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The Unintended Effect of Medicaid Aging Waivers on Informal Caregiving*

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Abstract

Medicaid aging waivers incentivize older adults who need long-term care to stay at home rather than move into a nursing facility. However, this policy may inadvertently shift care burdens onto informal caregivers. Using data on state-level waiver expenditure from 1998 to 2014 linked with the restricted access Health and Retirement Study (HRS), this paper investigates whether program funding is associated with the probability that an HRS respondent provides informal care to her older parents. Changes to state-level policy funding produce a quasi-experiment, which allows us to use two-way fixed effects models to estimate a causal relationship between the program and informal caregiving. The findings show that a 10 percent increase in aging waiver expenditure increases the overall likelihood that an adult child becomes an informal caregiver to her parents by 0.1 percentage points (0.3 percent). The overall estimate is composed of differential effects on different types of care. The results show that the Medicaid aging waiver funding is positively associated with the likelihood of being an errands caregiver and a non-intensive caregiver who spends fewer hours providing care, but unrelated to the likelihood of providing personal care and intensive care. The findings are mainly driven by the mechanism that aging-at-home is more attractive supported by the aging waivers.

Keywords: Medicaid Aging Waiver, Long-Term Care, HRS, Informal Care

JEL classification: I180, J140, J180

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1 Introduction

With the aging population in the United States, the demand for long-term care (LTC) services would continue to rise undoubtedly.[1] More than 50 percent of adults aged 65 and above are projected to need LTC at some point towards the end of their life cycle (Kemper et al., 2005; Brown and Finkelstein, 2008; Houser et al., 2012; Favreault and Dey, 2015; Johnson, 2017; Mommaerts and Truskinovsky, 2020). For older people who require care, market-based formal care options are expensive (Mommaerts, 2018; Hado and Komisar, 2019).[2] Yet, many older adults are low-income, and few people have private LTC insurance (Cohen, 2014; Johnson, 2016; Costa-Font et al., 2019). Hence, older Americans rely on Medicaid to pay for LTC. The rising demand and the climbing cost of institutional LTC services make policymakers face mounting pressure to limit public LTC spending. Medicaid aging waiver (MAW) programs are one attempt that governments try to alleviate financial burden without resulting in unmet LTC needs of old people. As the main programs offering home or community-based services (HCBS), these waivers provide states with funding to subsidize professional providers who offer in-home formal care, including help with daily services – like assistance with bathing or eating – and round-the-clock nursing services. By encouraging old people to age-in-place, state governments should relieve partial financial burdens due to lower cost of home-based services.

However, little is known about whether MAW programs relieve or exacerbate care burden onto informal caregivers. In 2014, unpaid caregiving nationwide was estimated to be valued at $522 billion (Chari et al., 2015; Weber-Raley and Smith, 2015). Given the importance of informal caregiving, any policy that may change the pattern of informal caregiving needs further examination. In this paper, we estimate the causal effect of the MAW programs on informal caregiving. In particular, we focus on the near-elderly caregivers. In 2020, there were around 24 million informal caregivers who are 50 and above, accounting for 57 percent of caregivers of older adults. We proceed by first developing a theoretical framework, extended on Mommaerts and Truskinovsky (2020) to illustrate how families respond to MAW programs, considering both

[1] Long-term care (LTC) is care provided by paid or unpaid assistants for people with limited function to live independently for a long period of time. The typical services include personal care such as bathing, dressing, eating, and toileting as well as errands care like preparing meals, running grocery, and managing medication.

[2] A nursing home with 24 hour supervision costs $100,400 per year, while in-home help from a personal care worker costs $34,000 per year in 2018 dollars.

substitution effect and preference-shift effect. We then use plausibly exogenous variation in state-level MAW expenditure between 1998 to 2014 to estimate the effect of MAW on informal caregiving.

Specifically, we first provide a theoretical framework for exploring how MAW programs might affect the use of informal care through the optimization problem among families. We have two main predictions. First, MAW programs could discourage informal care through the substitution effect. MAWs subsidize in-home formal care purchased on the market, leading to a reduction in the price of in-home formal care relative to in-home informal care. The relatively lower price of in-home formal care will attract more LTC demand and relieve informal caregivers consequently. Besides, since MAWs cover more home-based personal care services and less on errands assistance, the substitution effect on personal care should be stronger than that on errands care. Second, MAW programs could produce higher demand for informal care through the preference-shift effect. The decrease in the relative price of in-home care makes home-setting more attractive than institutional-setting (nursing homes). This preference-shift effect allows old people to stay at home longer, potentially increasing the need for informal care, which is more accessible in the home setting. In summary, the overall predicted effect of MAWs on informal caregiving is ambiguous.

In addition to providing the theoretical framework, we utilize a two-way fixed-effect strategy to identify the causal effect of MAWs on informal caregiving provided by adult children to their older parents. Using state-level variation linked with the restricted Health and Retirement Study (HRS) data, we find that MAW expenditure increase is associated with an increase in informal caregiving. Specifically, a 10 percent increase in annual MAW expenditure (about $32 million) is associated with the overall likelihood of becoming an informal caregiver who provides either personal care or errands care by 0.1 percentage points – about a 0.3 percent effect. However, the results also present evidence of a shift in the type of care. The policy increase is associated with a 0.15 percentage points (0.4 percent) increase in the probability of providing errands assistance, but the likelihood of providing personal care is indistinguishable from zero. This suggests that while the policy does induce adult children to help their parents, the help is primarily in the form of less intensive tasks which may have lower implicit cost, and which are not directly subsidized by MAWs. Interesting to note that the magnitude of our estimates are similar but the direction is the opposite of similar contexts in other nations. Stabile et al. (2006) employ variation in the generosity of home care

programs across provinces in Canada and estimate that an increase of similar scale in spending on home care benefits decreases the chance of giving care by 0.3 percentage points. Viitanen (2007) shows that similar expansion on formal care subsidized by public programs for the older population in European context decreases informal caregiving by 0.15 percentage points. We consider the difference between ours and theirs are mainly driven by two reasons. First, our paper focuses on near-elderly caregivers whose opportunity cost could be lower than the younger cohort in their context. Second, the preference-shift effect could be larger among near-elderly caregivers' families. Their parents may have a stronger preference for aging at home.

To better understand the positive estimates of MAWs on informal caregiving, we show that these effects are mainly driven by the preference-shift effect. Specifically, we find that MAWs reduce the likelihood of mothers living in nursing homes by 0.03 percentage points (0.4 percent) and fathers by 0.01 percentage points (0.5 percent). Furthermore, the policy affects the living arrangements of older parents. A raise in MAW funding increases the probability that mothers live with or live closer with adult children by 0.02 percentage points (0.3 percent) and 0.11 percentages points (0.25 percent), respectively. In addition, among medically needy individuals with severe limitations in ADL activities, MAWs significantly increase the likelihood to age at home rather than in nursing homes. These evidence validates the preference-shift channel that old people are incentivized by MAWs to age-in-place. These findings also confirm the results of existing studies on the HCBS programs, which demonstrate that these programs have been effective in helping families avoid institutionalization (Amaral, 2010).

This study makes several contributions to the existing literature. First, this paper is directly related to Medicaid HCBS programs. Amaral (2010) shows that Medicaid HCBS programs encourage more people to stay at home and help to avoid nursing homes. Van Houtven and Domino (2005) use North Carolina Medicaid waiver claims data for disabled and blind adults and find that the Medicaid waiver significantly reduces expenditure in institutions. Pande et al. (2007) show that the MAW in South Carolina helps frail old people stay at home longer. Other papers about Medicaid HCBS programs mainly focus on its cost-effectiveness and prediction of future expenditure at state or national level (Miller et al., 1999; LeBlanc et al., 2000; Van Houtven and Domino, 2005; Grabowski, 2006; Ng et al., 2011). This paper explores from another angle and shows causal evidence of the impact of MAWs on informal care. Closely related

to this paper, Muramatsu and Campbell (2002) use one wave of the Assets and Health Dynamics among the Oldest Old (AHEAD) data with state expenditure of HCBS in 1992 and show that generous HCBS expenditure are associated with more personal formal care use and no less informal personal care assistance. This study uses longitudinal data, taking advantage of changing state-level funding for the Medicaid program, and controls for individual fixed effects. In addition, this paper investigates not only the effects of MAWs on overall care but also the effects by type of care and composition of caregivers. We also show the channels through which the Medicaid program affects informal care, which is not studied in Muramatsu and Campbell (2002).

Second, the study is related to the literature that estimates effects of broad publicly financed policies on LTC choices.[3] The findings of these policies are mixed. Ettner (1994) and Stabile et al. (2006) show that publicly funded home care benefits lead to more formal in-home care and less informal care use. Hoerger et al. (1996) find that generous Medicaid reimbursement of nursing home care is associated with increased use of nursing homes. Grabowski and Gruber (2007) also find that generous Medicaid nursing home reimbursement increases nursing home use and Hoerger et al. (1996) find an increase of the probability entering nursing homes. Grabowski et al. (2010) show that an increase of state Medicaid bed-hold funding – which funds nursing homes to reserve beds of hospitalized Medicaid residents – increases the hospitalization rate in skilled nursing facilities. Cutler and Sheiner (1994) estimate that a spend-down policy – which increases state Medicaid income eligibility by expanding the income eligibility threshold – increases nursing home utilization. McKnight (2006) shows that the reduction of Medicare home visit payment in the 1990s decreases the reliance on home visits, but is not offset by increases in other forms of care. Orsini (2010) demonstrates that the constraint of Medicare home visits also induces more older people to live in shared living arrangements. Pezzin et al. (1996) suggest no or little substitution between formal care and informal care using the largest home care demonstration experiment, Long-Term Care Channeling Demonstration. In addition, Goda et al. (2011) explore how social security benefit notch affects nursing home use and find that an increase in the generosity of social security benefits

[3]There are potentially three main public policies related to LTC coverage: Medicaid, Medicare, and Paid Family Leave. Medicare only covers older people with acute conditions after discharge from hospitals for at most 100 days. Paid family leave policies are not popular. As of 2018, only four states have such a policy: Washington, New Jersey, California and Rhode Island. In addition, paid family leave policy only covers six weeks of care for children and seriously ill family members. The MAW program is therefore the primary program that can offer LTC to the growing older population.

in low-education population increases the probability of using paid home health care. Arora and Wolf (2018) show that a presence of the paid family leave in California reduces nursing home utilization. The results in this paper add to this literature suggesting that public policy can also change care use by shifting the location where LTC services are received.

Third, the relationship between in-home formal care and informal care shown in this study has direct relevance to LTC policy discussion. It is documented that the involvement of informal caregivers in LTC reduces unmet needs and improves the quality of life for care recipients (Callahan et al., 2009; Samus et al., 2014; Griffin et al., 2017). However, how to integrate informal caregiving into the health care team and coordinate informal caregivers with formal care providers is challenging to policymakers. For example, Medicare Advantage Plans expanded the supplemental benefits by increasing family caregiver support services such as adult daycare and counseling beginning in 2019. The 2020 COVID-19 pandemic makes in-home formal care less feasible and risky so some state Medicaid programs are temporarily allowing informal caregivers to be subsidized for providing care to beneficiaries (Fox-Grage and Spradlin, 2020). The findings in this paper combining these initiatives provide empirical evidence to inform the debate about how policymakers subsidize LTC care to address the growing needs of a rapidly aging population.

