IV estimates on caregiving suggests that informal parental care can be treated as exogenous in work decisions. Therefore, regardless of whether women are working, they are able to adjust in order to care for their elderly parents.

<sup>11</sup> Because self-assessed health is based on the respondent's subjective assessment, it tends to overlap with psychological distress measured by K6 scores. Therefore, we exclude it from the regression.

–0.363 (0.102), which is significantly negative. However, the estimate on the interaction between caregiving and employment is 0.071 (0.215), which is positive but small in magnitude and insignificant.

The FE model presents an even smaller association between caregiving and psychological distress; the FE estimate on caregiving is 0.692 (0.150) but still significant. The association between employment and psychological distress is less clear; the estimate on employment is –0.103 (0.115), which is negative but no longer significant. The estimate on the interaction between caregiving and work is –0.133 (0.173), which is negative and insignificant, indicating that work does not amplify the negative impact of caregiving on mental health. One plausible reason is that the positive mental health effect of performing multiple roles (which has been reported by Adelman (1994), Hao (2008), and Moen et al. (1992)) offsets the negative mental health effect of reduced leisure time and/or additional psychological pressures.<sup>12</sup>

## 5 Conclusions

A negative association has been observed between caregiving and female

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<sup>12</sup> We observe that those who both work and provide care for their elderly parents spend less time overall on caregiving than caregivers who do not work. Among female nonworkers, 30.8 percent spend more than 20 hours per week on informal care (intensive caregiving), whereas among female workers, 20.2 percent spend more than 20 hours per week on informal care. However, in the FE model in which we restrict the sample to caregivers, the estimate of the interaction between employment and intensive caregiving on the K6 score is –0.169 (0.410), which is negative, small and insignificant, while the estimates of intensive caregiving and employment are 1.144 (0.299) and –0.136 (0.219), respectively. This result suggests that work neither amplifies nor reduces caregivers' psychological distress, even though intensive caregiving itself has a large impact on caregivers' psychological distress.

employment in Japan. However, after we control for time-invariant individual heterogeneity, the association between caregiving and employment is negative and significant but small in magnitude. Furthermore, caregiving is not related to either hours or days worked per week. We further confirm that even though a negative association is found between caregiving and caregivers' mental health, employment does not increase the psychological distress already experienced by the caregivers as a result of their caregiving role. This result suggests that caregivers can remain in the labor force without feeling additional psychological pressure.

Overall, informal parental care appears not to be an extreme burden that could seriously harm employment for middle-aged women in Japan, probably because women with paid jobs tend to work relatively short hours and tend to have jobs with limited responsibility, regardless of their caregiving status. In the sample of the current study, the average hours worked per week among working women is 31.59 hours for caregivers and 33.41 hours for non-caregivers (as shown in Table 2). These hours are longer in the US: 36.94 hours for those who have ever been caregivers and 36.41 hours for those who have never been caregivers (Van Houtven et al. (2013); Table 3 using the Health and Retirement Study (HRS)).<sup>13</sup> The hours are also longer in Europe, at 36.52 hours for caregivers and 37.89 hours for non-caregivers (Sugano (2015); Table 4 using the Survey of Health, Ageing and Retirement in Europe (SHARE)). Women in Japan also tend to be engaged in jobs with limited responsibility. Among the working women in our sample,

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<sup>13</sup> It is not surprising that women who previously cared for their elderly parents but no longer do so are able to work longer hours than those who currently care for elderly parents. However, the average number of hours that middle-aged women work is longer by about three hours in the US than in Japan.

only 2.9 percent hold managerial positions, whereas 20.0 and 20.6 percent hold clerical and service positions, respectively. By comparison, the corresponding numbers for working men are 18.4 percent, 8.5 percent, and 7.5 percent, respectively. Therefore, if middle-aged women were given the same opportunities to work that men enjoy, caregiving could have a larger impact on their employment. However, we do not currently observe this situation in Japan.

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**Table 1.** Key features of respondents

