The Effect of Informal Caregiving on Labor Market Outcomes: Evidence from Medicaid Aging Waivers

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Abstract

Informal caregiving has enormous costs on caregivers. However, estimating the exact costs of informal caregiving on caregivers is difficult due to the fact that caregivers select into caregiving. Existing estimates, therefore, may suffer from selection bias. In this paper, I use a new instrumental variable, policy-induced changes in funding to the Medicaid aging waiver program, to estimate the labor-market costs of informal caregiving. Using the Health and Retirement Study (HRS) from 1998 to 2014, I find that labor force participation decreases with informal care. I also demonstrate large differences in selection bias by types of care, and gender of caregivers. Estimates accommodating for the differences in endogeneity bias generate findings that conflict with previous estimates in the literature.

1 Introduction

Informal caregiving is common. Approximately one-third of Americans over age 50 are informal caregivers to their parents (Van Houtven et al., 2013). The majority of these caregivers provide care for one parent while 15% give care to two parents (Weber-Raley & Smith, 2015). There are approximately 60 million informal caregivers in the U.S. in 2019. More than three out of five informal caregivers are also in the labor workforce. To accommodate providing care, caregivers may have to adjust their work schedule by working fewer hours or withdrawing from work completely (Weber-Raley & Smith, 2015). Since informal caregiving is in general not compensated or subsidized, informal caregiving has the potential to generate loss in the labor market. In 2014, unpaid care nationwide was estimated to be valued at $522 billion (Chari et al., 2015).

A large number of studies estimate the effects of informal care on labor market outcomes. Their findings are mixed and inconsistent. Some studies show that the effects on labor force participation, work hours, and wages incurred by caregivers are significant and large (Muurinen, 1986; Stone & Short, 1990; Boaz & Muller, 1992; Arber & Ginn, 1995; Ettner, 1996; Pavalko & Artis, 1997; Carmichael & Charles, 1998; Johnson & Sasso, 2000; Pavalko & Henderson, 2006; Bolin et al., 2008; Casado-Marín et al., 2011; Fevang et al., 2012; Kotsadam, 2012; Schmitz & Westphal, 2017). However, the magnitude of the estimates varies a lot. On the other hand, other papers find that informal caregiving generate no cost (Spitze & Logan, 1991; Wolf & Soldo, 1994; Dentinger & Clarkberg, 1999; Spiess et al., 2003; Lilly et al., 2010). In this chapter, I use a new policy-generated instrumental variables approach to estimate the causal effect of caregiving on labor market outcomes.

Mixed results shown in the literature could be due to several factors. First, informal caregivers may provide different tasks. The intensity of these tasks could be different and involve heterogeneous time use and effort. For example, providing help with personal care tasks such as dressing, eating, and bathing is more time-consuming than helping with errands, such as help for household chores, and transportation. Moreover, some caregivers might be full-time caregivers while others might provide help as needed and/or at their convenience. These different levels of care can generate different results on labor market outcomes. The existing literature has not examined in detail how labor market responses to caregiving vary by care form.

Second, the burden incurred from informal care might be different for females and males. Historically, women have been the main caregivers. The literature has focused more on estimating the costs of informal care for women. As the population is aging, however, there is an increasing need for informal care and men are increasingly acting as informal caregivers (Van Houtven et al., 2013; Glauber, 2019). Differences in the previous literature may be due to heterogeneity across gender of caregivers.

Third, the biggest challenge to estimate the actual costs of informal care is the endogeneity problem. Ideally, informal caregivers and non-caregivers should be identical except for their caring status. However, in reality, those who give care may differ from those who do not along a variety of dimensions. For example, caregivers may be less educated than non-caregivers. In this case, lower labor market attachment among caregivers may be due to their lower reservation wage, rather than to the caregiving itself. Similarly, some caregivers may have a dislike for being in the labor force and prefer to take up care responsibilities to be in the workplace. Such pre-existing differences between caregivers and non-caregivers create an endogeneity problem, making it difficult to find unbiased estimates of the effect of caregiving on labor market outcomes. One popular strategy to overcome the endogeneity problem is the use of an instrumental variable for informal caregiving. Existing studies have used the number of siblings, the health status of parents, and the proximity of adults to their parents as instruments for caregiving (Heitmueller, 2007; Kotsadam, 2012; Van Houtven et al., 2013; Heger, 2014; Nguyen & Connelly, 2014; Crespo & Mira, 2014). The mixed findings in the literature could therefore be due to the use of different instruments, some of which may not completely solve the endogeneity problem.

In this chapter, I address the three problems discussed above. First, I explore heterogeneity in estimates by care tasks. Second, I explore heterogeneity in estimates by gender of caregivers. Finally, I utilize a policy-generated instrument – funding for the Medicaid aging waiver program – to tackle to the endogeneity issue related to informal caregiving. I use panel data from the 1998 to 2014 waves of the HRS with detailed information on informal care and labor market outcomes. I combine the data from HRS with detailed funding data on the Medicaid aging waiver program at the year and state level (described in chapter 1). I conduct three analyses: first, I estimate simple OLS models on caregiving and labor market outcomes, ignoring any selection into caregiving. Next, I add individual fixed effects to account for time-invariant unobservables that could bias the

estimates. Finally, I conduct an instrumental variables analysis using funding for the Medicaid aging waiver program as an instrument for caregiving in addition to individual fixed effects.

The findings show that simple OLS regression overestimates the effect of informal care on labor force participation, suggesting positive selection into caregiving. A comparison OLS estimation with an individual fixed effect estimation shows that the overestimation is especially more pronounced for male caregivers. However, simple OLS regression underestimates the costs of female caregivers, suggesting negative selection into caregiving. Women are more willing to sacrifice their personal time and adjust their work occupations to have flexible schedules so they can both stay on the labor market and care for their parents. Male informal caregivers are more likely to be those who lack job opportunities and who are out of the labor force. Also, the negative effect for females on labor force participation is larger which is similar as shown in the literature (Johnson & Sasso, 2000; Carmichael & Charles, 2003; Meng, 2012; Nizalova, 2012; Van Houtven et al., 2013; Glauber, 2019). The finding from the instrumental variable shows that there is a negative association between caregiving and labor force participation. The estimates suggest that caregivers are about 2 to 4 percentage points less likely to be in the labor force than non-caregivers. I also find no evidence of a negative effect of informal caregiving on any intensive margin labor market outcomes like hours worked or wages. The results also show evidence of significant selection into caregiving.

In addition, this paper shows that the severity of the endogeneity problem varies by care type. Individuals who do not work are more likely to take up care responsibilities and commit more time to providing care to their older parents should care needs arise. This selection direction is more likely to be present for personal care, which requires time commitment and dedicated efforts. Such time-consuming and extensive care requires timely response at specific times which prevents scheduling flexibility (Wolf & Soldo, 1994; Hassink & Van den Berg, 2011). However, errands care could be shiftable over time and space (Van Houtven et al., 2013). For example, household chores can be done during off-work hours and can sometimes be provided at caregivers' homes. Help with running errands can be delivered on weekends. Therefore, it is important to address the endogeneity bias by care characteristics to estimate the causal effects of informal care on labor market outcomes which is consistent with the literature on categorization of informal care (McDaid, 2001; Wimo et al., 2002; Riewpaiboon et al., 2009).[1]

[1]The common classifications of informal care distinguish instrumental activities of daily living (IADL) such as

This study makes several contributions to the existing literature. First, I use panel data. Most work in this literature employs cross-sectional data. Because of endogenous selection into caregiving, results using cross-sectional data are biased and are not informative for policymaking. Thus the results of this study, which use individual fixed effects, are more suitable to control for unobserved differences between caregivers and non-caregivers. Second, I introduce a policy-generated instrumental variable to control for the endogeneity issue. Many instruments that have been previously used in the literature (i.e. number of siblings, distance to parents, etc.) may be endogenous themselves, and the power of these instruments might be questionable (Fevang et al., 2012; Van Houtven et al., 2013; Crespo & Mira, 2014). For example, some studies use parental health status as an instrument for caregiving by adult children, intergenerational health transmission may mean that adult children are in worse health themselves, which would invalidate this instrument. This paper takes advantage of the Medicaid aging waiver program and uses changes in the state-level funding over time as an exogeneous instrument for informal care. The policy instrument is less prone to the endogeneity issue than previously used instruments, many of which are related to the personal characteristics of parents or children.

Third, I add to the discussion of the endogeneity issue in informal caregiving by exploring whether selection bias differs by care type or gender of caregivers. Van Houtven et al. (2013) use the same HRS data and show the estimates of informal care on labor market outcomes separately for women and men. They also find that the negative effect for males is only significant on personal care and employment rate. Casado-Marín et al. (2011) use the European Community Household Panel (ECHP) from 1994 to 2011 and show that the costs of informal care are significant only for women and intensive care. I add on these findings by explaining why the results are heterogeneous - the direction of selection bias may differ by care types, and by gender of caregivers. Heitmueller (2007) specifically discuss that the degree of endogeneity bias is more serious for extra-residential care which caregivers do not live together with their parents. They explain that this type of care has more outside options such as care for friends and neighbors. I build on the discussion of endogeneity issue of informal care in the American context. The detailed distinction of selection issues by care attributes can help to reconcile the mixed findings of care estimates shown in the literature.

finance management and medication help, activities of daily living (ADL) such as bathing, eating , dressing or toileting, and some household activities such as household chores, cleaning, and running errands. The errands care includes the IADL and household activities and personal care corresponds to the ADL.