The paper proceeds as follows. Section 2 describes the institutional background of MAWs. Section 3 outlines a theoretic model of households choosing care choices and the potential channels that MAWs might affect informal caregiving. Section 4 describes the data, how the sample is selected, and presents descriptive statistics. Section 5 shows the empirical model. Section 6 reports the results of MAWs on informal caregiving and heterogeneous findings by sub-populations, analyzes the channels through which MAWs affect informal care, and probes robustness checks on the estimates. Section 7 concludes.

2 Institutional Background

2.1 Medicaid Home and Community-Based Services

Historically, Medicaid only funded LTC in institutional settings such as nursing homes. This has led to a substantial increase in Medicaid LTC expenditure over the years due to the high cost of nursing home care. To address this issue and align with the public's preference for receiving care in

their homes or community-based settings, Medicaid introduced the Home and Community-Based Services (HCBS) program in the early 1980s. The program is designed to be adaptive and attentive to the individual needs of those requiring LTC services. It enables them to receive care that aligns with their personal needs and preferences, thereby promoting independence and enhancing the quality of life for individuals requiring LTC services.

Medicaid HCBS mainly funds three programs that comprise the majority of its enrollment and spending on in-home services: a mandatory home health state plan, an optional personal care state plan, and optional waivers.[4] However, there are some key differences between the Medicaid state plans and waivers. Medicaid state plans are the standard Medicaid programs offered by each state to its residents and typically cover a wide range of healthcare services, including in-home care.[5] On the other hand, Medicaid waivers are programs that offer coverage beyond the standard state Medicaid plan and provide access to a wide range of services not typically covered under traditional Medicaid programs.[6]

The waiver program is known as a "waiver" because it allows states to "waive" certain requirements in traditional Medicaid and receive funding to provide services in a more flexible and cost-effective manner. For example, Medicaid waivers can select a particular population to serve, set limits on participants, and expand coverage through more generous financial requirements, which are not possible under state plans. Medicaid waivers are designed to meet the unique needs of certain populations, such as individuals with disabilities or elderly individuals who require in-home care services. Medicaid waivers often provide more extensive coverage for in-home services than the standard state Medicaid plan, making them a useful resource for those who need in-home LTC.

[4]Medicaid HCBS also includes other state plan programs such as Community First Choice that provides personal care and support services for individuals with disabilities and older adults, enabling them to live in their own homes and communities and Section 1915(i) that assists individuals with intellectual or developmental disabilities. In 2018, Medicaid spent about $62.5 billion for waiver programs, accounting for 58 percent of total spending, $20.6 billion for state plans, comprising 23 percent of total Medicaid expenditure, and the rest 9 percent spent for Community First Choice.

[5]To meet Medicaid eligibility criteria, the monthly income for a family of two is below $2,000 (%138 FPL) and the asset limit is $2,000 in 2021. The specifics of what services are covered can vary by state.

[6]In 2018, approximately 3 million enrollees received Medicaid HCBS, and 2.5 million beneficiaries received it through waivers.

2.2 Medicaid Aging Waivers

In this paper, we focus on Medicaid Aging Waivers (MAWs), which are specifically designed to support older adults who would otherwise require nursing home care.[7] The aim of MAWs is to enable seniors to age in their own homes or communities, enhance their independence and well-being, and alleviate the pressure on LTC facilities.

To be eligible for MAWs, individuals must meet certain criteria, which typically include being 65 years of age or older, being a resident of the state, having income and assets below a certain limit, and demonstrating a need for LTC services that can be provided at home or in a community setting.[8] The specific eligibility requirements vary by state, with 79 percent of states using 300 percent Supplemental Security Income (SSI) ($27,000 for a single individual) as their income thresholds, 16 percent using 100 to 300 percent SSI ($9,000 to $27,000), and 5 percent using 100 percent SSI ($9,000) in 2018. For the asset limit, 77 percent used $2,000, 11 percent of states used 0, 8 percent used $2,500 to $4,000, and 4 percent used $1,600 in 2018. While detailed eligibility information is not available for each state in the period 1998-2014, it is believed that before the expansion of the Affordable Care Act in 2011, the eligibility requirements for MAWs in each state were stable and did not vary significantly over years. Our results are insensitive to restricting our study period in 1998-2012.[9]

There are several unique features of MAWs that we utilize to draw causal estimates on informal care in section 6. First, MAWs are administered by individual states, allowing each state to set its own services offered and spending limits. The services covered under MAWs typically include personal care, home health care, day care, and home modifications, but the extent of coverage can vary from state to state.[10] As shown in Figure 1, the level of spending on each service offered in

[7] States have different names of providing HCBS for the older population. The common name is HCBS for the aged or elderly. For convenience and simplicity, we refer to these programs using a general name, the MAW. Other Medicaid waivers include waivers serving the blind or disabled, children with intellectual or developmental disabilities, children with mental illness, people with HIV/AIDS, and people with brain injury. The expenditure of MAWs were approximately $40 billion in 2017, making up 65 percent of the total Medicaid waiver expenditure.

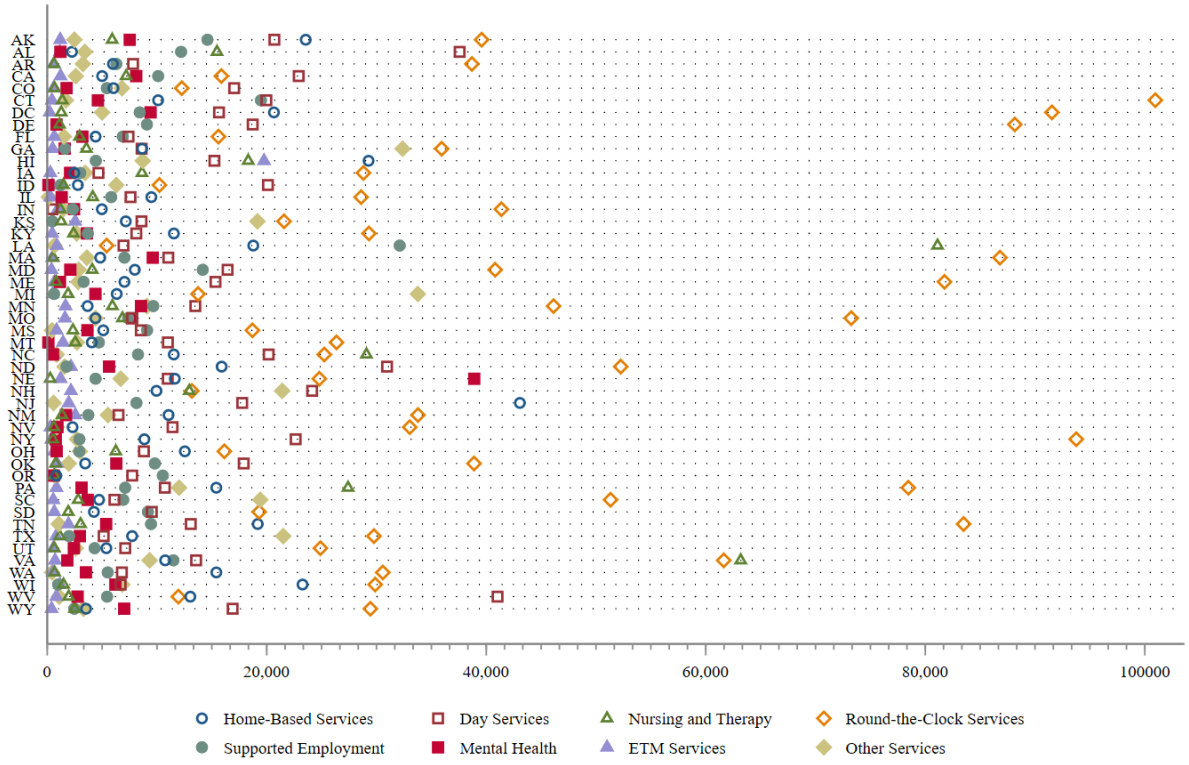
[8] The functional criteria often involve assessments of the individual's ability to perform activities of daily living (ADLs) and instrumental activities of daily living (IADLs). The assessment is typically conducted to determine the level of care required and ensure eligibility for MAWs.

[9] Since our treatment variable of MAW spending is averaged between two years, we restrict the sample to the year 2012 that the ACA was not expanded in 2011. See section 15 for details on our estimation design. The results are available upon request.

[10] In 2018, 85 percent of states provided home-based services, 70 percent offered nursing or therapy services, 78 percent covered equipment and technology modifications (ETM), 40 percent included round-the-clock services, 61 percent furnished day services, and 62 percent had case management services.

MAWs in 2014 varied widely between states. For example, Oregon spent only $826 per participant on home-based services, while New Jersey spent $43,066 per participant.

Figure 1: Variation in Spending per Enrollee for Each Service of MAWs in 2014



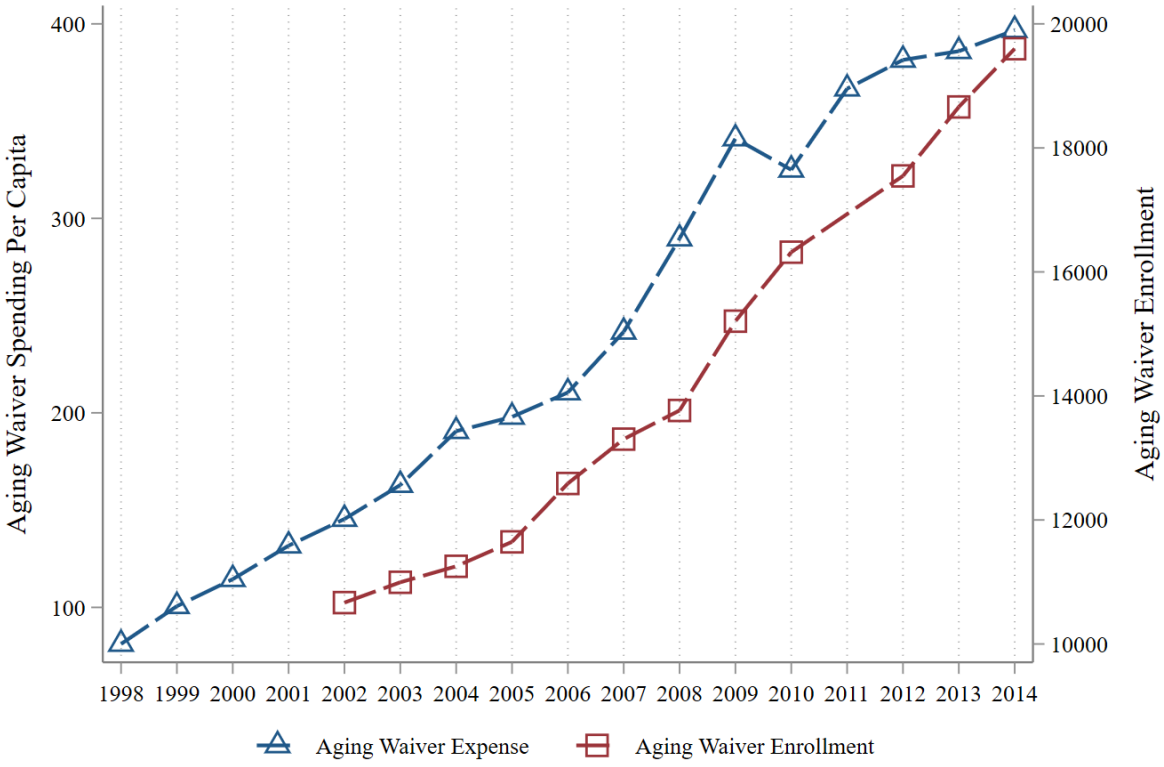
Notes: The plot displays the variation of spending per enrollee for each service covered under MAWs across states. The x-axis is the dollars spent per participant. The y-axis is the abbreviation of each state.