|   |                       | All        | Caregivers | Non-caregivers |
|---|-----------------------|------------|------------|----------------|
| Age                                       | <i>M (SD)</i>         | 56.8 (1.8) | 56.9 (1.7) | 56.8 (1.8)     |
| Number of living children                 | <i>M (SD)</i>         | 2.1 (1.0)  | 2.0 (1.0)  | 2.1 (1.0)      |
| <i>Proportions (%)</i>                    |                       |            |            |                |
| Marital status                            | Married               | 89.1       | 89.1       | 89.1           |
|   | Separated             | 2.7        | 2.3        | 2.8            |
|   | Divorced/widowed      | 5.9        | 5.3        | 6.0            |
|   | Never married         | 2.3        | 3.5        | 2.0            |
| Educational attainment                    | Less than high school | 9.6        | 7.2        | 10.1           |
|   | High school           | 51.1       | 47.6       | 51.9           |
|   | Some college          | 28.7       | 32.3       | 28.0           |
|   | University            | 10.0       | 12.6       | 9.5            |
|   | Other                 | 0.5        | 0.3        | 0.5            |
| Self-assessed health                      | Excellent             | 4.7        | 3.2        | 5.1            |
|   | Very good             | 31.9       | 26.5       | 33.0           |
|   | Good                  | 46.9       | 49.0       | 46.5           |
|   | Fair                  | 13.3       | 17.7       | 12.4           |
|   | Poor                  | 2.5        | 2.8        | 2.5            |
|   | Very poor             | 0.6        | 0.8        | 0.5            |
| Physical functional limitation            | One                   | 3.8        | 5.7        | 3.4            |
|   | Two or more           | 5.1        | 5.6        | 5.0            |
| Having children younger than 18 years old |                       | 2.7        | 1.8        | 2.9            |
| Home mortgage                             |                       | 27.3       | 25.2       | 27.7           |
| <i>N</i>                                  |                       | 21,339     | 3,839      | 17,500         |

**Table 2.** Labor supply variables and K6 scores by caregiving status

|                          | Caregivers (A) |               | Non-caregivers (B) |               | Difference <sup>a</sup> (A–B) |               |
|--------------------------|----------------|---------------|--------------------|---------------|-------------------------------|---------------|
|                          | <i>M</i>       | ( <i>SD</i> ) | <i>M</i>           | ( <i>SD</i> ) | <i>M</i>                      | ( <i>SD</i> ) |
| Employment               | 0.622          | (0.235)       | 0.688              | (0.215)       | –0.066                        | (0.009)       |
| Hours worked per week    | 31.59          | (14.81)       | 33.41              | (14.45)       | –1.82                         | (0.34)        |
| Days worked per week     | 4.69           | (1.34)        | 4.84               | (1.18)        | –0.14                         | (0.03)        |
| K6 (range: 0–24)         | 10.74          | (4.54)        | 9.53               | (4.11)        | 1.21                          | (0.08)        |
| Father needs care        | 0.179          | (0.006)       | 0.045              | (0.002)       | 0.134                         | (0.006)       |
| Mother needs care        | 0.504          | (0.008)       | 0.104              | (0.002)       | 0.400                         | (0.008)       |
| Father-in-law needs care | 0.122          | (0.005)       | 0.031              | (0.001)       | 0.091                         | (0.005)       |
| Mother-in-law needs care | 0.390          | (0.008)       | 0.106              | (0.002)       | 0.284                         | (0.008)       |
| <i>N</i>                 | 3,839          |               | 17,500             |               |                               |               |

<sup>a</sup> All significant at the 0.1% significance level.

**Table 3.** The estimated association between informal caregiving and employment ( $N = 21,339$ )

| Dependent variable<br>= employment                       | OLS       |         | IV <sup>a</sup>    |         | FE        |         |
|--|-----------|---------|--------------------|---------|-----------|---------|
|  | Coef.     | (SE)    | Coef.              | (SE)    | Coef.     | (SE)    |
| Caregiving   | -0.053**  | (0.012) | -0.072**           | (0.023) | -0.028**  | (0.009) |
| Age  | 0.120     | (0.102) | 0.120              | (0.102) | 0.302***  | (0.084) |
| Age square   | -0.012    | (0.019) | -0.012             | (0.009) | -0.026*** | (0.007) |
| Marital status (ref. = married)                          |           |         |                    |         |           |         |
| Separated  | -0.010    | (0.031) | -0.011             | (0.031) | -0.004    | (0.020) |
| Divorced/widowed   | 0.167***  | (0.019) | 0.167***           | (0.019) | -0.110*   | (0.050) |
| Never married  | 0.188***  | (0.030) | 0.190***           | (0.030) | -0.066*** | (0.008) |
| Educational attainment (ref. = high school)              |           |         |                    |         |           |         |
| Less than high school                                    | 0.030     | (0.018) | 0.029              | (0.018) |           |         |
| Some college   | -0.001    | (0.013) | 0.000              | (0.013) |           |         |
| University   | -0.015    | (0.021) | -0.013             | (0.021) |           |         |
| Other  | -0.052    | (0.081) | -0.053             | (0.081) |           |         |
| Self-assessed health (ref. = fair)                       |           |         |                    |         |           |         |
| Excellent  | 0.013     | (0.020) | 0.012              | (0.020) | -0.012    | (0.013) |
| Very good  | 0.010     | (0.009) | 0.009              | (0.009) | -0.002    | (0.005) |
| Good   | -0.085*** | (0.014) | -0.084***          | (0.014) | -0.010*   | (0.008) |
| Poor   | -0.157*** | (0.026) | -0.157***          | (0.027) | -0.021*** | (0.018) |
| Very poor  | -0.270*** | (0.054) | -0.269***          | (0.054) | -0.019    | (0.042) |
| Physical functional limitation                           |           |         |                    |         |           |         |
| One  | -0.052*   | (0.021) | -0.050*            | (0.021) | -0.002    | (0.014) |
| Two or more  | -0.125*** | (0.022) | -0.125***          | (0.022) | -0.035*** | (0.013) |
| Number of living children                                | 0.030***  | (0.006) | 0.030***           | (0.006) | 0.002     | (0.006) |
| Children younger than 18 years                           | 0.004     | (0.030) | 0.003              | (0.030) | 0.001     | (0.020) |
| Home mortgage  | 0.066***  | (0.011) | 0.066***           | (0.011) | 0.027     | (0.011) |
| Endogeneity test   |           |         | 0.294 <sup>b</sup> |         |           |         |
| <i>F</i> -statistic of joint significance of instruments |           |         | 639.1              |         |           |         |
| Overidentification test                                  |           |         | 0.479 <sup>c</sup> |         |           |         |

