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Intensive informal care and impairments in work productivity and activity

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Intensive Informal Care and Impairments in Work Productivity and Activity

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**Intensive Informal Care and Impairments
in Work Productivity and Activity**

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Ingo Kolodziej, Norma Coe and Courtney Van Houtven¹

Intensive Informal Care and Impairments in Work Productivity and Activity

Abstract

Informal care reduces work on the intensive and extensive margins; however, we do not know how caregiving affects work productivity. We link two new unique national U.S. data sets to provide the first causal estimates of the effect of providing at least 80 hours of informal care in the past month on work productivity, compared to less intensive caregiving. We control for caregiver selection into work using a Heckman selection model and use instrumental variables to estimate the causal effect of providing at least 80 hours in the past month on work productivity, using the Work Productivity and Activity Impairment (WPAI) instrument, and weekly hours worked. The IV is widowhood status of the care recipient. For both the OLS and IV results, providing at least 80 hours in the past month is associated with a 0.07-0.13 point increase in the WPAI compared to non-intensive caregivers, signifying lower work productivity. This result is mainly driven by presenteeism, or employees being less productive on the job, as opposed to absenteeism, measured by missed days of work. The OLS models are precisely estimated ($p < 0.001$) and IV results are not significantly different from zero at conventional levels. Intensive caregiving is also associated with about 3 fewer hours of weekly work compared to less intensive caregiving in OLS (non-significant with IV) and intensive caregivers are about 7 percentage points less likely to work full-time compared to part-time in OLS (non-significant with IV). Our findings begin to explain mechanisms by which caregivers experience wage penalties. Building data sets with work productivity for caregivers and non-caregivers alike would allow us to estimate the net societal benefits of caregiving and work productivity.

JEL-Code: C36, I1, J14, J24

Keywords: Informal care; work productivity; Heckman selection correction; instrumental variables

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1. Introduction

The traditional source of long-term care in the home in the United States has been family and friends acting as unpaid, usually untrained informal caregivers. The last 20 years have seen considerable expansion in formal home health care programs, through Medicaid, Medicare, and local agencies. Recent evidence shows that a larger proportion of older, disabled adults are accessing formal home care in the home than in the past, around 37% in 2016 (Van Houtven et al. 2020). Despite these increases in formal home care, informal care has remained stable over the past decade and remains the most prevalent source of home care, with almost three-quarters of disabled adults receiving informal care in 2016. Furthermore, upwards of 30% of disabled older adults used both formal and informal home care in 2016, therefore, informal care remains a common and potentially complementary source of long-term care in the home (Van Houtven et al. 2020). Simultaneously, adult daughters, the traditional providers of informal care to older parents, today are working at higher rates than ever before and there is increasing demand for older workers to remain in the labor force. Thus, there are concerns that informal care supply will not keep pace with demand.

Providing care to a dependent older adult can be meaningful and rewarding. However, it can also be stressful and involve physical and psychological challenges (Coe and Van Houtven, 2009; Kolodziej et al., 2022) including difficulties maintaining usual personal and working life activities. Currently, workers in the U.S. have minimal protections to help them balance caregiving and work; one can take up to 12 weeks of unpaid leave a year for caregiving responsibilities under the Family and Medical Leave Act (FMLA). However, studies have documented that FMLA is not a viable option for many caregivers, either due to eligibility restrictions or the difficulty of foregoing a paycheck (Wolff et al. 2019, U.S. Bureau of Labor Statistics 2019, 2021). The National Academies of Sciences and Medicine (2016) and Wolff et al. (2016) urge for a concerted and unified strategy in the United States that, among other goals, expands support and training for unpaid caregivers using evidence-based programs. The RAISE Family Caregivers Act, passed in January 2018, aims to increase supports for education, information, and training programs for caregivers; strives to make improvements in respite care options for unpaid caregivers, and prioritizes addressing “financial security and workplace issues for caregivers.” Importantly, the law required a national strategy for caregiver support be established over 18 months (AARP 2019), and the proposed strategy was released in Fall 2022 (US Department of Health and Human Services, 2022). One component of the recommended strategies includes targeted support of caregivers who work for pay, to enable them to manage these dual duties.

Thus far, individual employers have led the charge to support working unpaid caregivers and not the federal government, mostly through modest initiatives such as counseling for strained workers or providing case management and/or resources to enable finding professional home care for family

members in need. At the state level, 9 states have passed paid family leave policies that cover paid leave for the employee, usually 6 weeks, and these policies allow the paid leave to be used for care for a family member with a serious health condition (National Academies of Science 2019). Furthermore, in late 2020 all states had to offer paid family leave as a part of a pandemic relief package (Families First Coronavirus Response Act) to employees employed for at least 30 days. This temporary benefit (U.S. Department of Labor 2021) provided vital, but temporary (from 2-10 weeks) and partial coverage, for workers with caregiving duties (NAC and AARP 2021). This was the first federal-level program since FMLA was enacted, and expired December 31, 2020.

In light of competing demands for caregiving and work and limited worker protections, and the RAISE Family Caregiver Act that aims to support working caregivers so that they will remain in the labor force, it is important to understand the ramifications of intensity of caregiving on work productivity and hours worked. While work intensity has been examined, the implications of caregiving on work productivity and activity impairment have not. In this paper, we fill a gap by estimating the causal effect of caregiving intensity on work productivity, using the Work Productivity and Activity Impairment (WPAI) instrument, of adult children providing care to their parents in the U.S. To our knowledge, investigations concerning informal care and work productivity thus far have been correlational (e.g., Wolff et al. 2010, Giovannetti et al. 2009, Mazanec et al. 2011, Wolff et al. 2016, Hopps et al. 2017, Fakeye et al. 2022). Along with total changes in WPAI, we also consider its individual components, absenteeism and presenteeism. We also look at changes in hours worked among workers, in line with past literature and because changes in quantity of work could help interpret any observed changes to work productivity. We account for selection into working by applying the Heckman selection model and use instrumental variables (IV) to address endogeneity issues concerning caregiving, work hours and productivity.

Section 2 provides a review of the literature and country context, along with factors that may affect caregiver work productivity. Section 3 presents the novel data set linking caregiver observations with their parent care recipients; Section 4 describes the empirical strategy, including the Heckman Selection Model, the instrumental variables identifying the system of equations, and the main outcome model of informal care's effect on work productivity and hours worked per week among workers. Section 5 presents descriptive results, the strength of the instruments and first stage regression, and then the OLS and instrumental variables estimation for the work productivity and intensity outcomes, and sensitivity analyses. We find in the IV results that intensive caregiving does not change work productivity nor weekly hours of work. These null findings are robust to different definitions of caregiving intensity, including logged hours of care in the past month. Unable to reject exogeneity of intensive caregiving, we also present OLS results. The OLS results show that intensive

caregiving is associated with lower work productivity and 3 fewer hours worked per week on average. Section 6 presents a discussion and conclusion. If caregiver stated productivity reflects their actual productivity, our results suggest that the wage penalties observed in other research (especially for females) may be due to lower work productivity and fewer hours of work as our OLS results suggest. However, if endogeneity is present and undetected, our IV results suggest work productivity losses do not explain wage penalties, suggesting penalties arise from other factors such as wage discrimination.

2. Background

The U.S. has minimal worker protections compared to 34 of 38 other OECD countries. U.S. and Korea are the only OECD countries that do not guarantee paid sick leave coverage for personal illness (Raub et al. 2018). While paid sick leave coverage has increased in the U.S. over the past decade, it is largely employer-specific, and not guaranteed. 91% of state and local government employees, 89% of civilians, and 75% of private sector employees have paid sick leave. Since 1993 many working Americans have been guaranteed 12 weeks of unpaid leave through FMLA to manage serious personal illness, bond with a new child, or care for a sick family member. And yet, about 40 million Americans are excluded, such as part-time workers, those working for small private firms, or those who have been employed for less than a year (Wolff et al. 2019). Many studies have documented the inability to access unpaid leave for low-wage earners, thus FMLA is not a viable option for many working caregivers (U.S. Bureau of Labor Statistics 2019, 2021). Finally, although trade union membership, employee organizations and collective bargaining arrangements have fallen across nearly all OECD countries since the mid-1980s, they are lowest in the U.S., with only 10% of the work force represented by a union – compared to 17% on average across all 34 OECD countries (OECD 2017). The U.S. labor market context produces a tension between caregivers who work in an environment with few worker protections, and a need for caregivers to negotiate accommodations such as permission to work from home, permission to job share a full-time position or permission to move from full to part-time work. The result of such negotiations can determine whether a caregiver remains in the labor force, hours worked, and productivity.

Lack of worker protections could exacerbate difficulties in balancing caregiving and employment, which could manifest in three main work-related aspects, which have been the focus in previous research: difficulties remaining at work, difficulties maintaining the same number of hours, and difficulties returning to work after a caregiving spell (e.g. Lilly et al. 2010, Skira 2015, Van Houtven et al. 2013, Truskinovsky and Maestas 2018, Maestas et al 2020). Generally, the literature that focuses on causal methods, spanning several countries, finds modest reduction in labor force participation due

to caregiving and mixed evidence on whether caregivers who remain working reduce their hours of work¹.

In addition, there is evidence that caregivers, females particularly, experience wage penalties when they remain working (e.g. Van Houtven et al. 2013, Carmichael and Charles 2003), and are less likely to be hired and are evaluated more negatively on job-related factors than non-caregivers (Henle et al. 2020). It is unclear why these wage penalties arise. Wage penalties could be from caregivers reducing their work hours, valuing flexible work hours, moving to different jobs (lower wage, more flexible hours) to manage work and caregiver roles, losses in work productivity, or some other factor, such as discrimination.

Several potential pathways exist by which caregiving could impact work productivity. Caregiving negatively impacts health compared to non-caregivers (e.g. Coe and Van Houtven 2009, Heger 2017), which might directly impact work-related outcomes and possibly lead to loss in work productivity. Another pathway to lower work productivity could be through caregiver burden or strain (Cohen et al. 2015, Halpern et al. 2017, Riffin et al. 2019, Vick et al. 2019), which could lead to decrease in performance of employees due to increased caregiving and caregiving intensity. This could happen due to presenteeism (being distracted while being at the workplace), absenteeism (missing time at work) or both (Wolff et al. 2016). One recent paper found substantial increases in workplace absences after a caregiving spell begins (Truskinovsky and Maestas 2018). Finally, a simple reduction in hours worked could potentially explain why caregivers report being less productive at work or being less productive could lead caregivers to work more hours to try to increase productivity. We know of no studies that have examined work hours and productivity over long time horizons using causal inference methods.

Several studies consider the correlational relationship between caregiving and work productivity. Descriptive evidence suggests that there is a negative correlation between caregiving and work productivity in the U.S. (Hopps et al. 2017; Mazanec et al. 2011, Fakeye et al. 2022), and the overall productivity loss seems to be driven to a greater extent by presenteeism (Ganapathy et al. 2015)², though workplace absences increase in the months after a caregiving spell begins (Truskinovsky and Maestas, 2018). Larger productivity losses are associated with greater number of caregiving hours, higher cancer stage of the care recipient, marital status, and greater anxiety, depression, and burden related to financial problems, disrupted schedule, and health (Mazanec et al. 2011). Caregiver

¹ E.g. Leigh (2010), Michaud et al. (2010), Viitanen (2010), Meng (2012), Crespo and Mira (2014), Kolodziej et al. (2019) and Schmitz and Westphal (2017) for the extensive margin (see Bauer and Souza-Poza (2015) for an early overview), while Coe and Van Houtven (2009), Lilly et al. (2010), Kotsadam (2012) and Heger (2017) further consider the intensive margin.

² Ganapathy et al. (2015) calculate the mean total lost-productivity cost per employed caregiver at US\$835 per month with 72% attributable to presenteeism. Fakeye et al. (2022) estimate the cost associated to work productivity loss at US\$5600 per employed caregiver and likewise attribute this loss to presenteeism.

depression is positively associated with time missed at work (Wilson et al. 2007). Thus, our study fills an important gap by addressing sources of endogeneity and understanding a caregiving-specific measure of work productivity and activity impairment to estimate causal effects of caregiving on work behaviors. We take advantage of a unique data source that combines caregiver and care recipient data. It is important to note that inference from our approach is among caregivers with different levels of caregiving intensity (e.g. 20 hours or more a week versus 19 hours or less a week and more total hours per week versus less total hours). We cannot infer the effect of the extensive margin of caregiving on work productivity since we only observe caregivers in our data set.