The second unique feature of MAWs is their cost-effectiveness design, which requires that the cost of providing LTC services to older people in home and community-based settings is not greater than the cost of institutional care. Each state must conduct a cost-effectiveness analysis in its MAW application, which compares the costs of providing services through the waiver program with the benefits derived from it. The Centers for Medicare and Medicaid Services (CMS) then evaluates whether a MAW is cost-effective. The approval process often requires multiple revisions, with common areas for improvement including enrollment caps, service coverage, and units of services.[11] As a consequence of this requirement for cost-effectiveness, many people remain on waiting lists in each year. As the MAW expands, Figure 2 shows that more eligible older adults are being enrolled

[11]For example, the number of users who utilize adult daycare, the average units per user, etc. The modification details of each revision are not publicly available.

and receiving covered LTC services.

Figure 2: MAW Spending and Enrollment in 1998-2014



Notes: The data used are from CMS about enrollment in the MAW programs. The plot shows the MAW spending and its enrollment over the period 1998-2014. The left y-axis corresponds to spending and the right y-axis corresponds to enrollment.

The third feature of MAWs is the ability to customize services to fit the unique requirements of their aging populations, providing more versatility in the delivery of LTC services. In addition, MAWs stimulate creativity that allow states to experiment with innovative approaches of providing LTC.[12]

The MAWs are operationalized through a collaboration between the state government, healthcare providers, and community organizations. The state government submits a MAW application to CMS. The application describes the proposed program, including the services to be provided, eligibility criteria, and the costs associated with the MAW. CMS reviews the application and evaluates it based on requirements such as the financial feasibility of the program,

[12]Some new approaches to delivering LTC services in MAWs include Integrated Care Models, Technology-Enabled Care, Person-Centered Care, and Dementia Care. See details of each model at CMS website https://www.medicaid.gov/medicaid/waivers/index.html.

cost-effectiveness, and the quality of care provided. Once the MAW program is approved, its operationalization typically involves the enrollment of participants, the assessment of their needs, the development of individualized care plans, and the delivery of services and support. The state health agency is responsible for enrolling eligible older adults, and healthcare providers, such as home health agencies and adult day care centers, are responsible for providing LTC services to participants. Community organizations, such as non-profit agencies and advocacy groups, may also play a role in the implementation of MAWs by providing support and resources to participants and their families. In addition, CMS monitors the MAW on an ongoing basis to ensure that it is being implemented in accordance with the terms of the waiver agreement. The state is also required to provide regular reports on the performance of the program and the quality of care provided. As shown in Figure 3, which displays the variation of MAW expenditure in the period 1998-2014 for all 50 states in the United States, the pattern of expenditure of MAWs varies greatly from state to state, due to the policy design. Appendix Figure A1 divides the MAW into four sub-graphs by its spending and shows a clearer pattern between generous states and states with smaller sizes of MAW expenditure. The variation of MAW spending in each state over 1998-2014 is plotted in Appendix Figures A2-A6 for details.

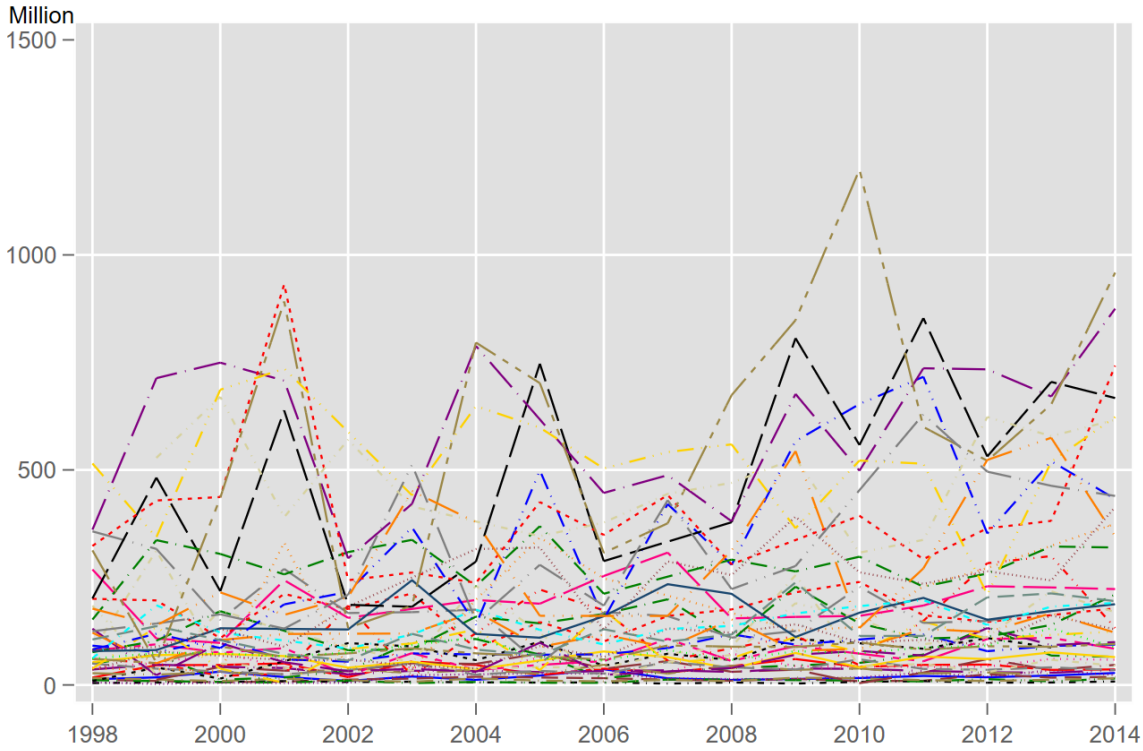
In addition to the MAW program, the standard Medicaid in each state might also cover some in-home services to its residents. For example, Medicaid home health and personal care state plans offer in-home care to eligible Medicaid beneficiaries regardless of their age and settings. Note that MAWs are designed to meet the unique needs of older populations who require in-home care services and often provide more substantial coverage for LTC services than the standard Medicaid state plans.[13] Nevertheless, we control for the spending from Medicaid state plans in our main estimation of section 5 to remove any potential effects of standard Medicaid on informal care.

3 Theoretical Framework

In order to understand how families respond to the MAW program, we have developed a simple static model. This model is based on the work of Mommaerts and Truskinovsky (2020) and is

[13]The home health state plan provides more services involving nurses and professionals, and the personal care state plan offers services such as personal care and household activities at homes, work sites, foster care, or assisted living facilities. See Appendix Table A1 for more details.

Figure 3: Variation of MAW Expenditure by State in 1998-2014



Notes: The plot draws the expenditure of MAWs across 50 states from 1998 to 2014. Each line corresponds to one state.

specifically designed to distinguish between informal care, formal home-based care, and formal facility-based care. Like Mommaerts and Truskinovsky (2020), we consider a two-generation family consisting of an older parent and a potential caregiver. Our model allows us to make precise and testable predictions about the behavior of such families.

3.1 Model set-up

In this model, the utility of a two-generation family is derived from total consumption, C, and the health status of the parent, H, according to the equation:

$$U = U(C, H) \tag{1}$$

As suggested by the Grossman model (Grossman, 1972), individuals' health is "produced" from the consumption of healthcare services. That is, a health production function determines an individual's state of health. We assume that the health of the elderly is produced by the following equation:

$$H = \tilde{H}(L; \boldsymbol{\theta}) \tag{2}$$

where L represents the total amount of LTC services received,[14] and $\boldsymbol{\theta}$ is an exogenous vector that includes stochastic individual shocks, such as his preference over each health inputs. It's important to note that our model is static, meaning that the health status of the elderly in prior periods is taken as given. However, the health condition of the elderly in each period is still influenced by current medical consumption.

We further assume that the utilities from consumption and health are independent and additive, as is commonly assumed in the health literature (Hall and Jones, 2007; Finkelstein et al., 2019). Plugging equation (2) into equation (1) with an additive function gives the following utility function:

$$U(C, L) = V(C) + W(L) \tag{3}$$

The family maximizes utility by choosing the optimal levels of non-LTC consumption, C, and LTC services, L. V and W are assumed to be increasing and concave functions.[15]

In our model, the parent receives LTC services from three different sources: informal care

[14] In our model, LTC services are distinguished from other medical expenses. As such, C represents all non-LTC related consumption. This assumption is reasonable given the distinct characteristics of LTC services, which are financed and delivered differently from other medical expenses. For example, LTC services often have specific needs and requirements, such as the need for long-term support and assistance with daily activities, that set them apart from other medical expenses. These differences make it more practical to consider LTC services separately in healthcare decision making (De Nardi et al., 2010; Goda et al., 2013; Kopecky and Koreshkova, 2014).

[15] One way to think about the representation of LTC consumption in the utility function is that the marginal benefit of LTC services decreases as the amount of LTC services consumed increases. This means that as the older parent's physical condition becomes increasingly weak, the improving effect of LTC services on her health will decrease.

provided by her child, formal home-based care provided by trained professionals, and nursing home care provided in a residential facility. The overall level of LTC care is produced by the quality-adjusted duration of care received from each source, weighted by the relative importance of each source.

To better reflect the real-world scenario, we have made two assumptions in our model. First, we use the Constant Elasticity of Substitution (CES) function to capture the possible complementary or substitutable relationship between informal care and formal home-based care. Second, we include nursing home care as a separate term in the LTC production function. This assumption implies that while families are fully substitutable for the decision to age at home or in a nursing home, the elasticity of substitution for the two forms of home care, informal care and formal home-based care, varies from person to person.