<sup>a</sup> See the columns headed by “Employment” in Table 4 for the results of first-stage estimation. <sup>b</sup>  $p$ -value of null of exogeneity (Wu-Hausman test). <sup>c</sup>  $p$ -value of null of valid exclusion restrictions. \*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$ .

**Table 4.** The first stage estimation results in IV model

Dependent variable = caregiving

| Dependent variable in the second stage      | Employment           |         | K6 score             |         |
|---|----------------------|---------|----------------------|---------|
|   | Coef.                | (SE)    | Coef.                | (SE)    |
| Father's need for care                      | 0.236 <sup>***</sup> | (0.017) | 0.238 <sup>***</sup> | (0.017) |
| Mother's need for care                      | 0.372 <sup>***</sup> | (0.012) | 0.371 <sup>***</sup> | (0.012) |
| Father-in-law's need for care               | 0.250 <sup>***</sup> | (0.022) | 0.253 <sup>***</sup> | (0.022) |
| Mother-in-law's need for care               | 0.290 <sup>***</sup> | (0.012) | 0.290 <sup>***</sup> | (0.012) |
| Age   | -0.005               | (0.080) | -0.020               | (0.081) |
| Age square                                  | 0.001                | (0.007) | 0.002                | (0.007) |
| Marital status (ref. = married)             |                      |         |                      |         |
| Separated                                   | -0.034 <sup>*</sup>  | (0.015) | -0.037 <sup>*</sup>  | (0.015) |
| Divorced/widowed                            | 0.002                | (0.012) | 0.002                | (0.012) |
| Never married                               | 0.096 <sup>***</sup> | (0.023) | 0.097 <sup>***</sup> | (0.023) |
| Educational attainment (ref. = high school) |                      |         |                      |         |
| Less than high school                       | -0.030 <sup>**</sup> | (0.010) | -0.027 <sup>**</sup> | (0.010) |
| Some college                                | 0.022 <sup>**</sup>  | (0.008) | 0.022 <sup>**</sup>  | (0.008) |
| University                                  | 0.026 <sup>*</sup>   | (0.012) | 0.025 <sup>*</sup>   | (0.012) |
| Other                                       | -0.045               | (0.038) | -0.043               | (0.038) |
| Self-assessed health (ref. = fair)          |                      |         |                      |         |
| Excellent                                   | -0.031 <sup>**</sup> | (0.012) |                      |         |
| Very good                                   | -0.018 <sup>**</sup> | (0.006) |                      |         |
| Good  | 0.031 <sup>**</sup>  | (0.009) |                      |         |
| Poor  | -0.009               | (0.018) |                      |         |
| Very poor                                   | 0.022                | (0.037) |                      |         |
| Physical functional limitation              |                      |         |                      |         |
| One   | -0.039 <sup>*</sup>  | (0.015) | 0.054 <sup>***</sup> | (0.015) |
| Two or more                                 | -0.029 <sup>*</sup>  | (0.013) | -0.015               | (0.013) |
| Number of living children                   | -0.001               | (0.003) | -0.002               | (0.003) |
| Children younger than 18 years              | -0.029 <sup>*</sup>  | (0.014) | -0.029 <sup>*</sup>  | (0.014) |
| Home mortgage                               | -0.016 <sup>*</sup>  | (0.007) | -0.017               | (0.007) |
| <i>N</i>                                    | 21,339               |         | 20,959               |         |