3. Data

We use data from three waves (Rounds I, II and III) of the National Study of Caregiving (NSOC), a national study of people who help or have helped older family members and friends with their daily activities.³ NSOC was conducted concurrently with the National Health and Aging Trends Study (NHATS)⁴ and consists of caregivers to the respective NHATS sample persons.⁵ We use pooled cross-sectional data of NSOC combined with NHATS data and limit the sample to two-generational relationships, i.e. children of care recipients. The living arrangements of care recipients is not limited; they could be living without continued professional support in the community or in any type of residential care setting, including independent living, assisted living, special care, memory care or Alzheimer's unit, or nursing home. In the US context it is important to include caregiving provided across the full continuum of long-term care, including in institutional settings, because substantial informal caregiving is provided to individuals living in institutional settings (Coe and Werner 2022). Two caregivers can provide care to the same care recipient in our sample. The NSOC sample includes 1500 workers and 1300 nonworkers. Among working caregivers, 76% are sole caregivers to their respective care recipients.

We create an indicator variable of intensive caregiving defined as providing at least 20 hours of care per week (80 hours in the past month), so the comparison is intensive caregivers compared to non-intensive caregivers. We also use the natural logarithm of monthly caregiving hours as a measure of caregiving intensity to accommodate the distribution of caregiving hours in our sample and examine

³ The study is conducted by the Johns Hopkins Bloomberg School of Public Health with Westat and is sponsored by the U.S. Department of Health and Human Services with the support of the National Institute on Aging. Further see Kasper and Freedman (2018) and Freedman et al. (2019).

⁴ The National Health and Aging Trends Study (NHATS) is sponsored by the National Institute on Aging (grant number NIA U01AG032947) through a cooperative agreement with the Johns Hopkins Bloomberg School of Public Health.

⁵ NSOC I (2011) refers to NHATS 1, NSOC II (2015) to NHATS 5, NSOC III (2017) to NHATS 7.

effects of a single hour on outcomes of interest. To estimate loss in work productivity due to caregiving, we use a composite measure of stated presenteeism and absenteeism at work due to caregiving responsibilities (WPAI:CG). To construct this composite measure, the original Work Productivity and Activity Impairment (WPAI) questionnaire was adapted for caregivers (Wolff 2016). The WPAI is a validated tool to estimate work productivity loss for employed individuals with specific health problems (Giovannetti et al. 2009). The WPAI:CG is a patient-reported outcome (PRO) Instrument⁶ and measures the caregivers' assessment of the impact of elder care on work-productivity by quantifying the time missed from work together with reduced productivity while being at work (Wolff 2016; Giovannetti et al. 2009). Specifically, we follow Wolff (2016) to calculate WPAI:CG in the NSOC.

Absenteeism is measured as the ratio of hours missed from work due to caregiving from the hours actually worked plus hours missed due to caregiving. For presenteeism, respondents are asked on a scale from 1 to 10 to what degree caregiving affected their productivity while at work. Presenteeism then is measured as a percentage of the stated number from the maximum possible (10). Finally, productivity loss is a composite measure of absenteeism and presentism: it is calculated as a percentage equal to the sum of absenteeism and the percentage of time worked times presenteeism, and it is top-coded at 1. A higher score on the WPAI means a caregiver is less productive at work.

[Table 1 about here]

4. Empirical Strategy

All individuals in NSOC are caregivers, but only some are employed. In the first step, we predict the probability of working by using the Heckman selection model. Second, conditional on working, we estimate the causal effect of intensive caregiving, e.g., providing at least 80 hours in the past month, on i) work productivity and activity impairment and ii) working hours. We account for endogeneity of caregiving intensity by instrumenting with widowhood status of the care recipient. We further consider caregiving hours per week among working caregivers, taking the natural logarithm due to skewness in the distribution. We bootstrap the standard errors to address correlation due to repeated observations from care recipients who have multiple caregivers.

4.1 Heckman selection with endogenous treatment

Working status is not randomly distributed among caregivers – it is likely correlated with unobservable characteristics that could also influence our productivity outcomes. We hypothesize that caregivers who would suffer the highest productivity losses due to caregiving have left employment. Therefore,

⁶ See the Johns Hopkins Bloomberg School of Public Health (<https://www.jhsph.edu/research/centers-and-institutes/health-services-outcomes-research/data-resources/PRO-tools/index.html>)

if this selection is not taken into account, the selection bias for the caregivers would result in an underestimation of productivity loss in our study. To account for this in our model, we first estimate the selection equation and model the probability of working (Heckman 1974, 1976).

$$\text{Prob}(D=1 | X_1) = \Phi(X_1\gamma) \quad (1)$$

Where D indicates employment, X_1 is a vector of individual-level variables⁷, and Φ is the cumulative distribution of the standard normal distribution. This yields an individual-level prediction for the probability of being employed, which is then transformed into the inverse Mills ratio in the second stage. So that our estimation strategy does not rely solely on functional form assumptions, we include variables that predict employment in X_1 that are not in the WPAI equation in the second stage. Our omitted variable is an indicator for being above age 62--the early retirement age in the U.S. Social Security system. There is no a priori reason to think that productivity is discontinuously tied to age, and specifically age 62, that would lead to large reductions in employment offers or wages. Instead, it is more plausible that the ability to claim Social Security benefits, and the implicit indication of a retirement "age", is likely drawing individuals out of the labor market discontinuously at age 62 regardless of their productivity or wage offers. Parameters from retirement plans have been used in several US and international contexts to explain exogenously induced incentives to retire from work; we use the same parameter in the US context to estimate the probability of working (e.g., Coe and Zamarro (2011), Coe et al. (2011), Rohwedder and Willis (2010), Insler (2014), Mazzonna and Peracchi (2017), Kolodziej and García-Gómez (2019)).

[Figure 1 about here]

The second stage estimates the productivity loss, conditional on employment.

$$E[\text{WPAI} | X_2, D=1] = X_2 \beta_1 + \rho \sigma_u \lambda(X_1\gamma) \quad (2)$$

Where ρ is the correlation between the unobserved determinants of working and unobserved determinants of productivity, σ_u is the standard deviation of the error term in the WPAI equation, and $\lambda(X_1\gamma)$ is the inverse Mills ratio evaluated at $X_1\gamma$.

[Table 2 about here]

⁷ Including socio-economic and general health indicators on caregiver level, as well as care recipient's health indicators, whether a proxy answered the care recipients' questions, whether the care recipient lives in an assisted living facility and NSOC rounds indicators (see table 2).

4.2 Instrumental variables

There are concerns in the economics of informal care literature that non-random selection into caregiving exists. In our case, such selection could arise if those less productive at work are more likely to become caregivers of one's parents. Since our sample includes only caregivers, we cannot use a similar selection model for caregiving. But the same logic might apply, that is, those caregivers with less labor attachment and/or less productive efforts at work, may be more likely to become intensive caregivers. As such, we assume that endogeneity exists in the relationship between intensive caregiving and work and we augment this equation using an instrumental variable, the widowhood status of the care recipient, to capture the potentially endogenous variable of providing at least 80 hours in the past month (Wooldridge 2010).

The first stage equation is

$$CG = \alpha_1 + \alpha_2 X_3 + \alpha_3 Z_1 + \varepsilon \quad (3)$$

where CG is an indicator for caregiving more than 80 hours a month (or in specification checks, logged hours of caregiving per week). X_3 is a set of individual-level characteristics⁸, and Z_1 is the instrument – widowhood status of the care recipient. Similar to previous literature⁹, we use the widowhood status of the parent as an instrument for informal caregiving behavior: If a parent is widowed, this increases his/her need for assistance which likely comes from his or her child (Wolf et al. 2015, Heger 2017). Widowhood of the parent is exogenous since it is unlikely to be altered by the child of the dependent parent. The death of a parent does not have a direct effect on mental health of the child (Coe and Van Houtven 2009) and should hence not influence work behavior directly through a bereavement effect (Van Houtven et al. 2013; Brown, Coile and Weisbenner, 2010).¹⁰

⁸ Including socio-economic and general health indicators as well as information on work type and flexibility on caregiver level, as well as care recipient's health indicators, whether a proxy answered the care recipients' questions, whether the care recipient lives in a residential care setting and NSOC rounds indicators (see tables 3 and 4).

⁹ E.g. Kolodziej et al. (2018) use separate indicators on whether the mother or the father is widowed as instrument for the probability to provide care. Coe and Van Houtven (2009) use the death of a parent as instrument for selection out of caregiving. Similarly, Heger (2017) uses an indicator on whether only one parent is alive as an instrument for caregiving hours.

¹⁰ We cannot rule out that shared lifestyle or environmental factors concordantly affect health of couples. However, we are not exploiting the event of a recent sudden death of a spouse as a discontinuous jump which could increase care needs separate from just being widowed and not having an in-home care provider – such as if the spouse died in a car accident that also involved the surviving spouse. Instead, we only use widowhood status which could have happened a long time ago.

One potential channel that could violate our exclusion criteria is through inheritances received upon the death of one parent. While large inheritances have been shown to decrease labor market participation (Holtz-Eakin et al. 1993), median inheritances in the U.S. are about \$55,000 (Anderson, 2019) and have modest effects on a family's financial ability to retire (Munnell et al. 2011). The potential inheritance here is likely even smaller, and thus less likely to have an impact on labor market decisions, since there is a surviving spouse (the parent care recipient), who typically would receive the full estate upon widowhood until his/her own death, at which time the remainder would be split among all children. Furthermore, we do not know the timing of widowhood, which could have taken place many years before the caregiving decision.

The final stage then brings it all together, combining equations 2 and 3,

$$E[Y|X_2, D=1] = X_2 \beta_1 + \beta_2 \widehat{CG} + \rho \sigma_u \lambda(X_1 \gamma) \quad (4)$$

Where Y is our two main outcomes of interest, WPAI and hours worked. β_2 is the coefficient of interest, measuring the causal relationship between intensive caregiving and our work outcomes.

5. Results

Descriptive. In the sample of caregiving adult children, working and non-working caregivers had been providing care for 7 years on average (Table 1). The working caregivers were generally providing lower intensity of caregiving, both in terms of mean hours per month overall--63 hours compared to 109 hours among non-working caregivers; and in the mean hours of personal care provided--29 hours for working caregivers versus 49 hours among non-working caregivers. As an additional measure of intensity, the proportion of working caregivers who provided at least 80 hours a month was lower than the proportion of non-working caregivers--26% versus 40%, respectively.

Three-quarters of the employed adult caregivers in our sample worked full-time with mean weekly hours of 36.8. Nearly two-thirds of working caregivers reported having flexible work hours and being a white-collar worker, whereas 18% were services workers and 12% were blue-collar workers. The mean score of the work productivity and activity impairment indicator is at 0.08.

The respondents are most commonly in the 50-59 age group, about two-thirds are daughters, half are married, and one-third had an Associate's degree or other training beyond high school. Whereas nearly two-third are white, around 30% are Black and around 6-7% are Hispanic. Only one-fifth of working caregivers had reached their early retirement age, whereas 48% had reached that age among non-workers. The working caregivers were descriptively better off financially than non-working caregivers,

in that their average household income was substantially higher, \$75,000 in past year compared to \$47,000, and three-fourths of working caregivers had a retirement plan compared to just under half of non-working caregivers.

The majority of older parent care recipients were unmarried and female, 70% were age 80 or above, and the mean number of activity limitations was 5 out of a maximum of 12, which is similar to a representative sample for the U.S. (Spector and Fleishmann, 1998). The vast majority of care recipients had arthritis and high blood pressure, one-third had a heart disease and around 11% had experienced a heart attack. Just over one-third had diabetes. Care recipients of non-working caregivers tended to be older with higher mean functional limitations (5.6) and rates of chronic conditions. Overall, around 13-14% of care recipients resided in a residential care setting (including nursing homes).

Heckman selection model results. We estimated a probit model of the probability of working in order to create the inverse Mills ratio to include in the main outcomes equations. Table 2 highlights that only a few factors significantly affected the likelihood of working. Specifically, having reached the early retirement age (to obtain Social Security benefits) reduced the probability of working by 13.9 percentage points, which was the variable we assumed would uniquely predict work (but not providing at least 80 hours in the past month independently). Having lower self-rated health made one less likely to work by 6 percentage points, whereas the care recipient's previous stroke and having osteoporosis was associated with an 8- and 4-percentage point reduction in the probability of working respectively. Males were more likely to work than females and caregivers with a retirement plan were more likely to be working, perhaps reflecting a taste for work or a high-quality job.