The overall level of LTC can be expressed as follows:

$$L = \left\{ [Q_c \cdot f(h_c)]^{\sigma} + (Q_m \cdot h_m)^{\sigma} \right\}^{\frac{1}{\sigma}} + h_n \tag{4}$$

where h_c, h_m, and h_n represent the quality-adjusted duration of LTC received through informal care, formal home-based care, and nursing home care, respectively. Q_c and Q_m represent the relative importance of informal care and formal home-based care to the overall production of LTC, compared to nursing home care.[16] The elasticity of substitution, represented by σ, captures the degree to which formal home-based care can be substituted for informal care as the quantity of formal home-based care changes.

It is worth noting that in our two-generation family model, informal care is provided by one child. As a result, the provision of quality-adjusted care may be constrained by factors such as fatigue and stress as the duration of care increases. To reflect this, the production function for informal care is assumed to be a concave increasing function, denoted by f. On the other hand,

[16] Equation (4) is a modified form of the standard CES function. The general expression is $Y = \eta[\delta_1 f(h_c)^{\sigma} + \delta_2 h_m^{\sigma}]^{\frac{1}{\sigma}}$, where η represents the relative efficiency compared to nursing home, δ_1 and δ_2 are known as allocation parameters, representing the contribution of the production factors in the produced output. If η is larger than one, it suggests that an increase in the use of home-based care (either informal or formal) has a greater impact on the overall level of LTC than an equivalent increase in the use of nursing home care. It is worth noting that equation (4) modifies the traditional CES equation by setting the values of Q_c and Q_m in terms of the parameters η, σ, δ_1 and δ_2 to make sure that as long as the preference for informal care or home-based care increases, the total level of LTC rises. Specifically, the equation defines $Q_c = \eta\delta_1^{\frac{1}{\sigma}}$ and $Q_m = \eta\delta_2^{\frac{1}{\sigma}}$.

formal care is generally provided by a larger number of trained professionals, so the quantity of care is typically more stable. Therefore, the production function for formal care is assumed to be constant, meaning that the same number of hours of care can be provided regardless of the duration of care.[17]

The family in our model faces two types of resource constraints. The first is a time constraint, which is represented by the equation:

$$h_w + h_c \leq T \tag{5}$$

This equation states that the total non-leisure time available to the child, denoted by T, is divided between market work, h_w, and informal care, h_c. The family is also faced with a budget constraint, which limits their ability to pay for non-LTC consumption and LTC services. They have a certain amount of resources, R, and labor income earned by the child, which can be used to cover these expenses. Formal home-based care and nursing home care have fixed prices in the market, represented by p_m and p_n, respectively.[18] This budget constraint can be expressed as:

$$C + p_m \cdot h_m + p_n \cdot h_n \leq R + w \cdot h_w \tag{6}$$

The family chooses consumption and health spending to maximize the joint utility in equation (3) subject to the production function for total level of LTC services (4) and resource constraints (5)- (6). That is, the optimal allocation solves:

$$\begin{aligned} \max_{C,h_c,h_m,h_n,h_w} \quad & V(C) + W(L) \\ \text{s.t.} \quad & L = \left\{ [Q_c \cdot f(h_c)]^\sigma + (Q_m \cdot h_m)^\sigma \right\}^{\frac{1}{\sigma}} + h_n \\ & h_w + h_c \leq T \\ & C + p_m \cdot h_m + p_n \cdot h_n \leq R + w \cdot h_w \end{aligned} \tag{7}$$

[17] The preference-weighted L is similar in spirit to Blau and Robins (1988) and Mommaerts and Truskinovsky (2020). It's important to note that this assumption of a concave and increasing production function for informal care can be extended to situations where there are more than one informal caregiver. Even with additional informal caregivers, the total number of informal caregivers is likely to be smaller than the number of formal carers. As a result, the provision of informal care may still be subject to limitations such as fatigue and stress as the duration of care increases.

[18] We assume that prices for formal care in the market are homogeneous, meaning that individuals base their decisions on the average price of the service in the market when choosing a type of service.

This simple framework allows us to analyze the basic trade-offs inherent to LTC decisions. It is worth noting that home care and nursing home care are fully substitutable relationships in our model, so when the expansion of MAW policy leads to cheaper home care, the optimal solution of equation (7) has two possible cases: an interior solution, which means that $h_n \neq 0$; or a corner point solution, which means that $h_n = 0$. We will analyze the effects of the MAW policy on the provision of informal care under both scenarios.

Proposition 1. *For older adults who would otherwise rely on institutional care, the expansion of the MAW policy leads to an increase in the supply of informal caregiving.*

Proof. For older adults who would otherwise choose nursing home care, it means that an interior solution of equation (7) exists. By analyzing the first-order conditions of equation (7), we can determine the optimal solution given by the following:

$$f'(h_c) = \left[\frac{\left(\frac{w}{p_n \cdot Q_c^{\sigma}}\right)^{\frac{\sigma}{1-\sigma}} - Q_m^{\frac{-\sigma}{\sigma-1}} \cdot p_m^{\frac{\sigma}{\sigma-1}} \left(\frac{Q_c^{\sigma}}{w}\right)^{\frac{\sigma}{\sigma-1}}}{Q_c^{\sigma}} \right]^{\frac{1-\sigma}{\sigma}} \tag{8}$$

The equation (8) helps us understand the effect of the MAW policy on the provision of informal care when the older adult requires some nursing home care services. As shown in equation (9), the total impact of MAW policy on informal care is due to two factors.

$$\frac{dh_c^*}{d\text{MAW}} = \frac{\partial h_c^*}{\partial p_m} \cdot \frac{dp_m}{d\text{MAW}} + \frac{\partial h_c^*}{\partial Q_m} \cdot \frac{dQ_m}{d\text{MAW}} \tag{9}$$

First, the MAW policy reduces the cost of LTC for older adults who opt for home-based care by subsidizing professional providers and making in-home formal care more affordable for eligible families. This results in a decrease in the price of formal home-based care, p_m, such that $\frac{dp_m}{d\text{MAW}} < 0$. The impact of this change on the provision on informal care is described by the following:

$$\frac{\partial h_c^*}{\partial p_m} = \frac{1}{f''(h_c^*)} \cdot [f'(h_c)]^{\frac{1-2\sigma}{1-\sigma}} \cdot Q_m^{\frac{-\sigma}{\sigma-1}} \cdot \left(\frac{Q_c^{\sigma}}{w}\right)^{\frac{\sigma}{\sigma-1}} \cdot p_m^{\frac{1}{\sigma-1}} \tag{10}$$

Second, the MAW policy increases the attractiveness of home-based care by providing the older adult with more convenient, comfortable, and personalized care options that allow her to remain in

her own homes and communities.[19] This leads to an increase in the quantity of formal home-based care, Q_m, such that $\frac{dQ_m}{d\text{MAW}} > 0$. This change on informal care gives:

$$\frac{\partial h_c^*}{\partial Q_m} = -\frac{1}{f''(h_c^*)} \cdot [f'(h_c)]^{\frac{1-2\sigma}{1-\sigma}} \cdot Q_m^{\frac{1-2\sigma}{\sigma-1}} \cdot \left(\frac{Q_c^\sigma}{w}\right)^{\frac{\sigma}{\sigma-1}} \cdot p_m^{\frac{\sigma}{\sigma-1}} \tag{11}$$

Since f is an increasing and concave function, it follows that $f''(h_c^*) < 0$ and $f'(h_c^*) > 0$, meaning the sign of $\frac{dh_c^*}{dp_m}$ is negative and the sign of $\frac{dh_c^*}{dQ_m}$ is positive. This suggests that, with the MAW policy reducing p_m and increasing Q_m, the provision of informal care is expected to increase. □

Proposition 2. *For older adults who would otherwise only rely on family care, the effect of the MAW policy on the provision of informal care is dependent on the value of the substitution elasticity parameter, σ.*

(1) If σ is in the range of $(-\infty, 0)$, the expansion of the MAW policy leads to an increase on informal care.

(2) If σ is in the range of $(0, 1)$, the effect of the MAW policy on informal care is uncertain.

(3) If σ approaches 1, the expansion of the MAW policy results in a decrease on informal care.

Proof. If older adults who would have otherwise only received care from family members, or then a corner solution would be reached where $h_n = 0$. This results in a slightly altered optimization problem, as outlined below:

$$\begin{aligned} \max_{C,h_c,h_m,h_n,h_w} \quad & V(C) + W(L) \\ \text{s.t.} \quad & L = \left\{ [Q_c \cdot f(h_c)]^\sigma + (Q_m \cdot h_m)^\sigma \right\}^{\frac{1}{\sigma}} \\ & h_w + h_c \leq T \\ & C + p_m \cdot h_m \leq R + w \cdot h_w \end{aligned} \tag{12}$$

The relationship between h_c^* and p_m is determined as follows, with the detailed solution process

[19] MAWs allow states to offer a wide range of services that are tailored to the needs and preferences of seniors and individuals with disabilities, allowing them to receive the care and support they need in a way that meets their individual needs and preferences. This can be particularly important for individuals who have complex care needs or who require specialized services.

displayed in the appendix:

$$\frac{dh_c^*}{dp_m} = -\frac{\frac{\sigma}{\sigma-1}\cdot A\cdot B\cdot\frac{1}{Q_m}+\left[-\left(\frac{\sigma}{1-\sigma}\right)^2\right]\cdot\frac{C}{B}\cdot V''\cdot\left[f\cdot f'^{\frac{1}{\sigma-1}}\cdot\left(\frac{B}{Q_m^\sigma}\right)^{\frac{1}{\sigma-1}}\cdot p_m^{\frac{1}{\sigma-1}}\right]}{\frac{\sigma}{1-\sigma}\cdot\left\{Q_c^\sigma\cdot f'^{\frac{2\sigma-1}{1-\sigma}}\cdot f''+\frac{C}{B}\cdot V''\cdot\left[w+\frac{p_m}{Q_m}\cdot A\cdot\left(f'^{\frac{\sigma}{\sigma-1}}+\frac{1}{\sigma-1}\cdot f\cdot f'^{\frac{2-\sigma}{\sigma-1}}\cdot f''\right)\right]\right\}} \tag{13}$$

The sign of the variables A, B, and C are all positive, where $A = \left(\frac{p_m Q_c^\sigma}{wQ_m}\right)^{\frac{1}{\sigma-1}}$, $B = \frac{Q_c^\sigma}{w}$, $C = \left[\frac{w\cdot V'}{Q_c^\sigma}\right]^{\frac{2\sigma-1}{1-\sigma}}$.