\*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$

**Table 5.** The estimated association between informal caregiving and hours worked per day ( $N = 14,089$ )

| Dependent variable<br>= hours worked per week            | OLS       |         | IV <sup>a</sup>    |         | FE       |         |
|--|-----------|---------|--------------------|---------|----------|---------|
|  | Coef.     | (SE)    | Coef.              | (SE)    | Coef.    | (SE)    |
| Caregiving   | -1.939*** | (0.454) | -2.056*            | (0.885) | -0.208   | (0.326) |
| Age  | 0.121     | (4.040) | 0.123              | (4.036) | 6.153*   | (2.906) |
| Age square   | -0.017    | (0.357) | -0.017             | (0.357) | -0.552*  | (0.252) |
| Marital status (ref. = married)                          |           |         |                    |         |          |         |
| Separated  | 0.290     | (1.029) | 0.290              | (1.028) | 0.676    | (0.615) |
| Divorced/widowed   | 4.967***  | (0.642) | 4.966***           | (0.641) | -0.632   | (1.263) |
| Never married  | 7.553***  | (1.149) | 7.567***           | (1.145) | -4.068*  | (1.995) |
| Educational attainment (ref. = high school)              |           |         |                    |         |          |         |
| Less than high school                                    | 2.173**   | (0.633) | 2.169**            | (0.632) |          |         |
| Some college   | 1.016*    | (0.462) | 1.020*             | (0.462) |          |         |
| University   | 0.289     | (0.853) | 0.296              | (0.854) |          |         |
| Other  | 5.986*    | (2.717) | 5.985*             | (2.716) |          |         |
| Self-assessed health (ref. = fair)                       |           |         |                    |         |          |         |
| Excellent  | 0.296     | (0.747) | 0.289              | (0.748) | 0.361    | (0.559) |
| Very good  | -0.279    | (0.344) | -0.283             | (0.345) | 0.029    | (0.210) |
| Good   | 0.272     | (0.524) | 0.279              | (0.523) | -0.021   | (0.361) |
| Poor   | -0.269    | (1.558) | -0.291             | (1.558) | -1.582   | (0.978) |
| Very poor  | -1.002    | (2.771) | -0.996             | (2.768) | -8.885*  | (3.567) |
| Physical functional limitation                           |           |         |                    |         |          |         |
| One  | -0.916    | (0.792) | -0.909             | (0.792) | -0.177   | (0.643) |
| Two or more  | 0.272     | (1.083) | 0.273              | (1.082) | -1.046   | (0.827) |
| Number of living children                                | -0.068    | (0.210) | -0.068             | (0.209) | 0.198    | (0.236) |
| Children younger than 18 years                           | -3.196**  | (1.123) | -3.200**           | (1.122) | -2.805** | (1.026) |
| Home mortgage  | 1.056*    | (0.418) | 1.056*             | (0.417) | 0.247    | (0.422) |
| Endogeneity test   |           |         | 0.891 <sup>b</sup> |         |          |         |
| <i>F</i> -statistic of joint significance of instruments |           |         | 393.2              |         |          |         |
| Overidentification test                                  |           |         | 0.074 <sup>c</sup> |         |          |         |

<sup>a</sup> Results of the first-stage estimation are available upon request from the author. <sup>b</sup> *p*-value of null of exogeneity (Wu-Hausman test). <sup>c</sup> *p*-value of null of valid exclusion restrictions.

\*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$ .