First stage results. Controlling for selection into work, we then use widowhood of the care recipient as an IV to predict intensive caregiving among working adult children (as measured by caring at least 80 hours a month and separately as logged caregiving hours per month) (Table 3). This instrument is empirically strong and the magnitude is relatively large compared to other covariates. Both F-statistics are above the conventional marker of strength, 10. The F-stat for providing at least 80 hours in the past month is 11.25 (10.54 when clustering on caregiver identification number in the first stage, see Appendix A) and the F-statistic is 14.15 (12.53) for logged hours of caregiving. As an example of the strong magnitude, hours of caregiving were 27% higher for working adult children when an older parent was widowed compared to if he/she was not widowed (Wooldridge 2013).

[Table 3 about here]

Main results. Our preferred models include both IV and the inverse mills ratio from a Heckman selection model for selection into work. However, in the results tables we present OLS and IV results with and without Heckman corrections for full transparency, and because our Wu-Hausman test

results do not reject exogeneity of providing at least 80 hours in the past month (see table 3). There may still be endogeneity between providing at least 80 hours in the past month and work outcomes, but we are not able to detect it in these data.

Using OLS estimation, we find that providing at least 80 hours in the past month is significantly positively associated with lower work productivity (e.g., a higher WPAI Score) (Table 4, column 1), around 0.073 points on the WPAI Score, and 0.075 with Heckman correction ($p < 0.001$ for each). Moving to the IV results (2SLS), however, whereas the point estimates remain similar to the OLS models, with coefficients of 0.117-0.130 points on the WPAI Score depending on inclusion of the Heckman correction term or not (Table 4, columns 3 and 4), the standard errors are ten times higher, thus these are non-significant estimates. Across all models for WPAI the inverse mills ratio is not significant when considering selection into work, meaning we are not detecting selection bias. Appendix Table B1 shows that the findings are consistent when we measure caregiving intensity as log hours per week instead of a discrete measure of intensity.

Next, we examine whether providing at least 80 hours in the past month has an effect on hours worked per week (Table 5). The OLS estimation shows that providing at least 80 hours in the past month is associated with on average 3 fewer hours of work per week (2.3 hours when considering selection into work, table 5, column 2). Individuals are, on average, working 36.8 hours per week to frame the magnitude of the association to total usual hours worked.

Using an instrumental variable estimation approach (2SLS), we find that providing at least 80 hours in the past month does not affect hours worked regardless of whether we consider the Heckman correction for selection into our sample, our preferred specification (Table 5, column 4), or not (Table 5, column 3). However, compared to the OLS results, the estimated coefficient on providing at least 80 hours in the past month, while imprecisely estimated, increased in size, once we correct for endogeneity and sample selection. On average, providing at least 80 hours in the past month causes a non-significant 3.6-hour reduction in weekly hours worked compared to less intensive caregivers. Unlike in the models of work productivity described above, in both the OLS and IV models, the negative effect of the Inverse Mills Ratio is statistically significant and relatively large in the estimation of working hours (Table 5, column 2 and 4) which suggests that not accounting for selection into work would lead to biased estimates.

We also consider the individual components of the WPAI, absenteeism and presenteeism (Tables 6 and 7). In both cases, we find positive associations between intensive caregiving and the work productivity measures, though no significant effects in IV estimation. The main results on WPAI seem to be mainly driven by presenteeism. We further estimate the effect of intensive caregiving on working

full-time, i.e., working at least 30 hours per week as opposed to working fewer hours, i.e., working part-time (Table 8). Intensive caregivers are about 7 percentage points less likely to work full-time than working part-time in OLS (non-significant with IV).

Finally, Appendix Table B2 shows that findings are robust to measuring caregiving intensity as log hours per week. The same applies to both work outcomes considered, if we remove about 14% caregiving individuals that provide care to a parent that lives in a residential care setting (Appendix Table B3 and B4), which corresponds to about 200 working caregivers: While the coefficient of widowhood increases in magnitude (0.089 and 0.271), it is significant at the 0.1% level and we have a slightly higher F-statistic (13.4 and 16.2) in the first stage. While dropping caregivers of dependent parents in residential care setting does not affect the OLS results, the coefficient of providing at least 80 hours in the past month is larger and insignificant when considering endogeneity issues. Findings are further robust to including a sampling strata variable that indicates the stratum from which the Primary Sampling Units were drawn and addresses geographic clustering in the regression to account for the survey (Appendix Table B5 and B6).

[Table 4 about here]

[Table 5 about here]

6. Discussion and conclusion

Previous studies have found wage penalties due to caregiving (e.g., Carmichael and Charles 2003, Skira 2015, Schmitz and Westphal 2017 and Van Houtven et al. 2013) and losses in work productivity have been associated with lower work hours in past correlational work. We find, using a U.S. national data set that allows for examination of work productivity and caregiving, and accounting for endogeneity, that providing at least 80 hours in the past month does not change work productivity, as reported by caregivers; in addition, providing at least 80 hours in the past month does not affect caregiver weekly hours worked conditional upon working. Thus, if caregivers' stated productivity reflects their actual productivity, our results suggest that wage penalties observed in other research could be due to other factors.

The rigidity in working hours in the US may be dampening a caregiver's ability to change their work hours given their choice to remain working. However, we also find little to no changes in work productivity and activity impairment (WPAI), suggesting that caregivers that remain working do not have changes in on-the-job productivity. This could be achieved through various avenues, including

changing jobs to a lower wage job while remaining working, trading wages for flexibility or lower demands on the job. Wage discrimination against caregivers could also explain our findings in light of the reduced wages found earlier. However, we are unable to check potential explanations using this data source.

Importantly, our OLS results find statistically significantly and precisely estimated ($p < 0.001$) lower work productivity among intensive caregivers. Providing at least 80 hours in the past month is associated with around a 0.07 increase in the WPAI compared to non-intensive caregivers, signifying lower work productivity. Providing at least 80 hours in the past month also is associated with fewer hours worked compared to less intensive caregiving in OLS. If the OLS results are the true estimates, the findings support a potential mechanism by which other studies have found wage penalties for caregivers—work productivity and hours worked are both lower for intensive caregivers.

We find that the changes in WPAI in the OLS results are mainly driven by presenteeism. While the employer is able to observe absenteeism it is harder to observe presenteeism. With little or no caregiver support, workers might show up at work even if they are unable to focus or are multitasking to handle caregiving tasks from the work site. As it would be harder for the employer to fire a less productive employee based on these grounds, a measure taken by the employer can be to reduce wages. The empirical results that show that work productivity loss is driven by presenteeism are in line with this reasoning. Intensive caregivers might be more likely to be working from home in some occupations, making the research question even more relevant today. However, we do not have information on the rates of working from home among workers who report flexibility in their job, and we do not have post-pandemic data, when working from home increased for those with flexible jobs.

In the United States informal care remains the most common source of long-term care despite constraints on the supply of informal care providers from increased female labor market participation and increasing dependency ratios. The underlying mechanisms for caregivers who can manage the double burden of work and care in terms of work productivity and activity impairment, however, remain unclear. If there are health consequences from caregiving, which many others have found, it does not appear to be affecting the reported work productivity and activity impairment of the caregivers who remain in the labor force. This could be due to a “survivor of the fittest” effect. However, bias from self-reported presenteeism and absenteeism and the missing perspective of the employers are issues that we cannot address with our data. In particular, applying causal methods to explore important subgroups of caregivers could identify heterogeneous effects on work and productivity, and identify particularly resilient and non-resilient subgroups. Possible subgroups could be based on gender, by high versus low coping skills and/or ability to multi-task, or by strong attachment to work (perhaps through work history if available in the data). Characteristics of the care

recipient could also drive caregiver behavior. Whereas our models control for parent's dementia status, we do not have stage of dementia, nor do we know severity of other diseases. In addition, having employer data and employer perspectives on work productivity losses of caregivers could provide an important perspective that may refute or confirm our null findings on work productivity. If refuted, such findings could help to explain wage penalties for working caregivers (especially females).

Further, a recent paper by this team found that maintaining work productivity and caregiving activity comes at the expense of the caregivers' own mental health. Specifically, intensive caregivers had higher anxiety and lower relationship satisfaction with the care recipient (Kolodziej et al., 2022). Future work should examine whether the health of working caregivers suffers from a double burden of work and care and include employers' perspective to observe actual losses in productivity. Given substantial differences in caregiving support and labor market protections (such as unions) and benefits (such as sick leave), our study should further be expanded to other contexts i.e., countries with differing health care and long-term care systems to take advantage of the diversity in long-term care systems.

This study has several limitations. First, the results of our IV models must be interpreted as being local average treatment effects (LATE), i.e., the findings are attributed to people whose caregiving hours to a parent are altered by the widowhood status of the care dependent parent. There is a known efficiency loss to IV estimates compared to OLS which might cast doubt about the null findings in this context. However, considering the confidence interval of the coefficient of interest, the productivity loss due to providing at least 80 hours in the past month would be small: a one percent increase in the average weekly hours of caregiving would result maximum in an 0.008 increase in the baseline work productivity and activity impairment which still does not justify the observed wage differentials.

Second, our instrument only picks up hours of care provision but not the timing of the care hours provided. If timing changes (e.g. because there is no spouse to take up spontaneous caregiving needs), the estimated hours of care will not change. If spontaneous caregiving needs play a role, our instrument would not work since it estimates the caregiving hours provided, not the timing. Despite these limitations, we believe our paper moves the field forward as the first paper that we know of to directly estimate work productivity losses among working caregivers using causal methods to control for selection into continued work and endogeneity of caregiving intensity.

Third, the data sets used allow us to give the first glimpse at causal effects of providing at least 80 hours in the past month on work productivity in the U.S. However, we are not able to compare our findings to non-caregivers. Building data sets that allow for comparison of work productivity among caregivers AND similar non-caregivers is critically important. Work productivity could move in different ways for similar non-caregivers, such as through a negative 'family effect', that is, by simply having an

older parent with disability and caregiving needs an adult child may experience reductions in work productivity (Amirkhanyan and Wolf, 2006). Placing our findings in this larger context could help move towards understanding caregiving effects more completely and help guide labor and caregiver policy recommendations and formation.

Higher thresholds for F-statistics in IV-models might be preferred (Andrews et al. 2019, Lee et al. 2022). We considered an alternative definition of caregiving intensity, i.e., providing help with chores and/or personal care on a daily basis (Appendix Table B7). In this case, the coefficient of our instrument is larger (0.106) and significant at 0.001 level with an F-statistic of 23.75 and the results remain robust. We therefore conclude that lack of significant results from IV are not due to weak instruments.

Finally, whereas our preferred results are the IV estimates that use a Heckman selection correction factor, it is not clear whether OLS is the wrong approach in modeling caregiving intensity and work productivity in this application. Whereas non-random selection into a role of providing at least 80 hours in the past month may exist, more exogenous factors may drive whether a caregiver is intensive or not, such as parent severity. Intensive margin changes in caregiving may have less to do with tastes for work or past work performance. Endogeneity versus exogeneity of informal care is not entirely settled in the literature. In many articles using cross sectional data, tests for exogeneity of informal care and outcomes have rejected exogeneity, but in some longitudinal studies of caregiving and work, using individual fixed effects led to inability to reject exogeneity despite having strong instruments (Van Houtven et al., 2013). This paper provides a first step in quantifying the work productivity effects of caregiving in the US. Building data sets that includes work productivity measures for caregivers and non-caregivers alike would allow us to control for selection into caregiving and frame the societal net benefits of caregiving on work productivity.