Similarly, the relationship between h_c^* and Q_m is as follows:

$$\frac{dh_c^*}{dQ_m} = -\frac{-\frac{\sigma}{\sigma-1}\cdot A\cdot B\cdot\frac{p_m}{Q_m^2}+\left[\left(\frac{\sigma}{1-\sigma}\right)^2\right]\cdot\frac{C}{B}\cdot V''\cdot\left[f\cdot f'^{\frac{1}{\sigma-1}}\cdot(p_m^\sigma B)^{\frac{1}{\sigma-1}}\cdot Q_m^{\frac{1-2\sigma}{\sigma-1}}\right]}{\frac{\sigma}{1-\sigma}\cdot\left\{Q_c^\sigma\cdot f'^{\frac{2\sigma-1}{1-\sigma}}\cdot f''+\frac{C}{B}\cdot V''\cdot\left[w+\frac{p_m}{Q_m}\cdot A\cdot\left(f'^{\frac{\sigma}{\sigma-1}}+\frac{1}{\sigma-1}\cdot f\cdot f'^{\frac{2-\sigma}{\sigma-1}}\cdot f''\right)\right]\right\}} \tag{14}$$

As we can see from equations (13) and (14), the signs of $\frac{dh_c^*}{dp_m}$ and $\frac{dh_c^*}{dQ_m}$ depend on the value of σ:

(1) For the case when $\sigma \in (-\infty, 0)$, the derivative $\frac{dh_c^*}{dp_m}$ is negative and the derivative $\frac{dh_c^*}{dQ_m}$ is positive. This indicates that when the MAW policy makes formal home-based care more accessible by reducing the cost of care and increasing the preference for it, older adults who would otherwise rely solely on in-home care and see a strong complementary relationship between informal and formal care will require an increase in the provision of informal care.

(2) For the case when $\sigma \in (0, 1)$, the signs of both $\frac{dh_c^*}{dp_m}$ and $\frac{dh_c^*}{dQ_m}$ are indeterminate. This means that for older adults who perceive a relatively weak complementary/substitutable relationship between informal and formal home-based care, the impact of the MAW policy on the provision of informal care is unclear.

(3) For the case where σ approaches 1, as explained in the appendix, $\frac{dh_c^*}{dp_m}$ is positive and $\frac{dh_c^*}{dQ_m}$ is negative. This indicates that when older adults view informal care and formal home-based care as perfect substitutes, the expansion of the MAW policy will encourage them to choose the more cost-effective formal home-based care and decrease the provision of informal care.

□

3.2 Testable predictions

To generate testable implications of the theory, this section derives two hypotheses based on Proposition 1 and Proposition 2.

Proposition 1 describes the scenario where older adults are likely to use nursing home care. According to National Center for Health Statistics, nursing home residents are older and relatively wealthier (Ness et al., 2004; Sengupta et al., 2022),[20] leading to the following hypothesis:

Hypothesis 1. *Older adults who are advanced in age and have a relatively higher income may experience an increase in their demand for informal care due to the promotion of the MAW policy. This may be due to their less use of nursing home care and an increase use of home care.*

The crucial distinction between Propositions 1 and 2 lies in whether an older adult utilizes nursing home services or not. As stated in Hypothesis 1, when focusing on the subgroup of older adults who are prone to utilizing nursing homes, the expansion of the MAW policy results in an increase in informal care. This hypothesis focuses on older individuals who are relatively wealthy in the sense that they can afford nursing home care but may still be considered eligible for MAWs if they deplete their assets.[21]

Proposition 2 pertains to older adults with LTC needs who are inclined towards home care. These individuals are generally younger and have lower income, and Proposition 2 suggests that the impact of the policy on informal care depends on the value of the substitution elasticity parameter, σ. A positive impact is expected when σ is less than 0, indicating a strong complementarity between informal care and formal home-based care. Conversely, when σ approaches 1, indicating a strong substitutability between the two forms of care, the effect of the MAW policy on informal care is expected to be negative.

Hypothesis 2. *The value of σ may be influenced by factors such as financial constraints, and the availability of family support. Hence, we formulate the following hypotheses:*

[20] For example, about 84 percent of nursing home residents are 65 and above. People who are 85 and above account for approximately 40 percentage of total nursing home residents and majority of these residents are women in 2018. In addition, about 60 percentage of nursing home resident use Medicaid as the main payer source and 40 percentage primarily pay out of pocket. More details about demographics of nursing home residents can be referred at the website: https://www.cdc.gov/nchs/nnhs/index.htm.

[21] The idea for Hypothesis 1 is to identify the marginal individuals who can use nursing home services and who might be able to take advantage of MAWs. However, it is important to note that the very wealthy would not be considered for MAWs and serve as the comparison group in our empirical analysis in section 6.2.

(1) Financial constraints: Older adults with limited financial resources dominantly use informal care from family members as they may not be able to afford professional care on their own. In this scenario, the provision of informal care and formal home-based care are more likely to be substitutes. As a result, the expansion of the MAW policy would decrease informal care for poor households.

(2) Limited support system: For older adults with limited support from family, they may benefit from both informal care and formal care services to ensure they receive adequate care and support so that these two care options are more likely to be complements (Chappell and Blandford, 1991; Bolin et al., 2008). Therefore, the impact of the MAW policy on the provision of informal care is positive.

4 Data

4.1 Medicaid HCBS and HRS data

The first data source is about Medicaid policy information on MAWs for each state in the period 1996-2014. The state applications and annual reports of MAWs are publicly available in the CMS website.[22] These applications and reports detail covered services, service definitions, and the MAW expenditure. These annual reports also serve as the foundation for CMS to evaluate the cost-neutrality of the renewal of MAW applications.[23]

The second data source is the Health and Retirement Study (HRS), a longitudinal survey which began in 1992. Respondents are interviewed every two years. The HRS is representative of Americans aged 51 and above. The survey includes different cohorts who become eligible for the study. The core cohort, the HRS cohort, has been followed and interviewed since 1992. Since 1993, the HRS has included 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

[22] See more details on website https://www.medicaid.gov/

[23] Some state have more than one MAW program and the total spending is used for our treatment variable.

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 sample years in this study are 1998 to 2014. Appendix Table A2 (Panel A) describes how respondents in different cohorts enter the HRS survey and the number of unique individuals in interview types. The survey also collects information on family members of respondents such as parents.[24]

The HRS restricted data includes the state of residence of respondents and their parents. We merge into the MAW spending from the first data source based on the state of residence of HRS respondents' parents.[25] The resulting data are an individual-year panel in 1998-2014 with MAW spending adjusted for inflation at the sate level.

We supplement with other data sources to address possible threats to our identification assumption since the changes in MAW spending within states over years might be correlated with state-level characteristics that could drive our results on informal care outcomes in section 5. The Bureau of Labor Statistics (BLS) has information about unemployment/employment rates in years 1999-2014 at the state level. The Bureau of Economic Analysis (BEA) Regional Economic Accounts provides information of states on GDP, personal income (PI), personal consumption expenditure (PCE) per capita in 1998-2014. In addition, the Census Bureau offers the size of total population and population over 65 as well as demographics of states such as percent poverty level, married, female, education level, and white in 1998-2014. We also collect some political affiliation of state governors from the MIT Election Lab.[26] In addition, the CMS provides public data about characteristics of nursing homes such as the number of nursing homes, the number of beds at nursing homes, and the number of residents at nursing homes in each state, which we use to check the robustness of our results in section 6.5.

[24]Since the HRS respondents are older themselves, the parents of these older respondents are more likely to be dead in the study years. Panel B of Appendix Table A2 reports the number of respondents who do not have living parents in 1998-2014.

[25]The MAW expenditure is averaged between HRS survey years and lagged-one years to be merged with the HRS data. For example, individuals in the 1998 HRS wave is merged with the MAW expenditure averaged in 1998 and in 1997.

[26]See details at https://electionlab.mit.edu/data

4.2 Sample selection

To study how MAWs affect informal care provided by HRS respondents, we first restrict the sample to respondents who had at least one living parent when they entered the HRS in 1998-2014.[27] Then we exclude the observations with missing care values and with missing state values of parents. Respondents drop out of the sample when their parents die. The resulting sample, which we call *the working sample*, consists of 36,904 observations and 10,893 unique individuals from 1998 to 2014. Panel A of Appendix Table A3 demonstrates the number of individuals with at least one living parent when they were first surveyed from 1998 to 2014 and Panel B reports how many respondents were followed into the next survey year.

4.3 Dependent variables

The most relevant variables for the current study come from 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 gave personal care (dressing, eating, bathing, and toileting) and errands assistance (errands, household chores, managing medicine, and transportation help), respectively. The total informal care hours are summed over personal care and errands assistance hours. If the total care hours provided by HRS respondents are larger than zero, we define them as informal caregivers, indexed by a total care indicator.[28] The same idea applies to personal care and errands care indicators.[29]

In order to explore the channels through which the MAWs affect informal care, we create a nursing home indicator and a living with HRS respondents indicator. These two indicators are constructed from the question that asks respondents with whom their mother or father live. The living with respondent indicator is equal to 1 if respondents live with their mother or father,

[27] Since the HRS is representative of people aged 51 and above, many of these people have already lost their parents died before the HRS respondents enter into the survey. See Appendix Table A2 (Panel B) for details in each survey year.

[28] Unlike previous literature, we 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, we 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. In section 6.5, several cutoffs are used to test the sensitivity of our main results.

[29] The reported care hours in the HRS do not distinguish between care hours provided to mothers or fathers if both parents of individuals are alive. Since majority of living parents are living mothers, the care hours are provided more for mothers than fathers.

0, otherwise. The nursing home dummy is 1 if the mother or father is in a nursing home, 0, otherwise. The other options are living by self, living with other children, living with relatives, living in retirement centers, and living with others. Additionally, we explore the proximity of respondents to their parents. The living within 10 miles with respondent dummy is indexed by 1 if the respondent's mother or father lives within 10 miles of an HRS respondent, 0, otherwise.

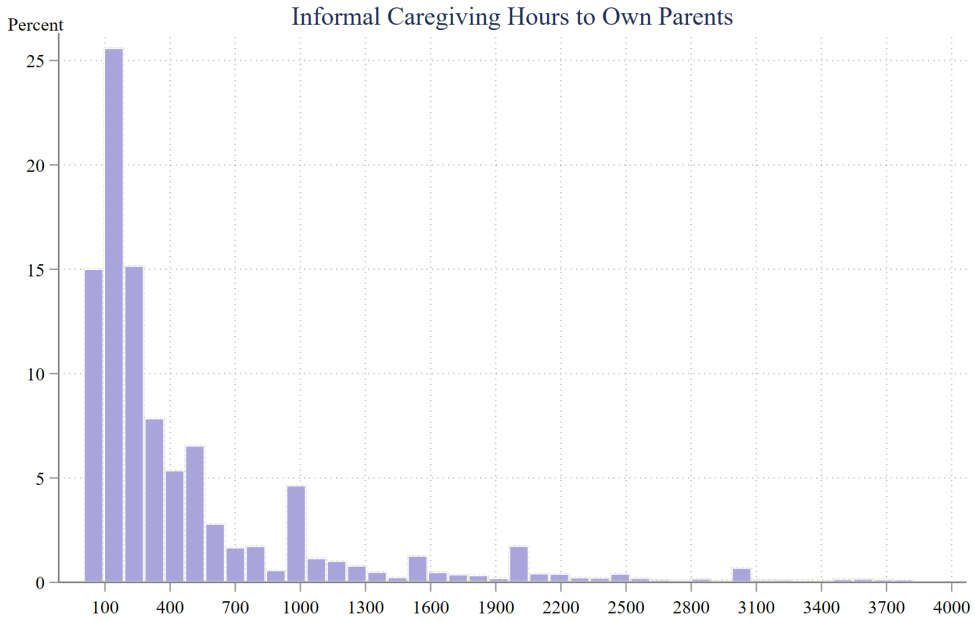
4.4 Sample statistics

In our working sample, about 36 percent of HRS respondents are informal caregivers who provided some care hours to their parents in the last two years. Approximately 26 percent of these caregivers provide only errands care and 2 percent offer only personal help to their older parents. Among all caregivers, about 29 percent of them give non-intensive care with less than 1,000 care hours in two years and 7 percent are intensive caregivers taking care of their parents with at least 1,000 hours in two years. In general, majority of caregivers provide mainly errands care to their parents. Non-intensive caregivers are more prevalent than intensive caregivers. Female caregivers usually provide more care than male caregivers. See Appendix Table A4 for details.