**Table 6.** The estimated association between informal caregiving and days worked per week ( $N = 14,904$ )

| Dependent variable<br>= days worked per week             | OLS       |         | IV <sup>a</sup>    |         | FE       |         |
|--|-----------|---------|--------------------|---------|----------|---------|
|  | Coef.     | (SE)    | Coef.              | (SE)    | Coef.    | (SE)    |
| Caregiving   | -0.120**  | (0.041) | -0.161*            | (0.076) | 0.031    | (0.029) |
| Age  | 0.195     | (0.334) | 0.195              | (0.333) | 0.364    | (0.273) |
| Age square   | -0.018    | (0.030) | -0.018             | (0.029) | -0.034   | (0.024) |
| Marital status (ref. = married)                          |           |         |                    |         |          |         |
| Separated  | 0.017     | (0.090) | 0.197              | (0.090) | 0.063    | (0.065) |
| Divorced/widowed   | 0.300***  | (0.048) | 0.299***           | (0.048) | -0.216*  | (0.102) |
| Never married  | 0.387***  | (0.093) | 0.391***           | (0.093) | 0.399*   | (0.195) |
| Educational attainment (ref. = high school)              |           |         |                    |         |          |         |
| Less than high school                                    | 0.200***  | (0.053) | 0.198***           | (0.052) |          |         |
| Some college   | -0.053    | (0.038) | -0.052             | (0.038) |          |         |
| University   | -0.375*** | (0.067) | -0.372***          | (0.067) |          |         |
| Other  | 0.439     | (0.259) | 0.438              | (0.259) |          |         |
| Self-assessed health (ref. = fair)                       |           |         |                    |         |          |         |
| Excellent  | 0.050     | (0.065) | 0.047              | (0.065) | 0.062    | (0.041) |
| Very good  | 0.006     | (0.029) | 0.004              | (0.029) | -0.005   | (0.018) |
| Good   | -0.027    | (0.042) | -0.025             | (0.042) | 0.001    | (0.032) |
| Poor   | -0.101    | (0.118) | -0.100             | (0.118) | -0.205*  | (0.085) |
| Very poor  | -0.396    | (0.336) | -0.394             | (0.335) | -0.897** | (0.331) |
| Physical functional limitation                           |           |         |                    |         |          |         |
| One  | -0.125*   | (0.063) | -0.122             | (0.063) | -0.080   | (0.056) |
| Two or more  | -0.087    | (0.096) | -0.086             | (0.096) | -0.181*  | (0.071) |
| Number of living children                                | 0.023     | (0.017) | 0.023              | (0.017) | -0.004   | (0.021) |
| Children younger than 18 years                           | -0.134    | (1.110) | -0.135             | (1.110) | -0.159   | (0.093) |
| Home mortgage  | 0.041     | (0.034) | 0.041              | (0.034) | 0.048    | (0.040) |
| <i>p</i> -value for the endogeneity test                 |           |         | 0.497 <sup>b</sup> |         |          |         |
| <i>F</i> -statistic of joint significance of instruments |           |         | 394.5              |         |          |         |
| <i>p</i> -value for the overidentifying restrictions     |           |         | 0.019 <sup>c</sup> |         |          |         |

<sup>a</sup> Results of the first-stage estimation are available upon request from the author. <sup>b</sup>

*p*-value of null of exogeneity (Wu-Hausman test). <sup>c</sup> *p*-value of null of valid exclusion restrictions. \*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$ .

**Table 7.** The association across informal caregiving, employment, and psychological distress ( $N = 20,959$ )

| Dependent variable<br>= K6 score            | OLS                   |         | FE                   |         |
|---|-----------------------|---------|----------------------|---------|
|   | Coef.                 | (SE)    | Coef.                | (SE)    |
| Caregiving                                  | 1.088 <sup>***</sup>  | (0.173) | 0.692 <sup>***</sup> | (0.150) |
| Employment                                  | -0.363 <sup>***</sup> | (0.102) | -0.103               | (0.115) |
| Caregiving $\times$ employment              | 0.071                 | (0.215) | -0.133               | (0.172) |
| Age   | -1.631                | (0.987) | 0.479                | (0.834) |
| Age square                                  | 0.131                 | (0.087) | -0.050               | (0.073) |
| Marital status (ref. = married)             |                       |         |                      |         |
| Separated                                   | -0.074                | (0.229) | 0.286                | (0.224) |
| Divorced/widowed                            | 0.088                 | (0.213) | 0.117                | (0.797) |
| Never married                               | -0.192                | (0.292) | -0.849               | (1.866) |
| Educational attainment (ref. = high school) |                       |         |                      |         |
| Less than high school                       | 0.572 <sup>***</sup>  | (0.162) |                      |         |
| Some college                                | 0.244 <sup>*</sup>    | (0.112) |                      |         |
| University                                  | 0.014                 | (0.158) |                      |         |
| Other                                       | -0.031                | (0.665) |                      |         |
| Physical functional limitation              |                       |         |                      |         |
| One   | 1.971 <sup>***</sup>  | (0.204) | 0.489 <sup>***</sup> | (0.152) |
| Two or more                                 | 3.503 <sup>***</sup>  | (0.218) | 1.375 <sup>***</sup> | (0.199) |
| Number of living children                   | -0.191 <sup>***</sup> | (0.046) | 0.063                | (0.061) |
| Children younger than 18 years              | 0.181                 | (0.271) | -0.170               | (0.258) |
| Home mortgage                               | -0.012                | (0.098) | 0.403 <sup>**</sup>  | (0.118) |

\*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$ .