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Tables

Table 1: Characteristics of Adult Children Caregivers by Work Status

	(1)		(2)	
	Mean	Obs	Mean	Obs
NSOC respondent information (caregiver level)				
Caregiving				
Any type of care: Hours per month	62.86	1458	108.59	1268
Personal care: Hours per month	28.95	1123	48.87	990
Caregiving intensity (constructed)	0.33	1457	0.54	1315
Intensive caregiving (min. 80 hours a month)	0.26	1458	0.40	1315
Number of years as a caregiver	7.21	1136	7.31	925
Work				
Work Productivity (WPAI) (higher is worse productivity or higher activity impairment)	0.08	1458	.	0
Hours per week usually worked	36.79	1458	.	0
Working full-time	0.79	1458	.	0
Working part-time	0.21	1458	.	0
Reported having flexible work hours	0.61	1458	.	0
White collar worker	0.67	1458	.	0
Service worker	0.18	1458	.	0
Blue collar worker	0.12	1458	.	0
Relationship				
Daughter	0.67	1458	0.72	1315
Son	0.33	1458	0.28	1315
Demographics				
Married	0.56	1458	0.50	1315
Race				
White	0.61	1458	0.60	1315
Black	0.28	1458	0.31	1315
Other	0.03	1458	0.03	1315
Ethnicity				
Hispanic	0.07	1458	0.06	1315
Reached early retirement age	0.18	1458	0.48	1315
Age in years				
30-39	0.05	1458	0.02	1315
40-49	0.21	1458	0.10	1315
50-59	0.48	1458	0.32	1315
60-69	0.24	1458	0.45	1315
70-79	0.02	1458	0.11	1315
Education				
9th to 12th grade or less	0.05	1458	0.12	1315
High school graduate	0.22	1458	0.27	1315
Associate's degree or less (beyond high school)	0.35	1458	0.34	1315
Bachelor's degree	0.21	1458	0.17	1315
Master's, professional, or doctorate	0.16	1458	0.10	1315
Education missing indicator	0.01	1458	0.01	1315

Household income last year (thousands)	75.04	1155	46.84	933
Accounts				
Has checking account	0.92	1453	0.82	1313
Has savings or money market account	0.75	1449	0.62	1310
Has certificate of deposit	0.18	1434	0.17	1297
Has retirement plan	0.75	1458	0.46	1315
Has stocks or mutual funds	0.27	1442	0.22	1301
NHATS respondent information (older parent)				
Married	0.27	1458	0.16	1315
Male	0.25	1458	0.16	1315
Age				
65-74	0.14	1458	0.09	1315
75-79	0.16	1458	0.09	1315
80-84	0.24	1458	0.20	1315
85-89	0.24	1458	0.26	1315
90+	0.22	1458	0.36	1315
Number of activity limitations	5.24	1458	5.64	1315
Chronic conditions (ever had)				
Heart attack	0.11	1458	0.11	1315
Heart disease	0.32	1458	0.32	1315
High blood pressure	0.79	1458	0.81	1315
Arthritis	0.76	1458	0.77	1315
Osteoporosis	0.35	1458	0.38	1315
Diabetes	0.36	1458	0.33	1315
Lung disease	0.24	1458	0.25	1315
Stroke	0.12	1458	0.15	1315
Dementia	0.24	1458	0.28	1315
Cancer	0.14	1458	0.14	1315
Lives in a residential care setting	0.14	1458	0.13	1315
NSOC Round I	0.31	1458	0.30	1315
NSOC Round II	0.33	1458	0.34	1315
NSOC Round III	0.36	1458	0.36	1315
Number of observations	1458		1315	

Note: Characteristics of working caregivers are shown for our main sample used for estimating working hours and WPAI. Characteristics of non-working caregivers are shown for individuals that are included in the first stage of the Heckman selection estimation. Number of observations for characteristics that are not included in the estimations can be lower than in the final sample due to missing values; number of observations are reported separately in these cases. Descriptive statistics for NSOC participants: caregivers of NHATS participants. Specific ADL-category and dementia assumed not to be present if cannot be derived from questionnaire. Individuals with missing information on type of occupation but who state to be working are included in the regressions in the base category together with white collar workers. Chronic conditions include past and current chronic conditions; the question asks whether a doctor ever told the NHATS participant that he/she had a condition. Residential care setting entails independent living, assisted living, special care, memory care or Alzheimer's unit, nursing home and other facility.

Table 2: Probit model estimating probability of working (versus not working), showing estimated marginal effects

	Working (m.e.)	Std. error
<i>NSOC respondent information (caregiver level)</i>		
Reached early retirement age	-0.139***	(0.030)
9th to 12th grade or less	-0.149	(0.115)
High school graduate	-0.080	(0.106)
Associate's degree or less (beyond high school)	-0.059	(0.107)
Bachelor's degree	-0.039	(0.108)
Master's, professional, or doctorate	-0.004	(0.109)
Has retirement plan	0.232***	(0.018)
Married	-0.021	(0.017)
Black	0.005	(0.025)
Other	0.041	(0.047)
Hispanic	0.034	(0.036)
Age in years	0.010	(0.009)
Age in years squared/100	-0.020*	(0.009)
General health	-0.064***	(0.009)
Male	0.042*	(0.017)
<i>NHATS respondent information (older parent)</i>		
Number of activity limitations	0.001	(0.003)
Proxy answered NHATS questions	-0.021	(0.030)
Heart attack	-0.007	(0.028)
Heart disease	0.008	(0.019)
High blood pressure	-0.015	(0.020)
Arthritis	0.023	(0.020)
Osteoporosis	-0.036*	(0.016)
Diabetes	0.025	(0.018)
Lung disease	-0.011	(0.020)
Stroke	-0.078**	(0.026)
Dementia	-0.023	(0.023)
Cancer	0.025	(0.023)
Lives in a residential care setting	-0.026	(0.023)
NSOC Round II	-0.013	(0.023)
NSOC Round III	0.010	(0.022)
Number of observations	2972	

Standard errors in parentheses. Nonparametric bootstrap estimation using 100 replications.

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

Table 3: First Stage - Effect of Widowhood on Intensive Caregiving measured as ≥ 80 hours a month and Log-Caregiving Hours per week

	Intensive caregiving vs. not	Std. error	Log- weekly caregiving hours	Std. error
<i>NSOC respondent information (caregiver level)</i>				
Widowed	0.074**	(0.023)	0.235***	(0.064)
Inverse Mills ratio	2.728***	(0.585)	5.398***	(1.522)
Reported having flexible work hours	0.078***	(0.020)	0.151**	(0.055)
Service worker	0.066	(0.035)	0.238**	(0.079)
Blue-collar worker	0.044	(0.035)	0.228**	(0.086)
Married	-0.072***	(0.021)	-0.309***	(0.068)
Black	0.164***	(0.033)	0.478***	(0.078)
Other	0.094	(0.059)	0.181	(0.165)
Hispanic	0.128**	(0.043)	0.519***	(0.124)
Age in years	0.010	(0.011)	0.027	(0.031)
Age in years squared/100	-0.020	(0.011)	-0.041	(0.031)
General Health	-0.006	(0.013)	0.049	(0.042)
Male	-0.091***	(0.021)	-0.356***	(0.071)
<i>NHATS respondent information (older parent)</i>				
Number of activity limitations	0.025***	(0.004)	0.074***	(0.012)
Proxy answered NHATS questions	0.016	(0.042)	-0.073	(0.109)
Heart attack	0.013	(0.038)	0.114	(0.090)
Heart disease	0.031	(0.022)	0.023	(0.073)
High blood pressure	-0.006	(0.025)	-0.017	(0.072)
Arthritis	0.006	(0.026)	-0.039	(0.071)
Osteoporosis	-0.003	(0.021)	0.051	(0.062)
Diabetes	-0.010	(0.025)	-0.015	(0.056)
Lung disease	0.025	(0.028)	0.117	(0.071)
Stroke	-0.044	(0.034)	-0.136	(0.102)
Dementia	0.003	(0.027)	0.099	(0.079)
Cancer	0.020	(0.025)	-0.106	(0.085)
Lives in a residential care setting	-0.133***	(0.023)	-0.477***	(0.075)
NSOC Round II	-0.026	(0.033)	-0.043	(0.078)
NSOC Round III	-0.023	(0.033)	-0.089	(0.078)
Constant	-0.112	(0.290)	2.199**	(0.812)
F-Stat	11.25		14.15	
Wu-Hausman F test	0.01920		0.00054	
	(P-value = 0,88980)		(P-value = 0.98144)	
Number of observations	1458		1458	

Standard errors in parentheses. Nonparametric bootstrap estimation using 100 replications.

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

Table 4: Effect of Intensive caregiving (defined as ≥ 80 hours a month) on work productivity and activity impairment (WPAI)

	(1)		(2)		(3)		(4)	
	OLS		OLS		IV		IV	
	No Heckman		Heckman		No Heckman		Heckman	
<i>NSOC respondent information (caregiver level)</i>								
Intensive caregiving	0.073***	(0.013)	0.075***	(0.013)	0.117	(0.140)	0.130	(0.154)
Inverse Mills ratio			-0.375	(0.268)			-0.531	(0.549)
Reported having flexible work hours	0.024*	(0.010)	0.025*	(0.010)	0.020	(0.017)	0.021	(0.016)
Service worker	-0.052***	(0.013)	-0.047***	(0.013)	-0.057**	(0.020)	-0.050**	(0.017)
Blue collar worker	-0.008	(0.017)	-0.005	(0.017)	-0.011	(0.020)	-0.007	(0.019)
Married	-0.009	(0.010)	-0.009	(0.010)	-0.006	(0.016)	-0.005	(0.016)
Black	-0.036**	(0.011)	-0.036**	(0.011)	-0.044	(0.028)	-0.045	(0.029)
Other	-0.029	(0.022)	-0.028	(0.022)	-0.033	(0.032)	-0.033	(0.032)
Hispanic	-0.035	(0.020)	-0.034	(0.020)	-0.041	(0.026)	-0.041	(0.026)
Age in years	0.001	(0.006)	-0.002	(0.006)	0.001	(0.006)	-0.003	(0.006)
Age in years squared/100	-0.001	(0.005)	0.003	(0.006)	-0.001	(0.006)	0.004	(0.007)
General Health	0.034***	(0.006)	0.038***	(0.006)	0.033***	(0.007)	0.039***	(0.007)
Male	-0.014	(0.010)	-0.016	(0.011)	-0.009	(0.019)	-0.011	(0.018)
<i>NHATS respondent information (older parent)</i>								
Number of activity limitations	0.007***	(0.002)	0.007***	(0.002)	0.006	(0.004)	0.006	(0.004)
Proxy answered NHATS questions	-0.040*	(0.016)	-0.040*	(0.016)	-0.041*	(0.017)	-0.041*	(0.018)
Heart attack	0.009	(0.019)	0.010	(0.019)	0.009	(0.021)	0.009	(0.021)
Heart disease	-0.003	(0.011)	-0.004	(0.011)	-0.004	(0.012)	-0.006	(0.013)
High blood pressure	-0.008	(0.013)	-0.007	(0.013)	-0.008	(0.013)	-0.007	(0.012)
Arthritis	-0.015	(0.009)	-0.015	(0.009)	-0.015	(0.010)	-0.016	(0.010)
Osteoporosis	0.016	(0.011)	0.017	(0.011)	0.015	(0.011)	0.018	(0.011)
Diabetes	-0.009	(0.011)	-0.009	(0.011)	-0.008	(0.012)	-0.009	(0.012)
Lung disease	0.019	(0.012)	0.020	(0.012)	0.017	(0.015)	0.019	(0.014)
Stroke	-0.012	(0.017)	-0.010	(0.017)	-0.011	(0.018)	-0.007	(0.020)
Dementia	0.015	(0.015)	0.017	(0.015)	0.015	(0.016)	0.017	(0.015)
Cancer	0.021	(0.016)	0.020	(0.016)	0.021	(0.017)	0.019	(0.017)
Lives in a residential care setting	0.014	(0.014)	0.013	(0.014)	0.019	(0.023)	0.020	(0.024)
NSOC Round II	0.015	(0.014)	0.015	(0.014)	0.016	(0.016)	0.017	(0.016)
NSOC Round III	0.000	(0.012)	-0.002	(0.013)	0.003	(0.015)	0.000	(0.014)
Constant	-0.039	(0.148)	0.030	(0.160)	-0.055	(0.160)	0.038	(0.163)
Number of observations	1458		1458		1458		1458	

Standard errors in parentheses. Nonparametric bootstrap estimation using 100 replications.