Fourth, findings from this study are directly relevant to discussions about how to publicly fund care for older Americans. The findings on the effects of informal care on labor market outcomes are especially relevant for policymakers to improve the design of Medicaid aging waivers across states. As shown in chapter 2, family members form an important part in complementing the state LTC policy and helping older people age at home. Incorporating informal caregivers into LTC needs of the aging population and deciding whether and how to subsidize informal care are essential elements of LTC policymaking. In Europe, there are established policies in place to formalize informal care (Zigante, 2018). For example, cash allowances are used to pay informal caregivers for their care work (Zigante, 2018). Different nations have detailed rules on how these cash allowances are paid, such as whether the eligibility is means-tested and whether the size of allowances is attached to income or the intensity of the care provided. In contrast, public policy in the U.S. in general does not offer direct cash benefits to family caregivers. State Medicaid aging waivers allow older adults to stay at home and receive affordable LTC services from formal caregivers. However, historically, the program has not allowed families to compensate informal caregivers. The results of the current study suggest that the aging waiver policy imposes financial costs on families by reducing labor force participation among some caregivers.

The chapter is organized as follows. Section 2 reviews the literature. Section 3 explains the theory. Section 4 describes the data, sample selection, and shows the summary statistics. Section 5 shows the empirical models. Section 6 reports the estimates of informal care on labor market outcomes from the empirical models and shows the robustness checks of the estimates. Section 7 concludes.

2 Literature Review

Despite the fact that money rarely changes hands in informal caregiving arrangements, informal caregiving is not free. If parents need care, adult children might be forced to adjust their job schedules to juggle with their caregiving responsibilities. Adult children might take more time off from work, ask for early leave or late arrival, and demand more flexible working schedules (Muurinen, 1986). In severe cases where parents cannot stay alone and need substantial care for a much more extended period, informal caregiving may lead individuals to completely withdraw

from the labor market (Arber & Ginn, 1995). The negative labor market outcomes of informal care provisions may persist over many years. Today's decision to sacrifice work to provide informal care can reduce not only the current income of caregivers but also compromise their future career chances. They might struggle to go back into their previous positions or companies and find it challenging to have the same wage level (Skira, 2015; Schmitz & Westphal, 2017). This has led researchers to devote considerable efforts to estimating the effect of informal caregiving on labor market outcomes.

In empirical work, the biggest challenge to consistently estimating the costs of informal care is the estimating the causal effect of informal caregiving. A simple comparison shows that informal caregivers are more likely to have a lower education level and unemployed than non-caregivers (Bolin et al., 2008). Before taking up the responsibility of caring for a family member, one might already have a loose attachment to the labor market (Lilly et al., 2007). Carmichael & Charles (2003) also show that being older or female, being unemployed, and earning less are positively correlated with being an informal caregiver. These demographic patterns of caregivers mean that it is difficult to distinguish selection from causal relationships between caregiving and labor market performance.

Some existing studies have ignored the selection problem. The results of estimating costs of informal care on labor market outcomes using cross-sectional data without addressing the endogeneity issue are mixed. Some papers show no effect of informal caregiving on labor market outcomes (Spitze & Logan, 1991; Wolf & Soldo, 1994; Dentinger & Clarkberg, 1999) while others show significant costs associated with informal caregiving (Muurinen, 1986; Stone & Short, 1990; Boaz & Muller, 1992). Specifically, Muurinen (1986) shows that 33% caregivers with patients in the home hospice option stop working while 22% of caregivers in institutional hospices drop out of the labor force using cross-sectional the National Hospice Study (NHS) surveyed terminally ill cancer patients. Stone & Short (1990) and Boaz & Muller (1992) find that caregivers are more likely to adjust their work schedules and work 20 hours less a week than non-caregivers using the Informal Care Survey from the 1982 National Long Term Care Survey (NLTCS). In contrast, Spitze & Logan (1991) find that parental care does not conflict with employment and affect their closeness with parents using personal interviews of people aged 40 and above. Wolf & Soldo (1994), who use the cross-sectional National Survey of Families and Households (NSFH) and

focus on female caregivers providing care to their parents who are at least 65, show no significant costs on work hours. Dentinger & Clarkberg (1999) employ a cross-sectional Cornell Retirement and Well-Being Study (CRWB) and randomly selected six large employers in upstate New York with potential informal caregivers aged 50 to 72. They also show that the costs of female caregivers are insignificant in general.

Recent studies have begun to use strategies to address endogeneity in estimating the effect of caregiving on labor market outcomes. Heitmueller (2007) shows that the costs of informal care are significantly overestimated on labor market outcomes without controlling for endogeneity and failure to address the endogeneity of informal caregiving can cause biased and inaccurate results. The literature employs different strategies to address this issue. One solution is to use longitudinal data which can control for unobserved individual heterogeneity (Johnson & Sasso, 2000; Leigh, 2010; Van Houtven et al., 2013; Schmitz & Westphal, 2017). Johnson & Sasso (2000) use simultaneous models of work and care in Health and Retirement Study (HRS) from 1994-1996. They find that both men and women at midlife reduce about 460 hours in work per year to help their aging parents. Leigh (2010) uses the panel data Household, Income and Labor Dynamics in Australia (HILDA) from 2001 to 2007 and finds that the negative impact of informal care on labor market outcomes is only one-quarter to one-sixth as large after controlling for individual fixed effects (4 to 6 percentage points) as the cross-sectional estimates (20 to 28 percentage points). Van Houtven et al. (2013) find modest costs on the employment rate for male personal caregivers (2.4 percentage points) and no effect on work hours or wages using longitudinal HRS data which controls for time-invariant individual heterogeneity. Schmitz & Westphal (2017) find that the effects of informal care on labor market outcomes can last for up to eight years and the long-term costs to caregivers are around 4 percentage points using the German Socio-Economic Panel (SOEP) from 2001 to 2013.

Another solution to address the endogeneity of informal care is to use the instrumental variable strategy. One common instrument is parental health status (Ettner, 1996; Heitmueller, 2007; Bolin et al., 2008; Kotsadam, 2012; Van Houtven et al., 2013; Heger, 2014; Nguyen & Connelly, 2014; Crespo & Mira, 2014). For this instrument to be valid, Crespo & Mira (2014) show that informal care should be correlated with parental health status and parental health status should be unrelated to unobserved labor market attributes. Other instruments similar to the idea of parental health are the age of parents (Ettner, 1996; Heitmueller, 2007), the number of siblings (Ettner, 1996;

Heitmueller, 2007; Bolin et al., 2008; Casado-Marín et al., 2011; Kotsadam, 2012), the health status of family and friends (Carmichael & Charles, 2003), and geographical proximity of parents (Heitmueller, 2007). Majority of these studies show a negative relationship between informal care and labor force participation and the magnitudes of the estimates vary from 2 to 12 percentage point except Kotsadam (2012) who finds no negative effect of informal care on the probability to be employed. The results on other labor market outcomes such as work hours and hourly wages are inconsistent which might be due to the validity of such instruments (Fevang et al., 2012; Van Houtven et al., 2013; Crespo & Mira, 2014).

In addition, there are heterogeneous effects of informal caregiving on labor market outcomes by gender of caregivers. In general, women take up the majority of informal caregiving (Johnson & Sasso, 2000; Pavalko & Artis, 1997; Pavalko & Henderson, 2006). Care initiation is equally happening to women regardless of employment status or demographics (Pavalko & Artis, 1997). Overall, women have lower labor force participation, work less and earn lower than men (Lilly et al., 2007), and women face higher difficulty to return to their previous job or previous level of work commitments after finishing their care responsibilities than men (Pavalko & Artis, 1997; Spiess et al., 2003; Wakabayashi & Donato, 2005). Johnson & Sasso (2000) find that women spending two or more hours per week work about 43 percent fewer hours than non-caregivers while men reduce work hours by 28 percent. Pavalko & Henderson (2006) further show that women working on jobs with flexible and generous care benefits are more likely to remain employed while providing care employing the longitudinal National Longitudinal Survey of Young Women (NLSYW) for female caregivers who are 14 to 24 years of age in 1968 providing care to ill or disabled family members. In contrast, Carmichael & Charles (2003) show that the negative relationship between employment and informal care for women is a combined selection and causal effect while this relationship is a pure selection effect for men. Men who provide care are on average of lower ability to earn in the labor market. Therefore, the negative relationship between informal caregiving and wages is more substantial for male caregivers than female caregivers. The care responsibilities compromise more on males by reducing their job opportunities and earning power. Lawton et al. (1994) estimate that the costs of intensive caregiving are larger for men than for women because women can find alternative part-time work easier than men. Fevang et al. (2012) show that the employment rate drops about 4 percentage points for daughters and only 1 percentage point for sons in the year of

parents' death.