The average duration of informal care provided by HRS individuals over two years is around 240 hours (2.4 hours a week), 150 hours (1.5 hours a week) for errands care, and 90 hours (about 1 hour a week) for personal care. The distribution of care hours for informal caregivers is highly skewed as shown in Figures 4-5. For parents of HRS respondents, their average age is about 80 and 43 percent of them are married. For their health conditions, approximately 24 percent need personal care and 12 percent have memory-related disease who cannot be left alone for at least one hour. About 43 percent of respondents' parents live close to them. The average MAW expenditure is about $320 million and the year to year change of policy spending is $20 million in 1998-2014 across states.[30] We use the scale of ten millions as our unit of MAW spending without otherwise specification.

[30] Appendix Table A5 reports more details about the summary statistics of our working sample.

Figure 4: Distribution of Informal Care Hours in HRS 1998-2014

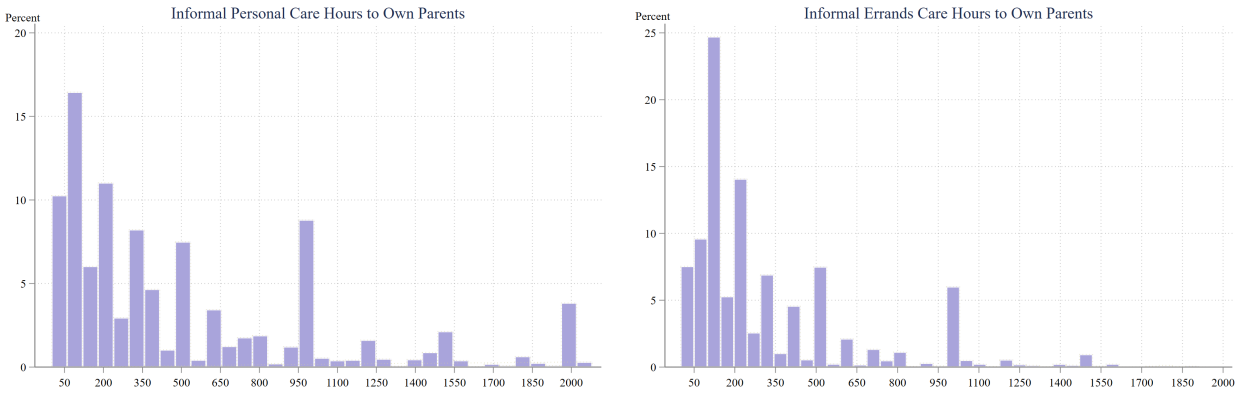


Notes: This graphs draws the distribution of the duration of informal care provided to their parents by HRS respondents in the past two years conditional on some hours. The care hours include personal care hours and errands assistance hours. Personal care hours are the number of hours in the past two 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. The vertical axis shows the percent of positive care hours.

5 Estimation Strategy

To estimate the impact of MAWs on informal care, we employ a two-way fixed effects (TWFE) approach using the MAW spending of states ($2014) as the continuous treatment variable. We utilize two sources of variation in our analysis. The first variation arises from the temporal changes in MAW expenditure across states, as displayed in Figure 3. The second variation comes from the within-individual changes in MAW expenditure over time. For an average older parent in a state, an increase in MAW spending can lead to a higher chance of enrollment and coverage of LTC services in the program (as shown in Figure 2) if eligible, as well as increased spending for the services provided (as shown in Figure 1), either by expanding the scope of services or increasing the length of each covered service in MAWs. We construct our treatment variable using the MAW spending at the state level for several reasons. First, CMS monitors the operation and execution of MAWs across states. Any operational problems randomly detected by CMS and failure to meet

Figure 5: Distribution of Care Hours by Type in HRS 1998-2014



(a) (b)

Notes: The x-axis in Panel up 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 bottom 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. The data used are our working sample of HRS individuals who had at least one parent alive in the period 1998-2014 and who provide positive care hours.

certain requirements by CMS will cause variation of the total MAW spending in each state. Second, states usually cap the number of participants, hours of services provided and the total expenditure for each year to justify the cost-effectiveness requirement in the MAW application. The caps on MAW expenditure over years introduce another source of random variation. Third, states allocate Medicaid HCBS resources between different waivers, which creates another source of variation on MAW spending over years.[31] However, there might be still possibilities that the MAW spending is endogenous and could bias our results. We address these threats in the next section. For now, we assume that the within-individual variation of MAW spending in each state over years is plausibly random, conditional on observable covariates. The estimation model is as follows:

$$Y_{ist} = \alpha_i + \delta \text{MAW}_{s\bar{t}} + \mu_t + \eta_s \times t + \beta_x X_{ist} + \epsilon_{ist} \tag{15}$$

where i indexes an individual, s is the state where an individual's parents live in year t. Y_{ist} is the informal care outcomes for an individual i whose parents reside in state s in year t. α_i is individual FEs, which controls for the unobservable factors that are constant within individuals across years

[31] Except older population, other common individuals covered in Medicaid waivers are children with intellectual development disabilities and disabled individuals.

such as underlying preferences for care options and preference for places to age of individuals and their parents. $\text{MAW}_{s\bar{t}}$ is the mean of MAW expenditure (\$2014) in state s averaged over year t and year $t-1$, which is our main treatment variable.[32] The average MAW expenditure of current years and lagged years accounts for the fact that, per the HRS design, there is a time inconsistency between survey years and MAW policy years. For example, informal care status of an HRS individual surveyed in 2012 is a function of average MAW expenditure (\$2014) over years 2011-2012.[33] μ_t is year FEs which controls for common temporal shocks across states that could affect informal care outcomes. $\eta_s \times t$ is the state-specific linear time trend which controls for the heterogeneous trends of MAW expenditure across states. X_{ist} is a vector of controls which include 1)time-varying demographics of individuals such as age, age squared, marital status, and number of siblings; 2)time-varying demographics of individuals' parents such as age and marital status; 3)state older population variables including share of older population (65+) and the size of total population in each state;[34] 4)state-level socioeconomic variables such as percent poverty level, education level, females, white, and married as well as personal income per capita, employment rate, and political affiliation of governors; 5)expenditure of standard Medicaid programs that might cover older population at home or community-settings. For example, some Medicaid state plans can also pay home health services and personal care services as optional services for eligible residents in each state regardless of their age. Therefore, older people of our interest could potentially be covered by both MAWs and state plans even though they are separate programs under Medicaid.[35] Our main specification is the model (15) with all controls. ϵ_{ist} is the standard errors which are clustered at the state level.

[32] Without otherwise specification, all MAW spending hereafter is adjusted for inflation and is in 2014 dollars.

[33] Informal care information is elicited about an individual's informal caregiving status in the past two years (2012 and 2011) depending on when the survey is administered.

[34] The control for share of older population in each state takes the fact that some states are getting older on average at faster rates, even with similar size of total population into consideration. The growing share of older people might impact both informal care and MAW expansion.

[35] Medicaid state plans are the standard Medicaid programs offered by each state to its residents. These plans generally cover a wide range of healthcare service such as inpatient and outpatient hospital services, doctor visits, prescription drugs, rehabilitation services, and LTC services in many settings such as nursing homes and hospitals as well as optional home and community-based services. See Appendix Table A1 for detailed description of services covered at home or community-based settings for each Medicaid program.

5.1 Identification threats

Our main identification assumption relies on that the within-state variation of MAW spending over years is not correlated with other unobservable confounders that might also affect informal care outcomes of interest. We use several strategies to test our assumption. First, we regress the MAW spending on lagged state characteristics in a state-year panel from 1998 to 2014 with an adjustment on the method used in Bailey and Goodman-Bacon (2015). The idea is to check whether the state characteristics in earlier periods predict the MAW generosity. Most economic and demographic factors in each state for our working period in Table 1 do not determine MAW expenditure in lagged 10 (column 1) to lagged 4 years (column 4).[36] In addition, Appendix Table A6 shows that MAW spending is uncorrelated with most of these state attributes but employment rate and political affiliation of governors in our HRS working sample for the period 1998-2014. Nonetheless, we check the sensitivity of our results after controlling for state-level factors in section 6.

Second, one might be concerned that states chose MAW expansion during the 1990s based on the health conditions of their older residents, which could in turn bias our informal care outcomes. For example, states could expand MAW programs if the health outcomes of older adults were worse or if they think the home- or community-setting can benefit older adults more on health, thus selectively affect informal care. To clear these possible issues, we estimate the effect of the initial MAW spending in 1998 on a range of health-related outcomes for older adults in the HRS period 1992-1998 using the estimation equation 15.[37] Table 2 shows little evidence that health status (columns 1 to 6) and healthcare use (columns 7-10) of older people in each state have any prediction power on MAW spending.[38]

Third, one might also be worried that MAW expenditure is correlated with the economic conditions of each state, which potentially impact informal care.[39] To address this issue, we regress MAW spending on economic variables with flexible functional form in a state-year panel.[40] For

[36] The results of each lagged period are available upon request.

[37] We use the age cutoff 60 to select the older population to do the balance test in order to increase the sample size and increase accuracy of estimates. The results using other age cutoffs such as 65 are similar (available upon request).

[38] We use the raw health variables in HRS to test the relationship between MAW spending in 1998. The detailed definition for each health outcome can be referred to Appendix Table A7. We also estimate this correlation using dichotomous health indicators and do not find any significance. Results are available upon request.

[39] For example, informal care is less if health is better and informal care is less if people are more employed with good economy.