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

Table 5: Effect of Intensive caregiving (≥ 80 hours a month) on weekly hours worked

	(1) OLS No Heckman		(2) OLS Heckman		(3) IV No Heckman		(4) IV Heckman	
<i>NSOC respondent information (caregiver level)</i>								
intensive caregiving	-2.902***	(0.744)	-2.306**	(0.769)	-5.840	(7.485)	-3.586	(8.042)
Inverse Mills ratio			-95.547***	(18.981)			-91.938**	(33.958)
Reported having flexible work hours	-2.930***	(0.635)	-2.587***	(0.618)	-2.675**	(0.990)	-2.490**	(0.940)
Service worker	-5.828***	(0.942)	-4.429***	(0.977)	-5.509***	(1.365)	-4.346***	(1.152)
Blue collar worker	-0.157	(1.058)	0.555	(1.067)	0.035	(1.241)	0.610	(1.214)
Married	-1.082	(0.727)	-1.155	(0.711)	-1.288	(0.913)	-1.241	(0.922)
Black	1.114	(0.943)	1.290	(0.930)	1.631	(1.735)	1.505	(1.722)
Other	0.973	(2.015)	1.235	(2.058)	1.289	(2.293)	1.361	(2.312)
Hispanic	-0.064	(1.462)	0.088	(1.481)	0.316	(1.621)	0.245	(1.621)
Age in years	1.399***	(0.354)	0.656	(0.354)	1.369***	(0.389)	0.671	(0.404)
Age in years squared/100	-1.620***	(0.340)	-0.696	(0.357)	-1.600***	(0.370)	-0.722	(0.436)
General Health	-0.563	(0.407)	0.506	(0.448)	-0.484	(0.484)	0.500	(0.479)
Male	3.867***	(0.766)	3.330***	(0.764)	3.554**	(1.087)	3.217**	(1.033)
<i>NHATS respondent information (older parent)</i>								
Number of activity limitations	0.138	(0.107)	0.112	(0.103)	0.210	(0.221)	0.144	(0.230)
Proxy answered NHATS questions	-1.588	(1.243)	-1.567	(1.226)	-1.531	(1.317)	-1.543	(1.297)
Heart attack	1.037	(0.901)	1.070	(0.867)	1.073	(1.000)	1.085	(0.955)
Heart disease	0.065	(0.761)	-0.197	(0.751)	0.126	(0.740)	-0.161	(0.740)
High blood pressure	0.216	(0.832)	0.498	(0.819)	0.233	(0.844)	0.495	(0.838)
Arthritis	0.816	(0.859)	0.653	(0.835)	0.826	(0.971)	0.663	(0.939)
Osteoporosis	0.254	(0.715)	0.689	(0.707)	0.282	(0.717)	0.685	(0.709)
Diabetes	-0.231	(0.752)	-0.422	(0.739)	-0.286	(0.739)	-0.439	(0.720)
Lung disease	-2.446**	(0.762)	-2.032**	(0.759)	-2.326**	(0.829)	-1.996*	(0.782)
Stroke	1.150	(0.934)	1.874*	(0.939)	1.074	(1.033)	1.814	(1.101)
Dementia	1.846*	(0.801)	2.188**	(0.772)	1.886*	(0.844)	2.192**	(0.812)
Cancer	0.450	(1.022)	0.193	(1.016)	0.475	(1.068)	0.213	(1.066)
Lives in a residential care setting	1.930	(1.045)	1.829	(1.063)	1.551	(1.582)	1.670	(1.599)
NSOC Round II	0.022	(0.806)	-0.019	(0.801)	-0.071	(0.924)	-0.057	(0.937)
NSOC Round III	1.369	(0.836)	0.865	(0.835)	1.233	(0.889)	0.826	(0.862)
Constant	11.280	(9.378)	28.669**	(9.188)	12.382	(10.420)	28.484**	(10.219)
Number of observations	1458		1458		1458		1458	

Standard errors in parentheses. Nonparametric bootstrap estimation using 100 replications.

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

Table 6: Effect of Intensive caregiving (defined as ≥ 80 hours a month) on Absenteeism

	(1)		(2)		(3)		(4)	
	OLS		OLS		IV		IV	
	No Heckman		Heckman		No Heckman		Heckman	
<i>NSOC respondent information (caregiver level)</i>								
Intensive caregiving	0.012**	(0.004)	0.012**	(0.004)	-0.061	(0.042)	-0.067	(0.042)
Inverse Mills ratio			0.009	(0.063)			0.231	(0.143)
Reported having flexible work hours	0.001	(0.003)	0.001	(0.003)	0.008	(0.005)	0.007	(0.004)
Service worker	-0.003	(0.004)	-0.003	(0.004)	0.005	(0.005)	0.002	(0.005)
Blue collar worker	0.000	(0.004)	0.000	(0.004)	0.005	(0.005)	0.004	(0.005)
Married	0.000	(0.003)	0.000	(0.003)	-0.005	(0.004)	-0.005	(0.004)
Black	-0.009*	(0.004)	-0.009*	(0.004)	0.004	(0.009)	0.005	(0.008)
Other	-0.007	(0.006)	-0.007	(0.006)	0.001	(0.008)	0.000	(0.009)
Hispanic	-0.004	(0.005)	-0.004	(0.005)	0.006	(0.008)	0.006	(0.008)
Age in years	0.002**	(0.001)	0.002*	(0.001)	0.001	(0.001)	0.003	(0.002)
Age in years squared/100	-0.002*	(0.001)	-0.002	(0.001)	-0.001	(0.001)	-0.004	(0.002)
General Health	0.005***	(0.001)	0.005**	(0.002)	0.007***	(0.002)	0.004*	(0.002)
Male	-0.005	(0.003)	-0.005	(0.003)	-0.012*	(0.005)	-0.012*	(0.005)
<i>NHATS respondent information (older parent)</i>								
Number of activity limitations	0.001*	(0.000)	0.001*	(0.000)	0.003*	(0.001)	0.003**	(0.001)
Proxy answered NHATS questions	-0.011*	(0.005)	-0.011*	(0.005)	-0.009	(0.005)	-0.009	(0.006)
Heart attack	0.002	(0.005)	0.002	(0.005)	0.003	(0.005)	0.003	(0.005)
Heart disease	0.001	(0.003)	0.001	(0.003)	0.002	(0.003)	0.003	(0.004)
High blood pressure	0.003	(0.003)	0.003	(0.003)	0.003	(0.003)	0.003	(0.004)
Arthritis	-0.004	(0.003)	-0.004	(0.003)	-0.004	(0.004)	-0.003	(0.004)
Osteoporosis	-0.003	(0.003)	-0.003	(0.003)	-0.003	(0.003)	-0.004	(0.003)
Diabetes	0.004	(0.003)	0.004	(0.003)	0.003	(0.004)	0.003	(0.003)
Lung disease	0.003	(0.004)	0.003	(0.004)	0.006	(0.004)	0.005	(0.004)
Stroke	-0.006	(0.004)	-0.006	(0.004)	-0.008	(0.004)	-0.010	(0.005)
Dementia	0.004	(0.004)	0.004	(0.004)	0.005	(0.005)	0.004	(0.004)
Cancer	0.010*	(0.005)	0.010*	(0.005)	0.011*	(0.005)	0.011**	(0.004)
Lives in a residential care setting	0.002	(0.003)	0.002	(0.003)	-0.008	(0.006)	-0.008	(0.007)
NSOC Round II	0.003	(0.003)	0.003	(0.003)	0.000	(0.004)	0.000	(0.004)
NSOC Round III	0.001	(0.004)	0.001	(0.004)	-0.002	(0.004)	-0.001	(0.004)
Constant	-0.055**	(0.020)	-0.057*	(0.025)	-0.028	(0.031)	-0.068	(0.041)
Number of observations	1458		1458		1458		1458	

Standard errors in parentheses. Nonparametric bootstrap estimation using 100 replications.

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

Table 7: Effect of Intensive caregiving (defined as ≥ 80 hours a month) on Presenteeism

	(1)		(2)		(3)		(4)	
	OLS		OLS		IV		IV	
	No Heckman		Heckman		No Heckman		Heckman	
NSOC respondent information (caregiver level)								
Intensive caregiving	0.068***	(0.013)	0.070***	(0.013)	0.175	(0.135)	0.175	(0.135)
Inverse Mills ratio	0.024*	(0.009)	-0.354	(0.265)	-0.649	(0.457)	-0.649	(0.457)
Reported having flexible work hours	-0.050***	(0.013)	0.025**	(0.009)	0.017	(0.014)	0.017	(0.014)
Service worker	-0.009	(0.018)	-0.045***	(0.013)	-0.052**	(0.016)	-0.052**	(0.016)
Blue collar worker	-0.009	(0.011)	-0.006	(0.019)	-0.010	(0.017)	-0.010	(0.017)
Married	-0.033**	(0.011)	-0.010	(0.011)	-0.003	(0.014)	-0.003	(0.014)
Black	-0.026	(0.020)	-0.032**	(0.011)	-0.050	(0.026)	-0.050	(0.026)
Other	-0.036*	(0.018)	-0.025	(0.020)	-0.035	(0.030)	-0.035	(0.030)
Hispanic	-0.000	(0.006)	-0.035	(0.018)	-0.048	(0.026)	-0.048	(0.026)
Age in years	-0.000	(0.005)	-0.003	(0.006)	-0.004	(0.005)	-0.004	(0.005)
Age in years squared/100	0.032***	(0.006)	0.003	(0.006)	0.005	(0.006)	0.005	(0.006)
General Health	-0.009	(0.010)	0.036***	(0.006)	0.037***	(0.006)	0.037***	(0.006)
Male	0.068***	(0.013)	-0.011	(0.010)	-0.002	(0.016)	-0.002	(0.016)
NHATS respondent information (older parent)								
Number of activity limitations	0.007***	(0.002)	0.007***	(0.002)	0.004	(0.004)	0.004	(0.004)
Proxy answered NHATS questions	-0.035*	(0.016)	-0.035*	(0.016)	-0.037*	(0.018)	-0.037*	(0.018)
Heart attack	0.007	(0.018)	0.007	(0.018)	0.006	(0.016)	0.006	(0.016)
Heart disease	-0.005	(0.011)	-0.006	(0.011)	-0.009	(0.011)	-0.009	(0.011)
High blood pressure	-0.010	(0.012)	-0.009	(0.012)	-0.009	(0.012)	-0.009	(0.012)
Arthritis	-0.013	(0.009)	-0.014	(0.009)	-0.015	(0.012)	-0.015	(0.012)
Osteoporosis	0.019	(0.010)	0.020*	(0.010)	0.021*	(0.010)	0.021*	(0.010)
Diabetes	-0.011	(0.011)	-0.012	(0.011)	-0.010	(0.011)	-0.010	(0.011)
Lung disease	0.018	(0.012)	0.019	(0.012)	0.016	(0.012)	0.016	(0.012)
Stroke	-0.008	(0.016)	-0.005	(0.016)	0.000	(0.017)	0.000	(0.017)
Dementia	0.014	(0.014)	0.015	(0.014)	0.015	(0.014)	0.015	(0.014)
Cancer	0.016	(0.015)	0.015	(0.015)	0.014	(0.014)	0.014	(0.014)
Lives in a residential care setting	0.014	(0.014)	0.014	(0.014)	0.027	(0.022)	0.027	(0.022)
NSOC Round II	0.013	(0.013)	0.012	(0.013)	0.015	(0.013)	0.015	(0.013)
NSOC Round III	0.001	(0.011)	-0.001	(0.011)	0.002	(0.013)	0.002	(0.013)
Constant	-0.013	(0.148)	0.052	(0.162)	0.004	(0.004)	0.067	(0.132)
Number of observations	1458		1458		1458		1458	

Standard errors in parentheses. Nonparametric bootstrap estimation using 100 replications.