The relationship between informal care and labor market outcomes also differs by different forms of care. Arber & Ginn (1995) use the 1985 and 1990 General Household Surveys (GHS) and show that people living together with a potential care recipient participate in the labor market less than those who live separately from their family members. Using the longitudinal BHPS data, Heitmueller & Michaud (2006) and Casado-Marín et al. (2011) also show that the negative effect of informal care on employment is significant for co-residential carers and the magnitude is up to 6 percentage points. Ettner (1996) finds that the decrease of work hours is only significant for caregivers providing care to parents who do not live together with caregivers by 3 hours a week. Nguyen & Connelly (2014) also show that the negative effect of informal care on employment rate is mainly concentrated on primary caregivers using Australian longitudinal data. This effect is similar for different living arrangements. Moreover, Van Houtven et al. (2013) show that the negative effect of caregiving might depend mainly on the type of care offered. For example, some parents demand necessary Activities of Daily Living (ADL) help like eating, bathing, or dressing so adult caregivers may spend more time providing these services than the instrumental ADL (IADL) tasks such as money, medication management or transportation help. They show that the costs of informal care are larger if caregivers provide non-shiftable care such as help on ADL, which needs instant response and delivery.

3 Theoretical Framework

Here I provide a theoretical framework for the predictions of my study. It is assumed that individuals are rational and they maximize their utility subject to a budget constraint. The utility function includes consumption goods, leisure, and the health of their parents. In terms of labor supply and informal caregiving, individuals allocate their time between paid work and care responsibilities to maximize their utility. The health status of parents is determined by the informal care given by individuals and other sources of care. Individuals make decisions subject to budget constraint where the consumption cannot exceed the income earned from the labor market and time constraint which the time spent on work and care cannot exceed the total available time. In the simple framework, we assume that individuals are altruistic adult children and parents do not have negotiating power

in the decision making process.

Individuals maximize their utility that the marginal rate of substitution of leisure for consumption equals to the price of working, the wage rate. Also, the marginal utility of leisure should be equal to the marginal utility of giving care. With time available being limited, the care responsibilities increase the reservation wage of leisure. With the assumption of diminishing returns and relative decreased wage earned in the labor market, the labor supply will be reduced (substitution effect). However, the decreased financial income will also decrease the consumption of care (income effect) if informal care is assumed to be normal goods. The relationship between informal care and labor market outcomes depends on which effect is stronger. If the substitution effect outweighs the income effect, informal care will decrease the performance in the labor market and vice versa.

According to the conceptual framework, different types of care may have various implicit costs. Personal care requires time-sensitive and time-intensive care which may increase the reservation wage of leisure higher than errands care with low level of efforts. Thus, the substitution effect on personal care would be larger than that on errands care. The predicted negative effect of personal care would be larger than that of errands care.

Based on the conceptual framework, the minimum reservation wage of care might be different by gender (Boaz & Muller, 1992). If the minimum acceptable wage of care is higher for females, they may more likely choose to care over work. Thus, the relationship between informal care and labor market outcomes may be heterogeneous by gender of caregivers.

4 Data

4.1 Medicaid Aging Waiver and HRS data

I use Medicaid policy information on aging waiver funding for each state for the years 1995 to 2014. The state application and annual report of Medicaid aging waivers are publicly available on the CMS website. These applications and reports detail the services covered, service definitions, and the total expenditures in covered years for state aging waivers. For some states, they may have more than one waiver serving the older population. The total expenditures of Medicaid aging waivers are calculated across each year, and these are used as the main treatment variable. See

chapter 1 for detailed description.

The second data source is the Health and Retirement Study (HRS), a longitudinal dataset which began in 1992. Respondents are surveyed every other year. The HRS is representative of Americans aged 51 and above. The survey includes different cohorts who become age eligible for the study. The core cohort, the HRS cohort, has been followed and interviewed since 1992. Since 1993, the HRS includes the Study of Assets and Health Dynamics Among the Oldest Old (AHEAD) cohort, including those born before 1924; the Children of the Depression Age (CODA) cohort, including those born between 1924 and 1930; and the War Babies cohort (WB), including those born between 1942 and 1947. An additional Early Baby Boomers (EBB) cohort of those born between 1948 and 1953 was added to the sample in 2004, and the Mid-Baby Boomers cohort of those born between 1954 and 1959 was added in 2010. A detailed questionnaire that asks respondents about their demographics, health outcomes, employment status, financial situation, respondents' year of death (if any), and intergenerational transfers is administered on site or via telephone.

The HRS restricted data includes the state of residence of respondents and their parents from 1998 to 2014. I combine the HRS data with the Medicaid aging waiver funding data. Specifically, I merge two data sets using the state of residence of respondents' parents. The resulting data is a state-year panel from 1998 to 2014 with observations every other year for individuals and their parents.

4.2 Sample selection

To study the informal caregiving by HRS respondents, I first restrict the sample to respondents with at least one living parent when they enter the survey. Respondents drop out of the sample when their parents die. The resulting sample consists of 35,526 observations and 10,519 unique individuals from 1998 to 2014.

4.3 Key variables

The first group of relevant variables created for the current study come from the questions on informal care that HRS respondents provided to their older parents. The HRS asks respondents whether they provided any care in the past two years to their parents, and if yes, how many hours respondents provided personal care (dressing, eating, walking, and bathing) and errands assistance

(errands, household chores, managing medications, and transportation). I use the hours of care information to create a series of caregiving indicators: If the total care hours provided by HRS respondents is greater than zero, I define the respondent as an informal caregivers.[2] I also create three mutually exclusive care type indicators: *only personal care*, indicating individuals who only help with personal care; *only errands care*, indicating those who only provide errands care; and a *both* indicator, indicating respondents who provided both errands care and personal care help during the previous two years.

The second group of relevant variables are the questions about labor market outcomes. Specifically, the survey asks respondents about their labor force status. Labor force participation (LFP) indicates whether a respondent is working and getting paid. Also, respondents are asked the number of hours per week worked at the main job and hourly wage rate if they are working. The wage rate is the respondent's hourly wage rate. The question is only asked to individuals who report she/he is working for pay. If the respondent is unemployed, the wage rate is imputed. If the respondent has the most recent job, the wage rate is used. If no previous wage rate is available for an unemployed individual, it is imputed using predicted values from regression results.

4.4 Sample statistics

Table 1 presents the summary statistics of informal care by care type, and gender of caregivers. Among the sample, about 32 percent of HRS respondents provide some kind of care to their parents. The proportion is larger for women at around 35 percent and smaller for men at 27 percent. Both women and men are more likely to provide errands care than personal care. Approximately 23 percent of HRS respondents provide only errands care and 2 percent provide only personal care; 7 percent provide both errands and personal care help. Figures 1 to 2 describe the distribution of overall care hours, personal care, errands care hours over two years. These distributions are highly skewed to the right since the share of intensive caregivers is small. Among caregivers, around 71 percent of them provide errands care and 7 percent provide personal care. For female caregivers, they are more likely to be only personal givers than male caregivers. They also tend to provide

[2] I do not directly employ the question surveyed in the HRS, whether respondents and their partners spent hours giving help to their parents or parents-in-law or not. In this question, I cannot distinguish the hours spent by respondents and their spouses. The hours' question asks the actual care hours provided by respondents themselves and their spouses, separately.

both personal care and errands care at the same time.

Table 2 presents the statistics of demographics of HRS respondents and their parents by caregiving status and by gender of caregivers. Among caregivers, about 70 percent of individuals are female. Caregivers are older than non-caregivers on average. In general, caregivers have more living siblings than non-caregivers and more frequent contact with their parents than non-caregivers. Caregivers are less likely to be in the labor force, work fewer hours if working, and earn a lower hourly wage than non-caregivers. In this sample, 62 percent of male caregivers are employed compared to 59 percent of female caregivers. Male caregivers are also more likely to earn more if working than female caregivers. The average age of parents of caregivers is about 82, which is higher than that of non-caregivers, 79. Parents of caregivers are more likely to be unmarried and more likely to have a memory-related diseases.

5 Estimation

The analysis is structured to produce unbiased estimates of the causal effect of caregiving on labor market outcomes. However, because of the endogeneity issues discussed above, estimating a simple naïve, OLS model is unlikely to produce unbiased results. I use two methods to address this issue. First, I exploit the panel nature of an estimate model controlling for individual fixed effects. Unobserved, time-invariant heterogeneity across individuals might bias OLS estimates of the causal effect of caregiving on labor market outcomes. For instance, families may have different preferences for informal caregiving and receiving. In some cultures, caring for elderly parents is part of the filial piety culture and every adult child is expected to take up the care responsibilities. Thus, some individuals might have stronger preference to provide care than others. Individuals may also have different underlying earning abilities in the labor market. Lower skilled individuals might be more likely to become informal caregivers than higher skilled individuals because the opportunity cost of caregiving is lower. To account for these sources of individual heterogeneity, I estimate the following OLS fixed-effect model:

$$Y_{it} = \delta_{ic} Infcare_{it} + \beta_x X_{it} + \text{Year}_t + \theta_i + \epsilon_{it} \tag{1}$$

where i indexes the HRS respondent and t is the survey year. Y_{it} is the labor market outcomes and $Infcare_{it}$ is the informal care indicators. The model controls for individual fixed effects, θ_i, and year fixed effect, Year_t. The individual fixed effect controls for the unobservable factors that are constant within individuals such as underlying preferences for caregiving, or underlying earning capacity. The year fixed effect controls for common economic shocks that might affect labor market outcomes. X_{it} is a set of time-variant characteristics of individuals as well as their parents such as age, marital status, and number of living siblings. The standard errors ϵ_{it} are clustered at individual level.