[40] Economic variables include unemployment rate, employment rate, GDP per capita, personal income (PI) per

Table 1: The Determinants of MAW Spending in 1998-2014

VARIABLES	(1) Lagged 10 Periods	(2) Lagged 8 Periods	(3) Lagged 6 Periods	(4) Lagged 4 Periods
Unemployment rate	-19.073	-8.567	2.106	-5.286
	(17.697)	(12.960)	(6.154)	(4.651)
Share of older individuals (65+)	-5,212.655	5,086.403	993.056	3,147.744
	(7,700.362)	(5,475.204)	(2,684.011)	(2,079.121)
Total population	-0.000	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Birth rate	24.384	-39.191	-14.245	41.603
	(32.352)	(32.085)	(29.385)	(25.540)
Fertility rate	-3.594	11.805*	3.133	-5.405
	(5.383)	(6.765)	(4.845)	(3.940)
Marriage rate	0.714	-0.043	-1.910	-0.853
	(1.103)	(0.879)	(1.896)	(1.326)
Divorce rate	-1.500	0.481	3.627	1.156
	(2.226)	(1.736)	(3.602)	(2.464)
PI per capita	-0.017	-0.008	0.008	-0.003
	(0.012)	(0.008)	(0.006)	(0.004)
PCE per capita	0.045	0.009	-0.022	0.002
	(0.047)	(0.029)	(0.019)	(0.014)
GDP per capita	745.470	-2,984.836	-370.050	112.131
	(7,914.942)	(4,168.478)	(1,629.503)	(2,013.531)
Poverty level (below 100% FPL)	-5.901	11.095	-7.767	0.509
	(8.354)	(7.848)	(5.296)	(3.546)
Poverty level (below 125% FPL)	7.342	-10.925*	3.974	-1.406
	(7.324)	(6.512)	(3.431)	(2.668)
Percentage of high school degrees	1.972	0.909	-0.572	-3.769
	(4.115)	(2.510)	(2.124)	(2.550)
Percentage of bachelor degrees	0.488	0.173	0.114	2.974
	(3.508)	(3.108)	(2.649)	(2.507)
Observations	332	422	512	602

Notes: The data used are an annual state-year panel from 1998 to 2014. The unemployment level, poverty level, and education percentage are from BLS, the state population is from Census Bureau, the GDP, personal income (PI), personal consumption expenditure (PCE) is from the Bureau of Economic Analysis Regional Analysis Accounts. The dependent variable is MAW spending in millions in 2014 real dollars of each state in years 1998-2014. Each cell reports estimates from a separate specification using the model $y_{st} = \beta_0 + \beta_1 X_{st-j} + \epsilon_{st}$ where j corresponds to the lagged period in each column. All regressions include state, year fixed effects, and state-specific time trend. Standard errors are clustered at the state level and shown in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

capita, and personal consumption expenditure (PCE) per capita.

Table 2: Relationship Between Initial MAW Spending in 1998 and Health Variables in HRS 1992-1998

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Health status	Mobility	ADL	IADL	Mental CESD	Cognition	Hospital stays	Medication	Doctor visit	Nurse home stay
MAW spending ($2014)	-0.0004	0.0048	0.0012	0.0024	-0.0076	0.037	-0.0043**	0.0008	0.0003	-0.0006
	(0.0036)	(0.0039)	(0.0039)	(0.0054)	(0.0048)	(0.0254)	(0.0016)	(0.0014)	(0.0014)	(0.0009)
Mean	3.03	1.16	0.45	0.41	1.64	21.52	0.30	0.78	0.94	0.05
Observations	35,505	24,358	32,778	28,979	28,812	14,560	35,467	32,758	34,534	35,486

Notes: The data used are from HRS 1992-1998 of individuals who are 60 and older. Each cell reports estimates using equation (15) for each dependent variable. Poor health is an indicator showing that an individual self-assesses his or her general health status. Mobility/ADL/IADL/CESD is an indicator of having some numbers of mobility/ADL/IADL/mental limitations. Cognitive score is integer values from 0 to 35. The mean row reports the mean of each dependent variable in each column. All models control for individual, year fixed effects, and state-specific time trends. Standard errors are clustered at the state level. The detailed definition of these outcome variables can be referred to Appendix Table A7. *** p<0.01, ** p<0.05, * p<0.10.

the first four columns of Table 3 , we use quadratic and cubic functions of unemployment rate and employment rate. We then add different income and consumption variables in columns 5-8. The employment rate is positively related to MAW spending and the unemployment rate is negatively related to MAW spending, as we expect in columns 1 and 3. These relationships, however, are not statistically significant in all specifications with and without economic controls (columns 1-8). Overall, the findings show that state-specific economic variables are uncorrelated with MAW expenditure.[41]

6 Results

Based on the theoretical framework presented in Section 3, we seek to answer two questions. First, we aim to examine the extent to which the expansion of MAWs affects informal caregiving. Second, we will examine the role that demographic differences among parents, financial constraints within families, and limited family support play in determining the heterogeneous responses of families.

6.1 Impact of MAWs on informal care

Table 4 presents the estimation results for the first empirical question based on the full sample regarding different care types. The five columns of the table are estimates obtained from five different specifications of Equation 15. The first specification includes the state expenditure, individual and year fixed effects, and state-specific linear time trends. The second specification adds the demographic information of both older adults and their parents, such as age, number of living siblings, and marital status. The third specification further controls for the size of the older population in each state, and the fourth specification includes additional state-level variables, such as the unemployment rate, education level, poverty rate, racial/ethnic composition, and political affiliation of the state governor. The MAW expenditure at the state level is expressed in ten million dollars, which is the standard unit for average yearly expenditure change across states. Panels A to C present the results for overall care, errands care, and personal care, respectively.

[41] One might also worry that the MAW size could be correlated with lagged economic conditions. For example, if states experienced high unemployment rates, the size of MAW for older population could be decreased if states are constrained by fiscal resources. Appendix Table A8 reports little evidence that there is any correlations between lagged economic conditions and MAW spending.

Table 3: Effects of State Economic Conditions on MAW Expenditure

	Dependent Variable: MAW Expenditure in Millions ($2014)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Unemployment rate	-24.088	-655.905			-665.964	-554.591	-646.628	-444.372
	(41.432)	(664.676)			(673.339)	(610.216)	(652.331)	(538.049)
Unemployment rate^2		124.679			126.248	117.396	119.702	100.146
		(116.672)			(117.522)	(111.868)	(112.538)	(100.093)
Unemployment rate^3		-6.430			-6.569	-6.275	-6.290	-5.627
		(5.815)			(5.896)	(5.683)	(5.693)	(5.205)
Employment rate			4.766	-1,805.237	-3,518.965	-2,161.813	-5,523.443	-4,637.753
			(20.693)	(2,290.286)	(3,484.399)	(2,764.805)	(4,907.733)	(4,134.785)
Employment rate^2				30.949	54.751	32.346	87.018	71.775
				(38.535)	(54.661)	(43.360)	(77.363)	(64.593)
Employment rate^3				-0.175	-0.283	-0.161	-0.454	-0.367
				(0.214)	(0.285)	(0.226)	(0.404)	(0.335)
GDP per capita					-11,863.195			-37,929.810
					(20,762.496)			(35,634.248)
PI per capita						0.076		0.192
						(0.076)		(0.151)
PCE per capita							-0.177	-0.316
							(0.148)	(0.240)
State + Year FEs	Y	Y	Y	Y	Y	Y	Y	Y
Observations	816	816	816	816	816	816	816	816
Adjusted R-squared	0.613	0.645	0.613	0.612	0.645	0.650	0.651	0.668

Notes: The data used are a state-year panel from 1998 to 2014. The unemployment and employment level is from BLS, the state population is from Census Bureau, the GDP, personal income (PI), personal consumption expenditure (PCE) is from the Bureau of Economic Analysis Regional Analysis Accounts. The dependent variable is MAW spending in millions in 2014 real dollars of each state in years 1999-2014. Each cell reports estimates from a separate specification. All regressions include state, year fixed effects and weighted using the state population. Standard errors are clustered at the state level and shown in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

As shown in Table 4 Panel A, a 10 million dollar increase in policy expenditure leads to a 0.03 percentage point rise in the likelihood of an individual becoming an informal caregiver, which translates to a 0.08 percent increase based on a baseline caregiving probability of 0.36. In Panel B, the effect of errands care provision is larger in magnitude than that on overall care shown in Panel A. A ten million dollar increase in MAW expenditure leads to a 0.05 percentage points increase

Table 4: Effects of MAWs on Informal Caregiving

	(1)	(2)	(3)	(4)
	Panel A Dependent Variable: Any Care			
MAW expenditure in ten millions ($2014)	0.00032*	0.00036**	0.00036**	0.00032**
	(0.00016)	(0.00015)	(0.00014)	(0.00015)
Mean of dependent variable	0.362	0.363	0.363	0.362
Number of individuals	10,892	10,795	10,795	10,754
Number of observations	36,901	36,605	36,605	36,218
	Panel B Dependent Variable: Errands Care			
MAW expenditure in ten millions ($2014)	0.00046**	0.00050***	0.00051***	0.00055***
	(0.00017)	(0.00016)	(0.00015)	(0.00016)
Mean of dependent variable	0.341	0.342	0.342	0.341
Number of individuals	10,892	10,795	10,795	10,754
Number of observations	36,901	36,605	36,605	36,218
	Panel C Dependent Variable: Personal Care			
MAW expenditure in ten millions ($2014)	0.00009	0.00009	0.00008	-0.0001
	(0.00013)	(0.00013)	(0.00011)	(0.00013)
Mean of dependent variable	0.098	0.099	0.099	0.099
Number of individuals	10,892	10,795	10,795	10,754
Number of observations	36,901	36,605	36,605	36,218
Demographics	N	Y	Y	Y
State older population	N	N	Y	Y
State characteristics	N	N	N	Y

Notes: This table shows estimates of MAW expenditure on informal caregiving using the working sample of HRS individuals who had at least one parent alive in the period 1998-2014. Panel A reports results of individuals who provided any care to their parents in the last two years: either errands care or personal care or both. Panel B reports results of individuals who provided specific errands care to their parents in the last two years such as helping household chores, running errands, managing medications, and assisting with transportation. Panel C reports results of individuals who provided specific personal care to their parents in the last two years such as help with dressing, eating, bathing, and toileting. Each column corresponds to one model and all models control for individual FEs, year FEs, state-specific linear time trend, and expenditure of other state plans that might cover similar services in MAWs. Column 2 adds demographics of individuals such as age, age squared, marital status, and number of siblings as well as demographics of their parents such as age and marital status. Column 3 adds controls of the share of older population (65+) and the size of total population in each state. Column 4 adds characteristics of macroeconomic conditions in each state including percent poverty level, education level, females, white, and married as well as personal income per capita, employment rate, and political affiliation of governors. The mean row summarizes the mean of dependent variables in each column. Standard errors in parentheses are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.10

in the chance of providing errands care, equivalent to a 0.15 percent increase. However, the effect on personal care provision in Panel C is statistically insignificant from zero. These estimates are

consistent across different specifications. Controlling for demographics of respondents and their parents, as well as state level characteristics, do not alter the magnitude and statistical significance of these estimates.

The theoretical framework in Section 3 suggests that the expansion of MAW spending may have opposite effects on informal caregiving depending on families' institutional care reliance, and the elasticity of substitution between informal care and formal home-based care. The empirical results confirm that, overall, the impact of MAWs expansion is positive on informal caregiving. However, according to our theoretical model in Section 3, the policy may affect informal caregiving in opposite directions, depending on families' demand for institutional care, as well as the elasticity of substitution between informal and formal home-based care. We examine the potential heterogeneous policy effects in the following section.