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

Table 8: Effect of Intensive caregiving (defined as ≥ 80 hours a month) on fulltime-work (≥ 30 hours/week; 1) vs. parttime-work (<30 hours/week; 0)

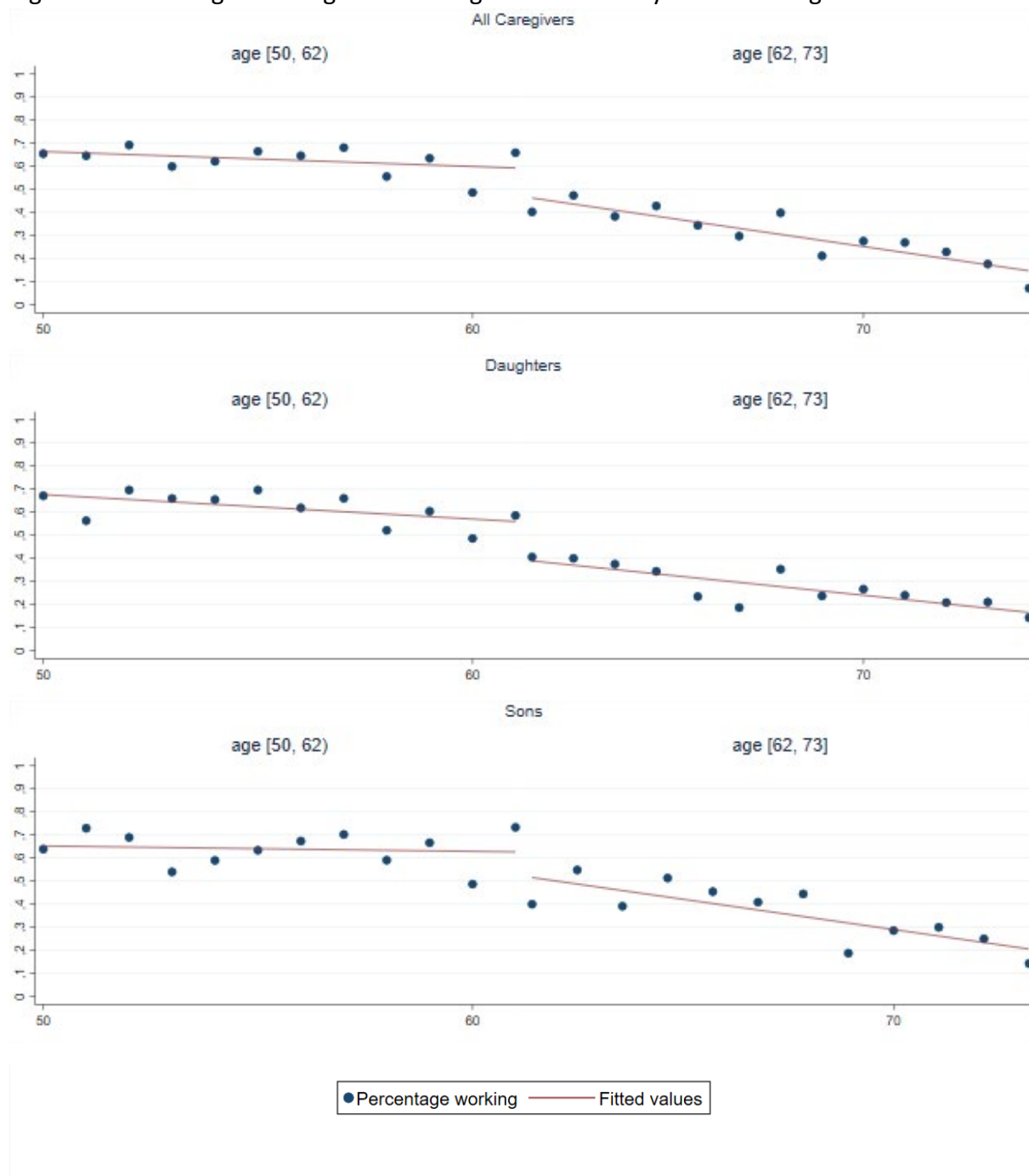
	(1)		(2)		(3)		(4)	
	OLS		OLS		IV		IV	
	No Heckman		Heckman		No Heckman		Heckman	
NSOC respondent information (caregiver level)								
Intensive caregiving	-0.069*	(0.028)	-0.048	(0.027)	-0.060	(0.275)	0.030	(0.293)
Inverse Mills ratio			-3.473***	(0.587)			-3.693***	(1.018)
Reported having flexible work hours	-0.111***	(0.020)	-0.099***	(0.020)	-0.112***	(0.033)	-0.105***	(0.032)
Service worker	-0.160***	(0.030)	-0.110***	(0.031)	-0.161***	(0.045)	-0.115**	(0.040)
Blue collar worker	0.009	(0.029)	0.034	(0.030)	0.008	(0.040)	0.031	(0.038)
Married	-0.024	(0.022)	-0.027	(0.021)	-0.024	(0.027)	-0.022	(0.028)
Black	0.068*	(0.028)	0.075**	(0.027)	0.067	(0.061)	0.062	(0.061)
Other	0.046	(0.050)	0.056	(0.051)	0.045	(0.061)	0.048	(0.062)
Hispanic	0.008	(0.045)	0.013	(0.044)	0.007	(0.055)	0.004	(0.055)
Age in years	0.044***	(0.012)	0.017	(0.012)	0.044***	(0.012)	0.016	(0.013)
Age in years squared/100	-0.052***	(0.012)	-0.018	(0.012)	-0.052***	(0.011)	-0.017	(0.015)
General Health	-0.008	(0.012)	0.031*	(0.012)	-0.008	(0.014)	0.032*	(0.012)
Male	0.076***	(0.021)	0.057**	(0.022)	0.077	(0.040)	0.064	(0.039)
NHATS respondent information (older parent)								
Number of activity limitations	0.006	(0.004)	0.005	(0.004)	0.006	(0.009)	0.003	(0.009)
Proxy answered NHATS questions	-0.007	(0.038)	-0.006	(0.038)	-0.007	(0.039)	-0.008	(0.039)
Heart attack	0.014	(0.032)	0.015	(0.030)	0.014	(0.032)	0.014	(0.031)
Heart disease	-0.016	(0.024)	-0.025	(0.023)	-0.016	(0.023)	-0.028	(0.022)
High blood pressure	0.028	(0.027)	0.039	(0.026)	0.028	(0.027)	0.039	(0.027)
Arthritis	0.011	(0.024)	0.005	(0.023)	0.011	(0.026)	0.004	(0.024)
Osteoporosis	0.014	(0.022)	0.029	(0.022)	0.013	(0.024)	0.030	(0.023)
Diabetes	-0.009	(0.025)	-0.016	(0.024)	-0.009	(0.026)	-0.015	(0.026)
Lung disease	-0.041	(0.023)	-0.026	(0.023)	-0.042	(0.027)	-0.028	(0.025)
Stroke	0.007	(0.033)	0.033	(0.033)	0.007	(0.032)	0.037	(0.033)
Dementia	0.034	(0.029)	0.046	(0.028)	0.034	(0.032)	0.046	(0.031)
Cancer	0.011	(0.035)	0.002	(0.035)	0.011	(0.035)	0.001	(0.036)
Lives in a residential care setting	0.062*	(0.028)	0.058*	(0.028)	0.063	(0.048)	0.068	(0.048)
NSOC Round II	-0.005	(0.026)	-0.006	(0.026)	-0.004	(0.029)	-0.004	(0.030)
NSOC Round III	0.009	(0.027)	-0.010	(0.027)	0.009	(0.029)	-0.007	(0.029)
Constant	0.004	(0.306)	0.636*	(0.313)	0.001	(0.318)	0.648	(0.334)
Number of observations	1458		1458		1458		1458	

Standard errors in parentheses. Nonparametric bootstrap estimation using 100 replications.

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

Figures

Figure 1: Percentage of Caregivers working -- break at early retirement age



APPENDIX A

NSOC changed design during the three waves we use. Wave 1 was originally designed to be cross-sectional; waves 2 and 3 longitudinal. This design change does not ensure that caregiver identification numbers are unique across waves. However, while we estimate robust standard errors in main specification, we cluster on caregiver identification number in robustness check to control for the possibility that caregiver behavior might be correlated over time. To cluster correctly, we ensure that caregiver identification numbers are distinct between wave 1 and waves 2 and 3. Significance levels in the first stage remain almost unchanged, though significance level of the instrument is even higher ($p < 0.001$) and the F-statistic is at 10.54 for intensive caregiving.

Table A1: First Stage - Effect of Widowhood on Intensive Caregiving measured as ≥ 80 hours a month and Log-Caregiving Hours per week

	Intensive caregiving vs. not	Std. error	Log-weekly caregiving hours	Std. error
<i>NSOC respondent information (caregiver level)</i>				
Widowed	0.074***	(0.022)	0.235***	(0.066)
Inverse Mills ratio	2.728***	(0.568)	5.398***	(1.475)
Reported having flexible work hours	0.078***	(0.020)	0.151**	(0.058)
Service worker	0.066	(0.034)	0.238**	(0.077)
Blue-collar worker	0.044	(0.032)	0.228*	(0.089)
Married	-0.072**	(0.022)	-0.309***	(0.072)
Black	0.164***	(0.029)	0.478***	(0.079)
Other	0.094	(0.061)	0.181	(0.182)
Hispanic	0.128**	(0.044)	0.519***	(0.123)
Age in years	0.010	(0.011)	0.027	(0.032)
Age in years squared/100	-0.020	(0.011)	-0.041	(0.031)
General Health	-0.006	(0.014)	0.049	(0.041)
Male	-0.091***	(0.020)	-0.356***	(0.077)
<i>NHATS respondent information (older parent)</i>				
Number of activity limitations	0.025***	(0.005)	0.074***	(0.011)
Proxy answered NHATS questions	0.016	(0.044)	-0.073	(0.111)
Heart attack	0.013	(0.037)	0.114	(0.089)
Heart disease	0.031	(0.024)	0.023	(0.074)
High blood pressure	-0.006	(0.025)	-0.017	(0.072)
Arthritis	0.006	(0.024)	-0.039	(0.069)
Osteoporosis	-0.003	(0.021)	0.051	(0.061)
Diabetes	-0.010	(0.024)	-0.015	(0.056)
Lung disease	0.025	(0.027)	0.117	(0.073)
Stroke	-0.044	(0.037)	-0.136	(0.101)
Dementia	0.003	(0.029)	0.099	(0.074)
Cancer	0.020	(0.027)	-0.106	(0.088)
Lives in a residential care setting	-0.133***	(0.022)	-0.477***	(0.077)
NSOC Round II	-0.026	(0.032)	-0.043	(0.087)
NSOC Round III	-0.023	(0.029)	-0.089	(0.076)
Constant	-0.112	(0.291)	2.199**	(0.833)
F-Stat	10.54		13.40	
Wu-Hausman F test	0.01920		0.00054	
	(P-value = 0,88980)		(P-value = 0.98144)	
Number of observations	1458		1458	

Standard errors in parentheses. Nonparametric bootstrap estimation using 100 replications.

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

APPENDIX B

Table B1: Specification check when measuring the effect of caregiving intensity as measured by log hours per month on WPAI

	(1) OLS No Heckman		1) OLS Heckman		(2) IV No Heckman		(3) IV Heckman	
<i>NSOC respondent information (caregiver level)</i>								
Log-caregiving hours	0.036***	(0.004)	0.036***	(0.004)	0.038	(0.049)	0.041	(0.051)
Inverse Mills ratio			-0.369	(0.260)			-0.397	(0.374)
Reported having flexible work hours	0.025**	(0.009)	0.026**	(0.009)	0.024*	(0.012)	0.025*	(0.011)
Service worker	-0.056***	(0.014)	-0.050***	(0.014)	-0.057**	(0.020)	-0.052**	(0.018)
Blue collar worker	-0.013	(0.018)	-0.010	(0.018)	-0.013	(0.021)	-0.011	(0.020)
Married	-0.003	(0.010)	-0.004	(0.010)	-0.003	(0.020)	-0.002	(0.020)
Black	-0.041***	(0.011)	-0.041***	(0.011)	-0.043	(0.024)	-0.043	(0.025)
Other	-0.028	(0.023)	-0.027	(0.023)	-0.029	(0.028)	-0.028	(0.028)
Hispanic	-0.044*	(0.020)	-0.043*	(0.020)	-0.045	(0.028)	-0.046	(0.028)
Age in years	0.000	(0.006)	-0.003	(0.006)	0.000	(0.006)	-0.003	(0.007)
Age in years squared/100	-0.001	(0.005)	0.003	(0.006)	-0.001	(0.006)	0.003	(0.007)
General Health	0.032***	(0.006)	0.036***	(0.007)	0.032***	(0.008)	0.036***	(0.007)
Male	-0.008	(0.010)	-0.010	(0.010)	-0.007	(0.020)	-0.008	(0.019)
<i>NHATS respondent information (older parent)</i>								
Number of activity limitations	0.007***	(0.002)	0.006***	(0.002)	0.006	(0.004)	0.006	(0.004)
Proxy answered NHATS questions	-0.036*	(0.015)	-0.036*	(0.015)	-0.036*	(0.017)	-0.036*	(0.017)
Heart attack	0.006	(0.018)	0.006	(0.018)	0.006	(0.020)	0.006	(0.020)
Heart disease	-0.002	(0.012)	-0.003	(0.012)	-0.002	(0.013)	-0.003	(0.013)
High blood pressure	-0.008	(0.012)	-0.007	(0.012)	-0.008	(0.013)	-0.007	(0.013)
Arthritis	-0.013	(0.010)	-0.013	(0.010)	-0.013	(0.010)	-0.013	(0.011)
Osteoporosis	0.014	(0.011)	0.015	(0.011)	0.014	(0.012)	0.015	(0.012)
Diabetes	-0.009	(0.011)	-0.009	(0.011)	-0.008	(0.011)	-0.009	(0.011)
Lung disease	0.016	(0.012)	0.018	(0.011)	0.016	(0.016)	0.017	(0.015)
Stroke	-0.011	(0.016)	-0.008	(0.016)	-0.010	(0.019)	-0.007	(0.020)
Dementia	0.012	(0.013)	0.013	(0.013)	0.012	(0.016)	0.013	(0.016)
Cancer	0.026	(0.016)	0.025	(0.016)	0.027	(0.019)	0.026	(0.019)
Lives in a residential care setting	0.021	(0.014)	0.020	(0.014)	0.022	(0.028)	0.022	(0.028)
NSOC Round II	0.015	(0.014)	0.015	(0.014)	0.015	(0.014)	0.015	(0.014)
NSOC Round III	0.002	(0.012)	0.000	(0.012)	0.003	(0.014)	0.001	(0.014)
Constant	-0.123	(0.148)	-0.057	(0.161)	-0.131	(0.210)	-0.067	(0.196)
Number of observations	1458		1458		1458		1458	

Standard errors in parentheses. Nonparametric bootstrap estimation using 100 replications.