In addition to time-invariant, individual-level heterogeneity, there may also be unobservable time-varying factors that are correlated with care status. For example, an individual's unobservable ability or skills can change over time – for instance, she might develop some type of decline in her cognitive skills, or her skill sets might become less valuable due to changing local labor market conditions. If such an individual has living parents at home, she could decide to leave the labor market and provide care instead since the opportunity cost of caregiving has decreased. Such unobserved, time-varying changes would bias the estimation of the relationship between caregiving and labor market outcomes. Furthermore, the individual fixed effects strategy above would not overcome this source of bias. To address the potential time-varying endogeneity issue, I also utilize the instrumental variable (IV) method.

I use funding for the Medicaid aging waiver program as an instrument for informal caregiving. As shown in chapter 2, the funding of Medicaid aging waiver program is highly correlated with informal caregiving. Specifically, the likelihood of an adult child providing care increases with Medicaid aging waiver expenditures. I estimate the following IV model:

$$Infcare_{ist} = \delta_{fs} \text{ Funding}_{st} + \beta_x X_{ist} + \eta_s + \text{Year}_t + \eta_s * t + +\theta_i + \epsilon_{ist} \tag{2}$$

$$Y_{ist} = \delta_{ic} \hat{Infcare}_{st} + \beta_x X_{ist} + \eta_s + \text{Year}_t + \eta_s * t + \theta_i + \epsilon_{ist} \tag{3}$$

where i indexes the individual adult child, s is the state where individual's parents live and t is year. $Infcare_{ist}$ is the outcome capturing informal care provided to parents living in state s by individual i and year t. Y_{ist} is the labor market outcomes for individual i in year t. θ_i is an

individual fixed effect. Funding_{st} is the Medicaid aging waiver funding in state s and year t, the instrumental variable for informal care. η_s is a state fixed effect which equals one when individual's parents are from state s and zero otherwise. Year_t is a set of year dummies. They equal one if observations in the data come from year t. $\eta_s * t$ is a state-specific linear time trend which controls for the differential trends in informal caregiving across states.

Equation 2 is the first-stage of the IV model. This model is estimated using Probit since the treatment variable is a binary variable indicating whether an individual is an informal caregiver or not. The Probit first-stage adjusts the probability of providing care of each individual to lie between 0 and 1.[3] In Equation 3, the estimated probability of caregiving from the first-stage is regressed on the labor market outcomes. The results from this regression show how labor market outcomes change with a 1 percentage point increase in the probability of being a caregiver.

Theoretically, the expenditures of Medicaid aging waivers across states are good instruments for informal care especially errands care. As demonstrated in chapter 2, the endogenous regressors of interest are monotonically increasing with funding of this policy. The identifying assumption in the IV approach is that the generosity of Medicaid aging waivers is only correlated with labor market outcomes through its affect on informal caregiving. In section 6.5, I provide evidence that this assumption holds.

6 Results

6.1 Individual FE results

Table 3 shows the OLS estimates of informal care on labor market outcomes: LFP, working hours, and the log of hourly wages. Columns 1 and 2 demonstrate the estimates of the effect of caregiving on LFP, columns 3 and 4 show the results on number of weekly working hours, conditional on working, and columns 5 and 6 show the results on log hourly wages, conditional on working. For each outcome, I report the results of estimating the Equation 1 without controlling for individual fixed effects (columns 1, 3 and 5), and with individual fixed effects (columns 2, 4 and 6). All models include controls for the characteristics of HRS respondents and their parents.

[3] Using a linear probability model in the first stage generates negative predicted probabilities of caregiving. Thus, we choose to use Probit.

For all three outcomes, I estimate a negative relationship between caregiver and labor market outcomes. Overall, the estimates with individual fixed effects are significantly lower than OLS estimates. Informal caregivers are less likely to participate in the labor force by about 3 percentage points without individual fixed effects and 2 percentage points with individual fixed effects. Informal caregivers are about 5 percent (mean 0.63) less likely to participate in the labor force than non-caregivers when individual heterogeneity is not controlled for. The relative magnitude is reduced to 3 percent when individual fixed effects are controlled for. For working hours, informal caregivers work about 1.5 hours less (4 percent less) per week than non-caregivers without individual fixed effects. This effect becomes insignificant and indistinguishable from 0 when individual fixed effects are included. In addition, informal caregivers earn approximately 8 percent less in hourly wage than non-caregivers without considering the individual heterogeneity. The magnitude on hourly wage is statistically indifferent from 0 when including the individual fixed effects.

6.2 FE results by care types and gender

Table 4 shows the results estimating Equation 1 on the LFP outcome by care type and gender. Panel A reports the results on full sample. Panel B and C demonstrate the findings separately for female and male caregivers. Each column corresponds to the estimates of one type of care on LFP. For overall informal care (columns 1), male caregivers are around 6 percentage points less likely to be in the labor force than male non-caregivers (panel C). The magnitude of the estimate decreases to 2 percentage points after including individual fixed effects in column (2). This suggests that there is positive selection into caregiving for men. For female caregivers, however, the estimated coefficient without fixed effects is not significantly different than 0 . The inclusion of individual fixed effects causes the magnitude of effect to increase to -0.19, nearly identical to the estimated coefficient for male caregivers when the fixed effects are included. Thus, for female caregivers, the selection effect is negative. Based on overall LFP (61 percent for females and 67 percent for males), the relative effect of informal caregiving on LFP is larger for women than for men.

The remaining columns of Table 4 show how the estimates differ depending on care type. For the full sample, the magnitudes of the estimates for care type are significantly attenuated when individual fixed effects are controlled for. For example, in Panel A and columns (3) and (4), the negative association between personal caregiving and LFP drops from 9 percentage points (14

percent) without individual fixed effects to 4 percentage points (6 percent) with individual fixed effects. For errands caregiving (columns 5 and 6), the OLS estimates drop from 3 percentage points (5 percent) without individual fixed effects, to 2 percentage points (2 percent) with individual fixed effects.

Panel B and C report the gender differences of the estimates of care types on LFP. The pattern of personal care for men and women is similar for models with individual fixed effects and models without individual fixed effects. Without individual FE, I estimate that female personal caregivers are approximately 7 percentage points less likely to participate in the labor force while male personal caregivers are around 10 percentage points less likely to be in the labor force. After including FE, the estimated effects drop to 3 percentage points for female caregivers and 4 percentage points for male caregivers. Considering the average labor participation rates differences, female caregivers are 5 percent less likely to be in the labor force while male caregivers are 7 percent less likely in the FE estimates. The pattern of results for errands caregiving, however, differs for women and men. In the model without FE, there is no relationship between errands caregivers and LFP for women, while male errands caregivers are 5 percentage points (8 percent) less likely to work than male non-caregivers. The inclusion of FE causes the magnitude of the estimates of errands caregiving to increase to 1.6 percentage points (3 percent) for women, while the magnitude decreases to around 2 percentage points (3 percent) for men. Thus, the unique, negative selection into caregiving among women is driven by their errands caregiving.

6.3 IV results

The results in Tables 3 and 4 demonstrated that there is significant selection into caregiving: unobserved, time-invariant characteristics are associated with both caregiving and LFP. To control for time-varying individual heterogeneity, I also conduct an IV analysis. As shown in Chapter 2, Medicaid aging waiver funding increases the probability of individual being an informal caregiver, especially of being an errands caregiver.

Table 5 reports the Local Average Treatment Estimates (LATE) of informal caregiving on LFP using Medicaid aging waiver expenditures as the instrument without controlling for individual fixed effects. I show results for the full sample (columns 1 and 2), for female caregivers (3 and 4) and for male caregivers (5 and 6). For each sample, I report the OLS result from Table 4 (columns 1, 3, and

5), as well as the IV estimate (columns 2, 4 and 6). Panel A of Table 5 shows the results of overall informal caregiving on LFP, and panel B shows the results of errands caregiving on LFP. Recall, there is not a significant relationship between personal caregiving and the Medicaid aging waiver funding. Panel A show that the LATE estimates are at least tenfold as that in OLS estimates. For overall care, the LATE estimate shows that caregivers are about 41 percentage points less than non-caregivers to work for pay while the magnitude in OLS is only 3 percentage points. For errands care, LATE estimate shows that there is no significant relationship between errands care and LFP. The estimates are also larger. The costs on females for overall caregivers and errands caregivers in LATE estimates are much larger and statistically significant. Female caregivers are on average 85 percentage points less likely to be employed. The pattern for males is opposite. LATE estimates on males become indifferent from zero either for overall care or errands care. The magnitudes of LATE estimates tend to be much bigger.