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

Table B2: Specification test examining the effect of caregiving intensity as measured by log hours per week on hours worked

	(1)		(1)		(2)		(3)	
	OLS		OLS		IV		IV	
	No Heckman		Heckman		No Heckman		Heckman	
<i>NSOC respondent information (caregiver level)</i>								
Log-caregiving hours	-1.216***	(0.258)	-1.063***	(0.259)	-1.889	(3.076)	-1.131	(3.214)
Inverse Mills ratio			-96.001***	(18.252)			-95.616***	(28.967)
Reported having flexible work hours	-2.982***	(0.705)	-2.610***	(0.693)	-2.871**	(0.978)	-2.600**	(0.936)
Service worker	-5.749***	(0.943)	-4.328***	(0.997)	-5.530***	(1.488)	-4.312**	(1.337)
Blue collar worker	-0.019	(0.963)	0.694	(0.960)	0.162	(1.407)	0.709	(1.361)
Married	-1.241	(0.713)	-1.311	(0.687)	-1.442	(1.146)	-1.331	(1.141)
Black	1.217	(0.883)	1.422	(0.884)	1.557	(1.773)	1.455	(1.793)
Other	0.917	(1.839)	1.214	(1.858)	1.060	(2.116)	1.227	(2.154)
Hispanic	0.187	(1.435)	0.339	(1.463)	0.534	(1.941)	0.373	(1.949)
Age in years	1.414***	(0.316)	0.663*	(0.327)	1.405***	(0.327)	0.665	(0.358)
Age in years squared/100	-1.625***	(0.302)	-0.695*	(0.333)	-1.617***	(0.313)	-0.698	(0.381)
General Health	-0.500	(0.414)	0.573	(0.461)	-0.423	(0.569)	0.576	(0.530)
Male	3.708***	(0.723)	3.164***	(0.725)	3.449*	(1.433)	3.140*	(1.382)
<i>NHATS respondent information (older parent)</i>								
Number of activity limitations	0.157	(0.108)	0.134	(0.108)	0.207	(0.266)	0.140	(0.273)
Proxy answered NHATS questions	-1.719	(1.262)	-1.677	(1.262)	-1.761	(1.311)	-1.682	(1.315)
Heart attack	1.135	(0.939)	1.159	(0.916)	1.210	(1.097)	1.167	(1.068)
Heart disease	0.003	(0.788)	-0.247	(0.769)	0.002	(0.834)	-0.246	(0.812)
High blood pressure	0.213	(0.796)	0.498	(0.792)	0.221	(0.819)	0.498	(0.810)
Arthritis	0.756	(0.793)	0.601	(0.776)	0.729	(0.937)	0.599	(0.899)
Osteoporosis	0.317	(0.757)	0.748	(0.749)	0.367	(0.819)	0.752	(0.789)
Diabetes	-0.221	(0.760)	-0.419	(0.745)	-0.246	(0.754)	-0.420	(0.736)
Lung disease	-2.379**	(0.848)	-1.961*	(0.843)	-2.275*	(1.072)	-1.952	(1.008)
Stroke	1.099	(0.955)	1.827	(0.962)	1.030	(1.045)	1.817	(1.089)
Dementia	1.953*	(0.937)	2.287*	(0.923)	2.034*	(0.989)	2.294*	(0.974)
Cancer	0.261	(0.987)	0.028	(0.985)	0.170	(1.162)	0.020	(1.147)
Lives in a residential care setting	1.747	(0.999)	1.638	(1.019)	1.437	(1.808)	1.607	(1.835)
NSOC Round II	0.044	(0.801)	-0.007	(0.774)	0.005	(0.872)	-0.011	(0.853)
NSOC Round III	1.327	(0.860)	0.815	(0.851)	1.229	(0.909)	0.807	(0.860)
Constant	14.016	(8.584)	31.233***	(8.577)	16.134	(12.700)	31.375**	(10.344)
Number of observations	1458		1458		1458		1458	

Standard errors in parentheses. Nonparametric bootstrap estimation using 100 replications.

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

Table B3: Specification test examining the effect of caregiving intensity on WPAI and dropping residential care dependents

	(1)		1)		(2)		(3)	
	OLS		OLS		IV		IV	
	No Heckman		Heckman		No Heckman		Heckman	
NSOC respondent information (caregiver level)								
Log-caregiving hours	0.070***	(0.016)	0.073***	(0.015)	0.169	(0.133)	0.184	(0.150)
Inverse Mills ratio			-0.442	(0.293)			-0.781	(0.675)
Reported having flexible work hours	0.020*	(0.010)	0.022*	(0.010)	0.011	(0.015)	0.014	(0.015)
Service worker	-0.052***	(0.013)	-0.046***	(0.014)	-0.063**	(0.022)	-0.053**	(0.019)
Blue collar worker	-0.005	(0.020)	-0.002	(0.020)	-0.014	(0.024)	-0.009	(0.023)
Married	-0.014	(0.011)	-0.016	(0.011)	-0.006	(0.016)	-0.008	(0.015)
Black	-0.039**	(0.013)	-0.038**	(0.013)	-0.057*	(0.027)	-0.057*	(0.029)
Other	-0.026	(0.023)	-0.025	(0.023)	-0.037	(0.033)	-0.038	(0.033)
Hispanic	-0.034	(0.017)	-0.034	(0.017)	-0.044*	(0.021)	-0.045	(0.023)
Age in years	0.001	(0.006)	-0.002	(0.007)	0.002	(0.006)	-0.003	(0.007)
Age in years squared/100	-0.002	(0.006)	0.002	(0.007)	-0.003	(0.006)	0.004	(0.008)
General Health	0.034***	(0.007)	0.039***	(0.007)	0.031***	(0.009)	0.040***	(0.008)
Male	-0.012	(0.012)	-0.014	(0.012)	0.001	(0.020)	-0.003	(0.018)
NHATS respondent information (older parent)								
Number of activity limitations	0.008***	(0.002)	0.008***	(0.002)	0.005	(0.004)	0.004	(0.005)
Proxy answered NHATS questions	-0.042*	(0.018)	-0.042*	(0.018)	-0.046**	(0.017)	-0.045**	(0.017)
Heart attack	0.014	(0.017)	0.014	(0.017)	0.012	(0.018)	0.012	(0.019)
Heart disease	-0.008	(0.011)	-0.009	(0.011)	-0.010	(0.012)	-0.013	(0.012)
High blood pressure	-0.009	(0.014)	-0.008	(0.014)	-0.009	(0.015)	-0.008	(0.016)
Arthritis	-0.015	(0.013)	-0.017	(0.013)	-0.015	(0.014)	-0.017	(0.015)
Osteoporosis	0.016	(0.011)	0.018	(0.011)	0.014	(0.012)	0.018	(0.012)
Diabetes	-0.012	(0.012)	-0.013	(0.012)	-0.011	(0.012)	-0.012	(0.012)
Lung disease	0.017	(0.014)	0.019	(0.014)	0.013	(0.015)	0.016	(0.015)
Stroke	-0.021	(0.016)	-0.018	(0.016)	-0.018	(0.018)	-0.012	(0.020)
Dementia	0.015	(0.015)	0.016	(0.014)	0.013	(0.016)	0.016	(0.016)
Cancer	0.022	(0.017)	0.022	(0.018)	0.023	(0.018)	0.021	(0.018)
NSOC Round II	0.020	(0.014)	0.020	(0.014)	0.025	(0.017)	0.025	(0.018)
NSOC Round III	-0.001	(0.013)	-0.004	(0.013)	0.004	(0.016)	-0.000	(0.015)
Constant	-0.048	(0.170)	0.027	(0.181)	-0.089	(0.171)	0.040	(0.186)
Number of observations	1261		1261		1261		1261	

Standard errors in parentheses. Nonparametric bootstrap estimation using 100 replications.

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

Table B4: Specification test examining the effect of caregiving intensity on hours worked and dropping residential care dependents

	(1)		(1)		(2)		(3)	
	OLS		OLS		IV		IV	
	No Heckman		Heckman		No Heckman		Heckman	
NSOC respondent information (caregiver level)								
Log-caregiving hours	-3.571***	(0.897)	-2.919**	(0.894)	-6.643	(7.400)	-4.752	(8.686)
Inverse Mills ratio			-107.195***	(19.376)			-101.611**	(33.679)
Reported having flexible work hours	-3.212***	(0.731)	-2.803***	(0.718)	-2.939**	(1.093)	-2.664*	(1.065)
Service worker	-5.678***	(1.038)	-4.108***	(1.061)	-5.341***	(1.194)	-3.993***	(1.073)
Blue collar worker	0.576	(0.951)	1.369	(0.991)	0.836	(1.222)	1.480	(1.171)
Married	-1.029	(0.803)	-1.371	(0.786)	-1.280	(1.014)	-1.500	(0.980)
Black	1.351	(0.919)	1.533	(0.898)	1.891	(1.580)	1.839	(1.757)
Other	1.308	(1.966)	1.386	(2.044)	1.663	(2.183)	1.590	(2.212)
Hispanic	-0.288	(1.407)	-0.230	(1.393)	0.029	(1.663)	-0.047	(1.733)
Age in years	1.284***	(0.314)	0.512	(0.343)	1.246***	(0.347)	0.530	(0.365)
Age in years squared/100	-1.519***	(0.299)	-0.548	(0.352)	-1.492***	(0.323)	-0.582	(0.400)
General Health	-0.313	(0.398)	0.970*	(0.428)	-0.226	(0.469)	0.954*	(0.452)
Male	3.305***	(0.898)	2.702**	(0.905)	2.929*	(1.253)	2.513*	(1.257)
NHATS respondent information (older parent)								
Number of activity limitations	0.313*	(0.137)	0.293*	(0.134)	0.404	(0.269)	0.348	(0.291)
Proxy answered NHATS questions	-0.924	(1.254)	-0.814	(1.224)	-0.816	(1.393)	-0.757	(1.390)
Heart attack	0.768	(1.035)	0.771	(1.034)	0.834	(1.152)	0.810	(1.153)
Heart disease	-0.419	(0.850)	-0.808	(0.862)	-0.354	(0.911)	-0.750	(0.969)
High blood pressure	-0.126	(1.025)	0.117	(1.010)	-0.097	(1.050)	0.121	(1.070)
Arthritis	0.990	(0.827)	0.719	(0.849)	0.981	(0.821)	0.727	(0.850)
Osteoporosis	-0.082	(0.806)	0.418	(0.789)	-0.034	(0.854)	0.420	(0.834)
Diabetes	-0.649	(0.726)	-0.842	(0.715)	-0.691	(0.785)	-0.857	(0.764)
Lung disease	-2.694**	(0.936)	-2.262*	(0.931)	-2.576**	(0.966)	-2.215*	(0.943)
Stroke	0.921	(1.003)	1.713	(0.983)	0.818	(1.091)	1.612	(1.129)
Dementia	1.242	(1.006)	1.722	(0.984)	1.290	(1.056)	1.725	(1.069)
Cancer	0.653	(0.943)	0.437	(0.953)	0.648	(0.965)	0.446	(0.997)
Lives in a residential care setting	-0.017	(0.795)	-0.072	(0.793)	-0.151	(0.924)	-0.148	(0.985)
NSOC Round II	1.653	(0.895)	0.992	(0.890)	1.482	(1.032)	0.926	(0.986)
NSOC Round III	13.911	(8.157)	32.143***	(8.686)	15.163	(9.372)	31.926***	(9.216)
Constant	0.313*	(0.137)	0.293*	(0.134)	0.404	(0.269)	0.348	(0.291)
Number of observations	1261		1261		1261		1261	

Standard errors in parentheses. Nonparametric bootstrap estimation using 100 replications.