Table 6 shows further the LATE estimates after controlling for individual fixed effects. The LATE estimates after controlling for individual fixed effects for overall care and errands care are statistically significant. The magnitudes of these estimates are much larger than that in OLS-FE model. On average, overall caregivers are 55 percentage points less likely to be employed and errands caregivers are 36 percentage points less likely. The magnitudes of LATE estimates for females are much smaller than that without controlling for individual fixed effects. The results are statistically not significant. The pattern for males is similar to that of LATE estimates without controlling for individual heterogeneity. The effect of care is not differentiable from zero.

Appendix Table A1 shows the reduced form of the Medicaid aging waiver policy instrument on the labor market outcomes. Panel A reports the estimates on LFP. There is significant effect of the policy on LFP and the effect on working hours and hourly wages are statistically insignificant. The reduced-form results further validates the IV results shown 6.3. The relationship between informal care and intensive labor market margins is not there.

6.4 Robustness checks

Thus far the working sample is all HRS respondents who are above 50 and have at least one living parent. To evaluate the sensitivity of the results to these sample restrictions, I re-estimate the individual FE models on the sample with only HRS respondents who are between 50 and 65.

The HRS respondents in this restricted sample are more likely to decide whether to work or not than the respondents who are older than 65. One concern with the original sample is that HRS respondents are also aging and for those who have already received care, there might be potentially less variation in caregiving status. The restricted sample includes individuals who might face the trade-off between giving care and working in the labor market. The results in Table A2, however, are almost identical to the estimates shown Panel A in Table 3. Additionally, the estimates are robust to the functional form of controls (Column 1 to 3 of Table A3). For example, one may have concerns that the age should be in higher order form in the model. In addition, the results of the OLS individual fixed effects model are robust to adding state year fixed effects (Column 4 of Table A3). The Medicaid aging waiver expenditures vary across states and years so the state year fixed effects are controlled for in the IV model. To make the results comparable in the OLS fixed effects model, the estimates are similar with or without state year fixed effects.

6.5 Exclusion restriction of IV

To test the validity of the policy instrument, Medicaid aging waiver funding, I test that the exclusion restriction assumption of this instrument is satisfied. Ideally, the policy instrument affects the labor market outcomes only through the caregiving channel. The idea to test this assumption is that if there is no first stage for some samples, there should be no significant results in the reduced form (Angrist et al., 2010). Table A4 shows the estimates of policy instrument on the LFP for two sub-samples. Panel A reports the results for individuals who do not give any care during survey years from 1998 to 2014. Since these never-caregivers were not induced into caregiving by the policy, their labor market outcomes should not be correlated with the policy instrument. The magnitudes of these estimates for never-caregivers are much smaller than that in Table A1. Panel B also reports the estimates for never-caregivers and always caregivers who persistently provide care during the years from 1998 to 2014. Again, because these individuals cannot comply with the policy – in that their caregiving is not related to he policy – their labor market outcomes should not be significantly related to the policy. I find that the estimated coefficients among this sub-sample are statistically non-significant and the standard errors are correctly estimated with much larger sample size.

Another way to test the exclusion restriction assumption of the policy IV is to check whether the characteristics of policy expanding states and that of non-expanding states are balanced or not

(Angrist et al., 2012). Since the Medicaid aging waiver expenditures are continuous, I divide the states into high expenditures states and low expenditures states using the mean cutoff.[4] Table A5 describes the statistics of characteristics in high-expenditure state and low-expenditure state as well as the significance level of differences between the two groups. The proportion of caregivers is higher in high expenditures states than in low expenditures states. The difference of caregiving is significant. Most of the characteristics are indistinguishable between high and low states. Column 4 gives the differences between caregivers and non-caregivers. Comparing to the p value given in column 4, the policy instrument shows more balanced baseline characteristics between high and low states.

6.6 Discussion

Informal caregiving is an important and growing part of the economy. However, past literature has struggled to identify the labor market effects of providing informal care to an aging parent. In this paper, I add to this literature by implementing several different approaches to estimating the relationship between caregiving and labor market outcomes. Across approaches I find evidence of labor market costs associated with informal caregiving. Caregivers are less likely to participate in the labor force, with estimated effects ranging between 3 and 10 percent.

My results also suggest that there is significant selection into caregiving. OLS estimates without individual fixed effects appear to overestimate the costs of informal care on LFP. For most models, I find that the inclusion of individual FE attenuates estimates. In general, it appears that informal caregivers have underlying characteristics that leave them less likely to participate in the labor force. They might be less educated and be less competitive to work with lower earning ability. I find larger differences between the OLS and OLS FE models for complicated care tasks such as personal care which requires time commitment. However, for errands care – which requires less time and dedication – my results suggest that the direction of selection bias is opposite. This suggests that these adult children who help with intermittent tasks like shopping and money management have underlying characteristics that leave them more

[4]Medicaid aging waiver expenditures vary across states and years. In order to categorize individuals into a high or low state, I first calculate the mean of aging waiver expenditures for each year. If the expenditures of one state in that year is larger than the mean value, the state is indicated as a high state and vice versa. Then, for years from 1998 to 2014, each individual in a specific state is indexed the high or low category of that state.

likely to participate in the labor force.

I also find evidence of different selection for men and women into caregiving. OLS estimates without controlling for individual heterogeneity seem to overestimate the costs of informal care for men while OLS estimates without individual fixed effects might underestimate the costs of informal care for women. It appears that women have underlying attributes that make them more likely to sacrifice their own personal time and adjust work schedule to help parents. Comparison between OLS and OLS FE estimates shows that this opposite direction of selection by gender is more likely for errands care which can be shiftable over time and space.

The much bigger LATE results in Table 5 and Table 6 estimate the local effect of informal care on LFP channeled through Medicaid aging waivers. The different pattern for females and males might come from the heterogeneous estimates from the first-stage as shown in chapter 2. These estimates might not show that the true costs are different by gender of caregivers on the whole population. In addition, the LATE estimates without and with individual fixed effects suggest that there is indeed time-varying individual characteristics that may affect the caregiving behavior and labor market outcomes while the policy instruments are not very strong. Table A6 in Appendix shows the IV identification tests. The Cragg-Donald F statistics is less than the rule-of-thumb 10. Stock-Yogo statistics give the critical value under which the IV is weak. As shown in the table, the policy instrument is weak under 10% critical value. One should be cautious about the interpretation of these estimates.

7 Conclusion

In this paper, I find that informal caregiving is costly. The costs of care are heterogeneous by gender of caregivers and by labor market outcomes. In general, the negative effect of informal care is more significant among female caregivers than male caregivers. Also, the costs of care are larger for extensive labor market outcomes such as the probability of being in the labor force and working for pay. The costs on intensive labor market outcomes such as working hours and hourly wage are negligible.

I find that there is large heterogeneity of endogeneity issue of informal care by care characteristics and by gender of caregivers. Individuals respond to informal care differently

depending on the extent of time and efforts dedication. The behavioral selection on taking up care tasks underscores the importance of addressing endogeneity problem by the type of care, the intensity of care, and gender of caregivers when estimating the causal effects of informal care on labor market outcomes. I show that models without controlling for the individual heterogeneity are more likely to overestimate the costs of informal care. The estimation bias is much larger for male caregivers and for care tasks that require time and effort commitment such as personal care and intensive care. Male caregivers are more often to be those who have loose attachment to the labor force and have lower capability to earn. Personal care requires more responsive help and time commitment. Thus, unemployed individuals are more likely to select to be personal caregivers if such care is needed. For females, the endogeneity issue is opposite. Estimates addressing the endogeneity are larger than those without controlling for the bias. Females are traditionally expected to be the main caregivers. They are more likely to sacrifice their personal time and have stronger preference to care for their parents even though they need to work at the same time.

The heterogeneity of endogeneity problem of informal care can help to reconcile the mixed findings in the literature. Research with cross-sectional data without addressing the endogeneity issue usually shows much larger estimates (Stone & Short, 1990; Boaz & Muller, 1992; Ettner, 1996; Carmichael & Charles, 1998; Bolin et al., 2008). Research with longitudinal data including individual fixed effects generates much smaller estimates (Johnson & Sasso, 2000; Heitmueller & Michaud, 2006; Leigh, 2010; Casado-Marín et al., 2011; Van Houtven et al., 2013; Schmitz & Westphal, 2017). It also explains the heterogeneous effects of informal care on labor market outcomes by gender of caregivers. The negative effect of informal care is larger for female caregivers since they are more willing to provide care and have stronger preference to make sacrifices (Pavalko & Artis, 1997; Spiess et al., 2003; Wakabayashi & Donato, 2005). Estimates without addressing this selection bias might show smaller costs for female caregivers (Lawton et al., 1994).

To further control for the endogeneity issue of informal care caused by time-varying unobservable characteristics, I utilize the policy exogenous variable, the Medicaid aging waiver expenditures, across states and across years as an instrument. Overall, the LATE estimates are much bigger than that in OLS estimates with 2 to 4 percentage points. The OLS estimates are

consistent with the scale shown in Van Houtven et al. (2013) using the similar HRS data. The magnitude of IV estimates is consistent with the scale shown in Heitmueller (2007). The negative estimates are larger for females than males. The findings suggest that women are more responsive than men to Medicaid aging waivers. With aging parents staying at home, women might sacrifice their personal time and adjust their workplace to have more flexibility to provide more informal care. For males, they also provide care to their parents while the effect of this care is less costly. Male caregivers can still maintain their working status and incur negligible costs on their work. These male caregivers affected by the policy may have higher ability to earn in the labor market than those who volunteer to be caregivers.

The findings can be discussed and taken into consideration when the LTC policy is proposed to change during current times. During the pandemic in 2020, states have begun to loosen some requirements of Medicaid and allowed flexibility for informal caregivers to be reimbursed for their care services in order to continue providing LTC services to enrollees.[5] Understanding the detailed effects of informal caregivers on labor market outcomes is essential as the federal government is planning for the eventual return to regular operations after the public health emergency ends. The results would add to the discussion on the compensation of informal caregivers.

Policymakers are constrained by budget and aim to expand Medicaid waivers so informal caregivers can shoulder more responsibilities of LTC with low costs. On the other hand, policymakers intend to encourage female caregivers to work and equalize the gender role in providing informal care. From the perspectives of policy change, the results suggest that CMS can consider to give tax credit to employers who allow working flexibility especially for females. Thus, females could be relieved to juggle care and work at the same time which might encourage them to provide more informal care. In addition, CMS might consider to allow payments to informal caregivers for their care services in Medicaid aging waivers. States can choose how much to pay and whether the pay should be determined based on income or intensity of care. The monetary incentive could encourage more males to become informal caregivers and help to ameliorate the burden carried on females. Future work is needed to determine how the payments should be structured to be welfare increasing for all of the parties involved in the LTC such as individual caregivers, employers, and government.

[5] https://www.nashp.org/states-modify-medicaid-home-and-community-based-waivers-to-respond-to-covid-19/

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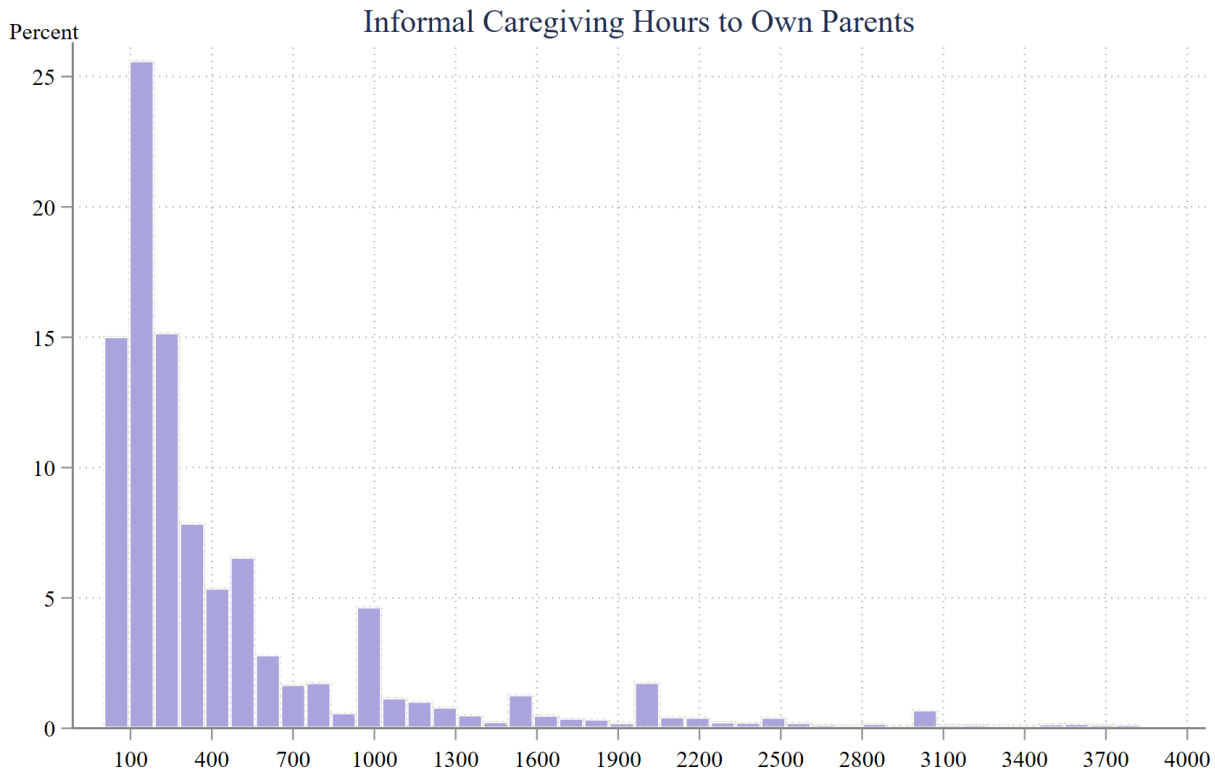
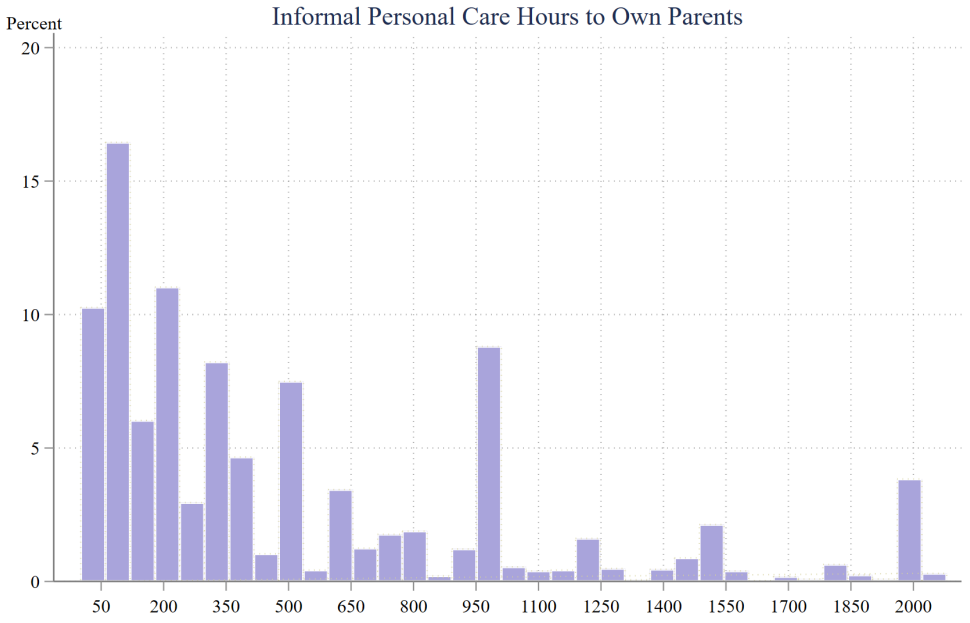
Figure 1: Distribution of Informal Care Hours

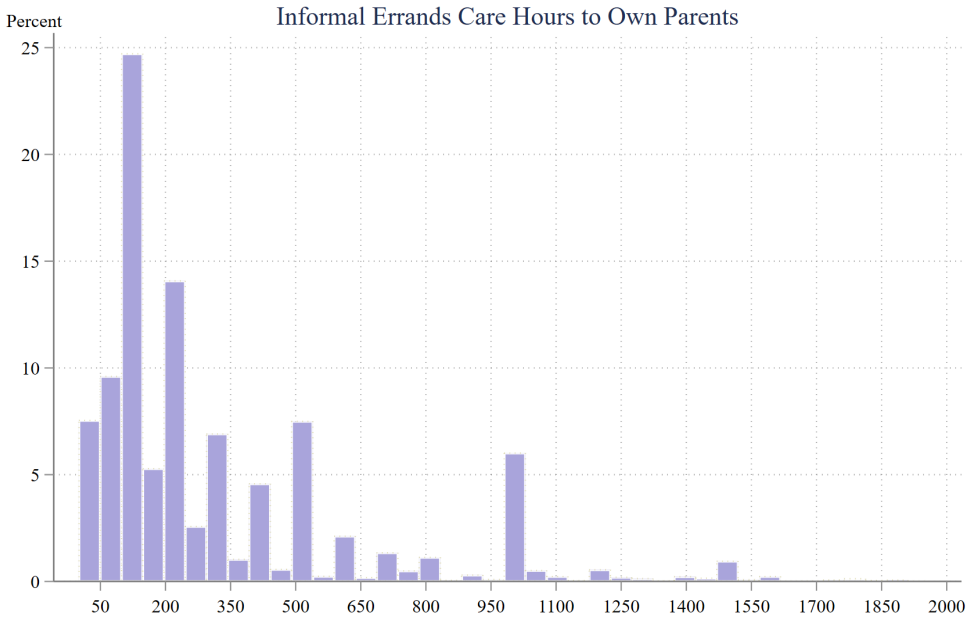


Notes: This graphs draws the distribution of caregiving hours to parents by HRS respondents in the past two years conditional on some hours. The care hours include personal care hours and errands assistance hours. Personal care hours are the number of hours in the past two years that the HRS respondent helped his or her own father, mother or both with personal needs on dressing, eating, bathing, and toileting. Errands assistance hours are the number of hours in the past two years that the HRS respondent helped his or her own father, mother or both with errands, household chores, and transportation. Data is HRS 1998-2014. The vertical axis shows the percent of positive care hours.