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

Table B5: Specification test examining the effect of caregiving intensity on WPAI including sampling strata to consider geographic clustering

	(1)		1)		(2)		(3)	
	OLS		OLS		IV		IV	
	No Heckman		Heckman		No Heckman		Heckman	
NSOC respondent information (caregiver level)								
Log-caregiving hours	0.073***	(0.013)	0.075***	(0.013)	0.117	(0.157)	0.130	(0.170)
Inverse Mills ratio			-0.379	(0.263)			-0.534	(0.555)
Reported having flexible work hours	0.024*	(0.010)	0.025**	(0.009)	0.020	(0.017)	0.021	(0.016)
Service worker	-0.052***	(0.014)	-0.047***	(0.014)	-0.057**	(0.021)	-0.050**	(0.018)
Blue collar worker	-0.008	(0.017)	-0.005	(0.017)	-0.011	(0.020)	-0.007	(0.019)
Married	-0.009	(0.011)	-0.009	(0.011)	-0.006	(0.017)	-0.005	(0.017)
Black	-0.038***	(0.011)	-0.037***	(0.011)	-0.045	(0.029)	-0.046	(0.029)
Other	-0.031	(0.021)	-0.030	(0.021)	-0.035	(0.031)	-0.035	(0.031)
Hispanic	-0.037*	(0.018)	-0.036*	(0.019)	-0.042	(0.025)	-0.043	(0.025)
Age in years	0.001	(0.006)	-0.002	(0.006)	0.001	(0.006)	-0.003	(0.007)
Age in years squared/100	-0.001	(0.005)	0.002	(0.006)	-0.001	(0.006)	0.004	(0.007)
General Health	0.034***	(0.006)	0.038***	(0.006)	0.033***	(0.007)	0.039***	(0.007)
Male	-0.014	(0.011)	-0.016	(0.011)	-0.009	(0.020)	-0.011	(0.019)
NHATS respondent information (older parent)								
Number of activity limitations	0.007***	(0.002)	0.007***	(0.002)	0.006	(0.004)	0.006	(0.005)
Proxy answered NHATS questions	-0.039*	(0.016)	-0.039*	(0.016)	-0.040*	(0.018)	-0.040*	(0.018)
Heart attack	0.009	(0.019)	0.010	(0.019)	0.009	(0.021)	0.009	(0.021)
Heart disease	-0.003	(0.011)	-0.004	(0.011)	-0.004	(0.012)	-0.006	(0.013)
High blood pressure	-0.008	(0.012)	-0.007	(0.012)	-0.008	(0.013)	-0.007	(0.013)
Arthritis	-0.015	(0.010)	-0.015	(0.011)	-0.015	(0.012)	-0.016	(0.012)
Osteoporosis	0.015	(0.011)	0.017	(0.011)	0.015	(0.012)	0.017	(0.011)
Diabetes	-0.009	(0.011)	-0.009	(0.011)	-0.008	(0.012)	-0.009	(0.012)
Lung disease	0.019	(0.012)	0.020	(0.012)	0.017	(0.015)	0.019	(0.014)
Stroke	-0.012	(0.018)	-0.010	(0.018)	-0.011	(0.019)	-0.007	(0.021)
Dementia	0.016	(0.014)	0.017	(0.014)	0.015	(0.015)	0.017	(0.015)
Cancer	0.020	(0.016)	0.019	(0.016)	0.020	(0.017)	0.019	(0.017)
Lives in a residential care setting	0.014	(0.014)	0.013	(0.014)	0.020	(0.026)	0.020	(0.026)
NSOC Round II	0.015	(0.013)	0.015	(0.013)	0.017	(0.015)	0.017	(0.015)
NSOC Round III	0.001	(0.012)	-0.001	(0.012)	0.003	(0.015)	0.000	(0.014)
Sampling strata	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
Constant	-0.044	(0.148)	0.024	(0.158)	-0.060	(0.163)	0.033	(0.165)
Number of observations	1458		1458		1458		1458	

Standard errors in parentheses. Nonparametric bootstrap estimation using 100 replications. Sampling strata variable indicates the stratum from which the Primary Sampling Units were drawn and addresses geographic clustering in the regression to account for the survey design. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B6: Specification test examining the effect of caregiving intensity on hours worked including sampling strata to consider geographic clustering

Geographic clustering

	(1)		(1)		(2)		(3)	
	OLS		OLS		IV		IV	
	No Heckman		Heckman		No Heckman		Heckman	
NSOC respondent information (caregiver level)								
Log-caregiving hours	-2.891***	(0.756)	-2.300**	(0.761)	-5.815	(8.724)	-3.571	(9.353)
Inverse Mills ratio			-95.295***	(18.316)			-91.724**	(34.316)
Reported having flexible work hours	-2.894***	(0.688)	-2.560***	(0.660)	-2.644*	(1.091)	-2.466*	(1.034)
Service worker	-5.815***	(0.927)	-4.423***	(0.943)	-5.499***	(1.443)	-4.340***	(1.213)
Blue collar worker	-0.165	(1.030)	0.547	(1.025)	0.027	(1.280)	0.602	(1.234)
Married	-1.087	(0.667)	-1.159	(0.657)	-1.292	(0.835)	-1.244	(0.853)
Black	1.234	(0.983)	1.382	(0.961)	1.735	(2.018)	1.590	(2.022)
Other	1.127	(1.794)	1.354	(1.814)	1.426	(2.083)	1.473	(2.130)
Hispanic	0.095	(1.488)	0.210	(1.508)	0.457	(1.812)	0.361	(1.795)
Age in years	1.389***	(0.348)	0.651	(0.348)	1.360***	(0.386)	0.666	(0.406)
Age in years squared/100	-1.609***	(0.338)	-0.691	(0.354)	-1.591***	(0.371)	-0.717	(0.443)
General Health	-0.556	(0.400)	0.509	(0.451)	-0.478	(0.496)	0.502	(0.479)
Male	3.882***	(0.759)	3.343***	(0.764)	3.569**	(1.207)	3.230**	(1.149)
NHATS respondent information (older parent)								
Number of activity limitations	-1.630	(1.215)	0.116	(0.108)	0.215	(0.260)	0.148	(0.275)
Proxy answered NHATS questions	1.031	(0.956)	-1.599	(1.185)	-1.569	(1.318)	-1.574	(1.288)
Heart attack	0.078	(0.768)	1.066	(0.929)	1.068	(1.036)	1.081	(1.002)
Heart disease	0.247	(0.931)	-0.186	(0.758)	0.137	(0.806)	-0.151	(0.813)
High blood pressure	0.817	(0.813)	0.522	(0.921)	0.261	(0.956)	0.517	(0.967)
Arthritis	0.267	(0.726)	0.654	(0.788)	0.827	(0.948)	0.665	(0.915)
Osteoporosis	-0.224	(0.774)	0.698	(0.720)	0.295	(0.735)	0.694	(0.725)
Diabetes	-2.444**	(0.858)	-0.417	(0.760)	-0.280	(0.790)	-0.433	(0.761)
Lung disease	1.155	(0.965)	-2.031*	(0.852)	-2.324*	(0.990)	-1.995*	(0.928)
Stroke	1.838*	(0.879)	1.876	(0.979)	1.080	(1.085)	1.817	(1.162)
Dementia	0.496	(1.020)	2.181**	(0.845)	1.878*	(0.934)	2.186*	(0.901)
Cancer	1.923	(1.037)	0.229	(1.019)	0.516	(1.061)	0.248	(1.060)
Lives in a residential care setting	0.017	(0.769)	1.824	(1.048)	1.546	(1.630)	1.667	(1.664)
NSOC Round II	1.360	(0.848)	-0.022	(0.757)	-0.075	(0.881)	-0.060	(0.887)
NSOC Round III	-0.016	(0.024)	0.859	(0.844)	1.226	(0.876)	0.821	(0.863)
Sampling strata	11.753	(9.262)	-0.013	(0.024)	-0.015	(0.025)	-0.012	(0.025)
Constant	-1.630	(1.215)	28.988**	(9.115)	12.800	(10.346)	28.789**	(10.274)
Number of observations	1458		1458		1458		1458	

Standard errors in parentheses. Nonparametric bootstrap estimation using 100 replications. Sampling strata variable indicates the stratum from which the Primary Sampling Units were drawn and addresses geographic clustering in the regression to account for the survey design. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B7: Effect of alternative definition of caregiving intensity, i.e., providing help with chores and/or personal care on a daily basis.

	(1)		(2)		(3)		(4)	
	OLS		OLS		IV		IV	
	No Heckman		Heckman		No Heckman		Heckman	
NSOC respondent information (caregiver level)								
Intensive caregiving	0.053***	(0.014)	0.054***	(0.014)	0.085	(0.101)	0.091	(0.106)
Inverse Mills ratio			-0.284	(0.280)			-0.364	(0.375)
Reported having flexible work hours	0.028**	(0.010)	0.029**	(0.010)	0.027**	(0.010)	0.028**	(0.010)
Service worker	-0.049***	(0.013)	-0.045***	(0.013)	-0.052***	(0.014)	-0.047***	(0.013)
Blue collar worker	-0.005	(0.016)	-0.003	(0.017)	-0.007	(0.019)	-0.004	(0.020)
Married	-0.008	(0.011)	-0.008	(0.011)	-0.004	(0.018)	-0.004	(0.018)
Black	-0.029*	(0.015)	-0.029	(0.015)	-0.033*	(0.015)	-0.033*	(0.015)
Other	-0.025	(0.022)	-0.024	(0.022)	-0.028	(0.023)	-0.027	(0.023)
Hispanic	-0.031	(0.021)	-0.030	(0.021)	-0.034	(0.021)	-0.034	(0.021)
Age in years	-0.001	(0.006)	-0.003	(0.006)	-0.001	(0.006)	-0.004	(0.007)
Age in years squared/100	-0.000	(0.005)	0.003	(0.006)	0.000	(0.005)	0.004	(0.007)
General Health	0.036***	(0.007)	0.039***	(0.008)	0.036***	(0.006)	0.040***	(0.007)
Male	-0.016	(0.010)	-0.018	(0.011)	-0.013	(0.015)	-0.014	(0.014)
NHATS respondent information (older parent)								
Number of activity limitations	0.008***	(0.002)	0.008***	(0.002)	0.007*	(0.003)	0.007*	(0.003)
Proxy answered NHATS questions	-0.040*	(0.019)	-0.040*	(0.019)	-0.041**	(0.015)	-0.041**	(0.015)
Heart attack	0.010	(0.018)	0.010	(0.018)	0.009	(0.018)	0.009	(0.018)
Heart disease	-0.002	(0.011)	-0.002	(0.011)	-0.002	(0.012)	-0.003	(0.011)
High blood pressure	-0.006	(0.012)	-0.006	(0.012)	-0.006	(0.012)	-0.005	(0.012)
Arthritis	-0.014	(0.012)	-0.015	(0.012)	-0.014	(0.010)	-0.015	(0.011)
Osteoporosis	0.017	(0.010)	0.018	(0.009)	0.017	(0.012)	0.019	(0.012)
Diabetes	-0.011	(0.011)	-0.011	(0.011)	-0.011	(0.011)	-0.012	(0.012)
Lung disease	0.020	(0.012)	0.021	(0.012)	0.018	(0.013)	0.020	(0.013)
Stroke	-0.014	(0.018)	-0.012	(0.018)	-0.014	(0.018)	-0.012	(0.018)
Dementia	0.015	(0.014)	0.016	(0.014)	0.014	(0.014)	0.015	(0.014)
Cancer	0.021	(0.014)	0.021	(0.014)	0.021	(0.017)	0.020	(0.017)
Lives in a residential care setting	0.014	(0.015)	0.013	(0.015)	0.019	(0.024)	0.020	(0.024)
NSOC Round II	0.015	(0.013)	0.015	(0.013)	0.017	(0.015)	0.017	(0.015)
NSOC Round III	0.000	(0.011)	-0.001	(0.011)	0.002	(0.014)	0.001	(0.013)
Constant	-0.002	(0.148)	0.050	(0.152)	0.003	(0.151)	0.071	(0.176)
Number of observations	1458		1458		1458		1458	

Standard errors in parentheses. Nonparametric bootstrap estimation using 100 replications.

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