Figure 2: Distribution of Care Hours by Type



(a) Personal Care



(b) Errands Assistance

Notes: The graphs are drawn using HRS 1998-2014 conditional on providing any care. The x-axis in Panel (a) indicates the total hours of help on personal care to parents provided by HRS respondents in the past two years. Personal care includes dressing, eating, bathing, and toileting. The x-axis in Panel (b) indicates the total hours of help on household chores, errands and transportation to parents by HRS respondents in the past two years. The y-axis is the percent of hours on care.

Table 1: Summary Statistics of Informal Care by Gender of Caregivers

	(1) All	(2) Female	(3) Male	(4) Caregiver	(5) Female Caregiver	(6) Male Caregiver
Care indicators						
Overall care (any type)	31.85	34.83	26.72			
Both personal and errands care	6.89	8.38	4.33	21.55	23.99	16.11
Only personal care	2.34	2.84	1.46	7.31	8.14	5.44
Only errands care	22.62	23.61	20.93	70.79	67.61	77.88
Individuals	10,519	6,306	4,213	5,286	3,478	1,808
Observations	35,526	22,470	13,056	11,354	7,846	3,508

Notes: The data used is from HRS 1998 to 2014 full sample including individuals with at least one living parent. The care indicators are constructed using the cutoff zero. Overall care indicator is one if an individual provides either personal care or errands care. Both personal and errands care indicator represents individuals who provide positive personal care and errands care at the same time. Only personal care indicator shows individuals with only personal care and only errands care indicator shows individuals with only errands care. Personal care includes dressing, eating, bathing, and walking. Errands care includes help with running errands, household chores, making meals, or managing medications.

Table 2: Summary Statistics by Care Status

	Caregiver	Non-caregiver	Female Caregiver	Female Non-caregiver	Male Caregiver	Male Non-caregiver
	(1)	(2)	(3)	(4)	(5)	(6)
	Mean	Mean	Mean	Mean	Mean	Mean
Panel A: Demographics of respondent						
Female	0.69	0.60				
Age	58.23	56.87	57.91	56.06	58.96	58.10
Number of living siblings	2.92	3.27	3.00	3.33	2.76	3.18
Number of siblings living within 10 miles of parents	0.55	0.54	0.55	0.55	0.55	0.53
Frequency of contact with parents	24.94	12.72	26.10	14.31	22.44	10.30
Live within 10 miles of respondent	0.60	0.35	0.58	0.34	0.65	0.37
Panel B: Labor market outcomes						
Labor force participation	0.60	0.65	0.59	0.62	0.62	0.69
Work hours if working	37.81	39.56	36.14	37.24	41.33	42.78
Log hourly wage if working	2.79	2.85	2.71	2.73	2.95	3.02
Panel C: Demographics of parents						
Age	81.95	78.63	81.69	77.82	82.53	79.88
Education	10.72	10.79	10.62	10.71	10.94	10.93
Marital status	0.30	0.50	0.30	0.52	0.29	0.46
In nursing home	0.07	0.07	0.07	0.06	0.07	0.09
Memory related disease	0.18	0.10	0.18	0.10	0.16	0.10
Individuals	5,286	8,738	3,478	5,131	1,808	3,607
Observations	11,354	24,172	7,846	14,624	3,508	9,548

Notes: The data used is from HRS 1998 to 2014 full sample including individuals with at least one living parent. The care indicators are constructed using the cutoff zero. Overall care indicator is one if an individual provides either personal care or errands care. The first four columns use the sample of all HRS individuals by care status. Columns 5 to 8 are among females and columns 9 to 12 are among males. Panel A shows the demographics of HRS respondents. Number of siblings living close to parents means the number of siblings who live within 10 miles of mothers of HRS respondents. Live within 10 miles indicates whether HRS respondent lives close to their parents. Labor force participation indicator shows whether an individual is working and getting paid. Work hours and log hourly wage are the working hours per week and hourly wage for individuals who are working. Panel C describes the demographics of parents of HRS respondents. Education is used in years of education. Marital status is equal to one if one's parents are married. Here the parents mean mostly about mothers since majority of the living parents in HRS sample are living mothers.

Table 3: Results of OLS on Labor Market Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)
	LFP		Working hours		Log hourly wages	
	OLS	OLS-FE	OLS	OLS-FE	OLS	OLS-FE
Care indicator						
Informal care	-0.034***	-0.019***	-1.464***	-0.305	-0.084***	-0.018
	(0.007)	(0.006)	(0.268)	(0.228)	(0.015)	(0.012)
Individual FE	N	Y	N	Y	N	Y
Adjusted R-squared	0.101	0.082	0.037	0.051	0.073	0.032
Mean	0.63		39.04		2.83	
Individuals		10,519		7,738		7,536
Observations	35,526	35,526	22,170	22,170	20,596	20,596

Notes: The data used is from HRS 1998 to 2014 full sample including individuals with at least one living parent. Panel A shows the OLS estimates of care indicators with and without individual fixed effects on labor market outcomes. The care indicators are constructed using the cutoff zero. Overall informal care indicator is one if an individual provides either personal care or errands care. Personal care includes dressing, eating, bathing, and walking. Errands care includes help with running errands, household chores, making meals, or managing medications. Labor force participation indicates whether an individual is working and getting paid. Working hours is the weekly hours for the employed. Log hourly wage is the logarithm hourly wage for the employed. The mean of these dependent variables are shown in the bottom.

Table 4: Results of OLS on Labor Force Participation by Care Types and Gender

	(1)	(2)	(3)	(4)	(5)	(6)
	Informal care		Personal care		Errands care	
	Panel A Full sample on labor force participation[0.63]					
Coefficients	-0.034***	-0.019***	-0.088***	-0.035***	-0.029***	-0.016***
	(0.007)	(0.006)	(0.011)	(0.009)	(0.007)	(0.006)
Individual FE	N	Y	N	Y	N	Y
Adj. R-squared	0.101	0.082	0.103	0.088	0.1	0.088
Individuals		10,519		10,519		10,519
Observations	35,526	35,526	35,526	35,526	35,526	35,526
	Panel B Female sample on labor force participation[0.61]					
Coefficients	-0.010	-0.019***	-0.068***	-0.033***	-0.005	-0.016**
	(0.009)	(0.007)	(0.012)	(0.010)	(0.009)	(0.007)
Individual FE	N	Y	N	Y	N	Y
Adj. R-squared	0.098	0.082	0.100	0.083	0.098	0.082
Individuals		6,306		6,306		6,306
Observations	22,470	22,470	22,470	22,470	22,470	22,470
	Panel C Male sample on labor force participation[0.67]					
Coefficients	-0.057***	-0.021**	-0.100***	-0.045**	-0.055***	-0.020*
	(0.012)	(0.010)	(0.021)	(0.018)	(0.012)	(0.010)
Individual FE	N	Y	N	Y	N	Y
Adj. R-squared	0.122	0.103	0.122	0.103	0.122	0.102
Individuals		4,213		4,213		4,213
Observations	13,056	13,056	13,056	13,056	13,056	13,056

Notes: This table shows the effects of care indicators on labor force participation outcome. The data in Panel A used is full sample including all individuals with at least one living parent, Panel B is female sample with female individuals having at least one living parent, and Panel C is male sample with male individuals with at least one living parent from HRS 1998 to 2014. Each column corresponds to the estimate of one type of care indicator on labor force participation. Every care indicator has two models with the first model of no individual fixed effects and the second model of individual fixed effects. The care indicators are constructed using the cutoff zero. Overall informal care indicator is one if an individual provides either personal care or errands care. Personal care indicator shows individuals with help on personal care and errands care indicator shows individuals with errands care. Personal care includes dressing, eating, bathing, and walking. Errands care includes help with running errands, household chores, making meals, or managing medications. Means are in the brackets for each sample.

Table 5: OLS-IV Estimate of Informal Care on Labor Force Participation

	(1)	(2)	(3)	(4)	(5)	(6)
	All		Female		Male	
	OLS	2SLS	OLS	2SLS	OLS	2SLS
Panel A						
Overall care	-0.034***	-0.407***	-0.010***	-0.888***	-0.057***	0.253
	(0.007)	(0.139)	(0.009)	(0.215)	(0.012)	(0.186)
F-statistics		4.20		2.99		2.55
Panel B						
Errands care	-0.029***	-0.260	-0.005	-0.853***	-0.055***	0.326
	(0.007)	(0.161)	(0.009)	(0.265)	(0.012)	(0.199)
F-statistics		7.83		6.67		5.14
Controls	Y	Y	Y	Y	Y	Y
Individual FE	N	N	N	N	N	N
Observations	35,526	35,526	22,470	22,470	13,056	13,056

Notes: The data used is from HRS 1998 to 2014 full sample including individuals with at least one living parent. Panel A shows the estimates of care indicators on labor force participation. The care indicators are constructed using the cutoff zero. Overall informal care indicator is one if an individual provides either personal care or errands care. Panel B shows the estimates of errands care indicator on labor force participation. Column 1 shows the findings of OLS and column 2 shows the 2SLS estimates using the policy instrument, Medicaid aging waiver expenditures without individual fixed effects. Column 3 and 4 show the results for females. Column 5 to 6 correspond to the findings for males. All models control for state year trend of the policy and the demographics of HRS respondents and their parents such as age, marital status and number of living siblings. The standard errors are clustered at individual level.

Table 6: FE-IV Estimate of Informal Care on Labor Force Participation

	(1)	(2)	(3)	(4)	(5)	(6)
	All		Female		Male	
	OLS-FE	2SLS	OLS-FE	2SLS	OLS-FE	2SLS
Panel A						
Overall care	-0.019***	-0.547*	-0.019***	-0.122	-0.021**	0.046
	(0.006)	(0.289)	(0.007)	(0.233)	(0.010)	(0.202)
F-statistics		3.51		2.49		2.27
Panel B						
Errands care	-0.016***	-0.360*	-0.016**	-0.106	-0.020*	0.101
	(0.006)	(0.206)	(0.007)	(0.189)	(0.010)	(0.174)
F-statistics		4.66		3.40		3.18
Controls	Y	Y	Y	Y	Y	Y
Individual FE	Y	Y	Y	Y	Y	Y
Individuals	10,519	10,519	6,306	6,306	4,213	4,213
Observations	35,526	35,526	22,470	22,470	13,056	13,056

Notes: The data used is from HRS 1998 to 2014 full sample including individuals with at least one living parent. Panel A shows the estimates of care indicators on labor force participation. The care indicators are constructed using the cutoff zero. Overall informal care indicator is one if an individual provides either personal care or errands care. Panel B shows the estimates of errands care indicator on labor force participation. Column 1 shows the findings of OLS and column 2 shows the 2SLS estimates using the policy instrument, Medicaid aging waiver expenditures without individual fixed effects. Column 3 and 4 show the results for females. Column 5 to 6 correspond to the findings for males. All models control for individual fixed effects, state year trend of the policy and the demographics of HRS respondents and their parents such as age, marital status and number of living siblings. The standard errors are clustered at individual level.

Table A1: Reduced Form Results of IV Model on Labor Market Outcomes

	(1)	(2)	(3)
	All	Female	Male
	Panel A: Dependent variable labor force participation		
Aging waiver expenditures	-0.00082**	-0.00083*	-0.00079*
	(0.00035)	(0.00048)	(0.00047)
Number of individuals	10,519	6,306	4,211
Observations	35,526	22,470	13,054
	Panel B: Dependent variable work hours		
Aging waiver expenditures	0.008	0.009	0.005
	(0.011)	(0.013)	(0.020)
Number of individuals	7,738	4,516	3,222
Observations	22,170	13,551	8,619
	Panel C: Dependent variable log hourly wage		
Aging waiver expenditures	-0.001	0.000	-0.001
	(0.001)	(0.001)	(0.001)
Number of individuals	7,536	4,415	3,121
Observations	20,596	12,634	7,962

Notes: The data used is from HRS 1998 to 2014 full sample including individuals with at least one living parent. The Medicaid Aging waiver expenditures are in millions of Medicaid aging waivers across states and across years. Panel A shows the reduced form estimates of policy expenditures on labor force participation. The labor force participation indicating whether a HRS respondent is working or not. Panel B shows the estimates on working hours for individuals employed in the last two years. Panel C reports the results on hourly wage for paid individuals. All models control for individual fixed effects, state year trend of the policy and the demographics of HRS respondents and their parents such as age, marital status and number of living siblings. The standard errors are clustered at individual level.

Table A2: Results of OLS on Labor Market Outcomes Restricting Age 65 and Below

	(1)	(2)	(3)	(4)	(5)	(6)
	Labor force participation		Working hours		Log hourly wages	
	OLS	OLS-FE	OLS	OLS-FE	OLS	OLS-FE
Care indicator						
Informal care	-0.037***	-0.015***	-1.394***	-0.428*	-0.077***	-0.017
	(0.007)	(0.006)	(0.268)	(0.228)	(0.015)	(0.012)
Individual FE	N	Y	N	Y	N	Y
Adjusted R-squared	0.049	0.062	0.014	0.032	0.073	0.034
Individuals		9,981		7,542		7,375
Observations	31,361	31,361	20,932	20,932	19,550	19,550

Notes: The data used is from HRS 1998 to 2014 full sample including individuals whose age is restricted to 65 and below. The table shows the OLS estimates of care indicators with and without individual fixed effects on labor market outcomes. The care indicators are constructed using the cutoff zero. Overall informal care indicator is one if an individual provides either personal care or errands care. Labor force participation indicates whether an individual is working and getting paid. Working hours is the weekly hours for the employed. Log hourly wage is the logarithm hourly wage for the employed.

Table A3: Results of OLS-FE on LFP with Different Forms of Age

	Dependent variable: LFP		
	(1)	(2)	(3)
	Linear	Cubic	State-year trend
Informal care	-0.018**	-0.018***	-0.019***
	(0.006)	(0.006)	(0.006)
Individual FE	Y	Y	Y
Adjusted R-squared	0.075	0.083	0.084
Individuals	10,519	10,519	10,519
Observations	35,526	35,526	35,526

Notes: The data used is from HRS 1998 to 2014 full sample. The table shows the OLS estimates of care indicators on LFP using different forms of age and adding state-year trend. The main result uses the quadratic form of age. The care indicator is constructed using the cutoff zero. Overall informal care indicator is one if an individual provides either personal care or errands care. Labor force participation indicates whether an individual is working and getting paid.

Table A4: Reduced Form Results of Policy IV on Labor Force Participation by Samples

	(1)	(2)	(3)
	All	Female	Male
	Never caregivers and always caregivers		
Aging waiver expenditures	-0.00069	-0.00088	-0.00038
	(0.00041)	(0.00063)	(0.00048)
Number of individuals	8,738	5,131	3,606
Observations	24,172	14,624	9,547
Controls	Y	Y	Y
Individual FE	Y	Y	Y
State year trend FE	Y	Y	Y

Notes: The data used is from HRS 1998 to 2014 full sample including individuals with at least one living parent. The aging waiver expenditures are in millions of Medicaid aging waivers across states and across years. Panel A shows the reduced form estimates of policy expenditures on labor force participation for individuals who never give care during the survey years 1998 to 2014. The labor force participation indicating whether a HRS respondent is in the labor force or not. Panel B shows the estimates on the sample of individuals who either never provide care to their parents or continuously give care during the years from 1998 to 2014. All models control for individual fixed effects, state year trend of the policy and the demographics of HRS respondents and their parents such as age, marital status and number of living siblings. The standard errors are clustered at individual level.

Table A5: Baseline Characteristics between High and Low States

	(1)	(2)	(3)	(4)
	High state	Low state	High vs. low P value	Caregiver vs. non-caregiver P value
	Baseline Characteristics			
Panel A: Demographics of respondent				
Overall care	0.35	0.31	0.02**	0.00***
Female	0.61	0.69	0.51	0.08*
Age	56.88	56.77	0.23	0.05*
Number of living siblings	3.44	3.28	0.05*	0.01**
Number of siblings living close to parents	0.49	0.61	0.73	0.61
Frequency of contact with parents	16.49	16.87	0.22	0.18
Live within 10 miles of respondent	0.40	0.40	0.37	0.12
Panel B: Demographics of parents				
Age	80.95	81.13	0.16	0.46
Education	11.02	10.83	0.79	0.0002***
Marital status	0.52	0.46	0.80	0.003***
Memory related disease	0.10	0.11	0.11	0.41

Notes: The data used is from HRS 1998 to 2014 full sample including individuals with at least one living parent. The high state means the aging waiver expenditures are larger than the mean value of aging waiver expenditures across states in a specific year. The categorization of high or low state is indexed for every year because the expenditures of Medicaid aging waivers are in general increasing for each state. Individuals are correspondingly categorized the high or low state of that state they are in. Column 3 shows the t-test of the characteristics between high and low states. Column 4 reports directly the t-test between caregivers and non-caregivers.

Table A6: Instrument Statistic Tests

Weak identification test (Cragg-Donald Wald F statistic):	3.51
Stock-Yogo weak ID test critical values:	
10% maximal LIML size	3.97
15% maximal LIML size	3.04
20% maximal LIML size	2.63
25% maximal LIML size	2.39