6.2 Heterogeneous effects of MAWs on informal caregiving

According to our model predictions, the average policy effect detected in Section 6.1 is an integration of heterogenous impacts from multiple dimensions. First, we anticipate that there will be differences in the choice of institutional care by elderly parents based on factors such as their age and economic status. Therefore, the expansion of MAWs may cause their demand for informal care to change in different directions as demonstrated in Hypothesis 1. The empirical results that support this are shown in Table 5.

Column (1) of Table 5 demonstrates that a 10 million increase in the cost of MAWs leads to a 0.04 percentage point increase in the likelihood of children providing informal care for parents who are older (over 85 years old). In contrast, for parents who are relatively younger, as depicted in column (2) of the Table 5, the increase in cost of MAWs has no significant effect on their children's provision of informal care. This suggests that older parents, who would typically be in a nursing home, are now more likely to stay at home due to the support of MAWs, which results in an increased demand for informal care from their children.

We also performed a heterogeneous analysis for the economic status of families.[42] By comparing

[42]Note that we use the income of adult children as a proxy for the family's economic status. This is due to two reasons. Firstly, in our two-generation model, we assume that the family's income is derived from the labor market outcomes of the children. Secondly, information on the parents' income is scarce in our data, so we rely on the children's income to represent the economic status of the entire family.

columns (3) and (4) of Table 5, we find that for families with an income in the 50th to 80th percentile, a ten million increase in MAWs expenditure results in a 0.05 percentage point (increase in the informal care provided by children, while for those in the top 5% , the MAWs expansion has little impact. Our results are consistent with the predictions outlined in Hypothesis 1 in Section 3. Families with an income ranging from 50th to 80th percentile are situated in a financial position that does not allow them to take advantage of the low-cost nursing home services offered by Medicaid or to comfortably pay for nursing home expenses without any worries. As a result, the expansion of MAWs has a more pronounced impact on their budget and the informal care provided by their children. On the other hand, for the wealthiest families, the cost of nursing homes is not a hindrance, and the expansion of MAW policies does not significantly impact their budget, resulting in no observable changes in their informal caregiving practices.

Table 5: Heterogeneous Effects of MAWs on Informal Care in Hypothesis 1

	By Age of Parents		By Income of Individuals	
	(1)	(2)	(3)	(4)
	Older (85+)	Younger	Between Mean and 80 Percentile	Above 95 Percentile
MAW expenditure ($2014)	0.00042**	0.00002	0.00053**	0.00028
	(0.00020)	(0.00034)	(0.00024)	(0.00079)
Mean of dependent variable	0.407	0.308	0.393	0.291
Number of individuals	7,070	6,078	7,769	1,122
Number of observations	19,955	16,263	23,567	2,066

Notes: This table shows heterogeneous estimates of MAWs on informal care using the working sample of HRS individuals who had at least one parent alive in the period 1998-2014. Columns 1-2 report heterogeneous estimates by age of HRS respondents' parents. Older parents group indicates individuals with their mothers who are above 85 and their fathers who are above 80 and younger parents group is individuals who have parents younger than 85 for mothers and 80 for fathers. Columns 3-4 report heterogeneous estimates by income of HRS respondents. Column 3 estimates the effect of MAWs for individuals whose income ($2014) falls between the mean and 80 percentile of income distribution. Column 4 reports estimates for individuals whose income is above 95 percentile. The dependent variable is any care indicator of individuals who provided any care to their parents in the last two years: either errands care or personal care or both. All models control for individual FEs, year FEs, state-specific linear time trend, and expenditure of state plans that might cover similar services in MAWs as well as all controls listed in column 4 of Table 4 such as demographics of individuals and their parents, growth of older population, and state characteristics. Details of each control can be referred to footnotes in Table 4. The mean row summarizes the mean of dependent variables in each column. Standard errors in parentheses are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.10

Our second model prediction, as outlined in Hypothesis 2, explores the different impacts of the expansion of MAW on a subset of people who only choose home-based care. This heterogeneity

comes from the recipients' varying perception on informal and formal home-based care, i.e., whether they treat the two care types as complements or close to perfect substitutes. Although the issue of these differing perspectives was not directly asked in the HRS questionnaire, we consider the characteristics that may contribute to inconsistent views. Firstly, we posit that financial constraints within families can result in varying substitution types. For very poor families, they may be unable to hire a formal caregiver when the parents require more intensive care, so the adult children tend to care for their parents at home. In this case, informal care and formal home-based care may be seen as substitutes for each other. On the other hand, for families that are not extremely poor, they have the resource to hire formal home-based care, hence their children tend to provide informal care that is less substitutable by formal caregivers. As a result, these families are more likely to view informal care and formal home-based care as complementary to each other. This prediction is supported by the results in columns (1) and (2) of Table 6. For families with low income and a parent with dementia, a ten million increase in MAW expenditures leads to a 0.3 percentage point decrease in informal caregiving, consistent with the prediction when the family views the two care types as substitutes. On the other hand, for families with better economic status or without a parent with dementia, the expansion of MAWs leads to an increase in informal caregiving by 0.03 percentage points, consitent with the prediction when the family views the two care types as complements.

It may be a concern that a parent with dementia might opt in nursing homes in the first place, which fails the precondition to draw Hypothesis 2. To address this, we broadened the scope of the physical health condition of the parents to include those who are less demanding for nursing home care and more likely to only rely on home-based care. As shown in columns (3) and (4) of Table 6, we find that the results are more significant for families who express need for personal care compared to those in columns (1) and (2). The MAW's support leads to a decrease in the provision of informal care by 0.2 percentage points for families with financial constraints. Conversely, an increase of ten million in MAW expenditure results in a 0.04 percentage point increase in the provision of informal care for families in a better fiscal condition.

Secondly, we argue that the extent of limited support within a family also leads to divergent view on the substitution between informal care and formal home-based care. For families with few members, even if adult chidlren are willing to provide care, they may not be able to meet the LTC

needs of an elderly parent, necessitating the involvement of formal care, leading to a complementary relationship between informal care and formal home-based care for such families. As the number of family members increases, the additional cost each member bears to provide for LTC decreases, it is more likely that the household members provide informal care services similar to that provided by formal home-basesd care at the margin, thus the informal care should be treated as close to perfect substitutes to formal care. This hypothesis is supported by the evidence presented in Table 7. As shown in columns (1) and (2), when a parent does not have a partner, or in other words, the elderly can not seek their partner for additional help, a ten million increase in MAW expenditure leads to an increase of 0.05 percentage points in the informal care provided by adult children. Conversely, when the parent has a partner, the impact of MAW is not significant.

Table 6: Heterogeneous Effects of MAWs on Informal Care in Hypothesis 2

	By Dementia of Parents and Poor Individuals		By Personal Care Need and Poor	
	(1)	(2)	(3)	(4)
	Dementia and Poor	No Dementia or Poor	Need Help and Poor	No Need or Poor
MAW expenditure ($2014)	-0.00262*	0.00034**	-0.00213***	0.00043***
	(0.00150)	(0.00016)	(0.00064)	(0.00016)
Mean of dependent variable	0.507	0.345	0.487	0.335
Number of individuals	2,004	10,233	3,203	9,763
Number of observations	3,562	32,656	5,736	30,482

Notes: This table shows heterogeneous estimates of MAWs on informal care using the working sample of HRS individuals who had at least one parent alive in the period 1998-2014. Columns 1-2 report heterogeneous estimates by dementia of HRS respondents' parents and their income status. Column 1 refers to the group of individuals who have income less than %138 FPL (around $27,500 in 2021 adjusted for inflation ($2014)) and their parents (either mother or father) have memory disease. Column 2 shows the group of individuals who are otherwise. Columns 3-4 report heterogeneous estimates by income of HRS respondents and the personal care needs of their parents. Column 3 estimates the effect of MAWs for individuals whose income ($2014) is lower than $27,500 ($2014) and their parents need personal care. The dependent variable is any care indicator of individuals who provided any care to their parents in the last two years: either errands care or personal care or both. All models control for individual FEs, year FEs, state-specific linear time trend, and expenditure of state plans that might cover similar services in MAWs as well as all controls listed in column 4 of Table 4 such as demographics of individuals and their parents, growth of older population, and state characteristics. Details of each control can be referred to footnotes in Table 4. The mean row summarizes the mean of dependent variables in each column. Standard errors in parentheses are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.10

Table 7: Heterogeneous Effects of MAWs on Informal Care in Hypothesis 2

	By Marital Status of Parents		By Siblings of Respondents	
	(1)	(2)	(3)	(4)
	No Married	Married	Only Child	Have Siblings
MAW expenditure ($2014)	0.00048**	0.0003	0.00033	0.00008
	(0.00020)	(0.00035)	(0.00105)	(0.00027)
Mean of dependent variable	0.403	0.253	0.457	0.382
Number of individuals	8,609	3,725	849	4,531
Number of observations	25,740	10,478	2,444	14,707

Notes: This table shows heterogeneous estimates of MAWs on informal care using the working sample of HRS individuals who had at least one parent alive in the period 1998-2014. Columns 1-2 report heterogeneous estimates by marital status of HRS respondents' parents. Column 1 refers to the group of individuals whose parents are divorced or widowed. Column 2 shows the group of individuals whose parents are married. Columns 3-4 report heterogeneous estimates by the number of siblings of HRS respondents. Column 3 estimates the effect of MAWs for individuals who is only child. Column 4 shows the group of individuals who have at least 1 sibling. The dependent variable is any care indicator of individuals who provided any care to their parents in the last two years: either errands care or personal care or both. All models control for individual FEs, year FEs, state-specific linear time trend, and expenditure of state plans that might cover similar services in MAWs as well as all controls listed in column 4 of Table 4 such as demographics of individuals and their parents, growth of older population, and state characteristics. Details of each control can be referred to footnotes in Table 4. The mean row summarizes the mean of dependent variables in each column. Standard errors in parentheses are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.10

6.3 Heterogeneous impact of MAWs by gender of caregivers

Beyond the mechanism addressed by our theoretical model, we also examine whether there are variations in the impact of MAWs on informal caregiving among male and female adult children, as they may face different opportunity costs in providing care to their parents.

The effects of MAWs on informal caregiving, differentiated by the gender of the caregiver, are presented in Table 8. As shown in Panel A, a ten million dollar increase in aging waiver expenditure leads to an increase of approximately 0.04 percentage points (0.11 percent) in the probability of becoming an informal caregiver for female caregivers, though the level of significance has decreased. The effect on providing errand care is greater, with an increase of 0.06 percentage points (0.17 percent). Similar to the results from the full sample, the impact on personal care remains statistically insignificant. In Panel B, the effect of MAWs on male caregivers is displayed. In comparison to female caregivers, the significance and magnitude of the effect of MAWs on informal

caregiving have decreased for male caregivers. The coefficient of the impact of MAWs on overall care for sons is estimated to be around 0.03 percentage points (0.08 percent), and the probability of providing errand care increases by 0.05 percentage points (0.14 percent). . The estimated effect on personal care for male caregivers remains indistinguishable from zero and statistically insignificant.

Table 8: Effects of MAWs on Care by Gender

	(1)	(2)	(3)
	Any Care	Errands Care	Personal Care
	Panel A: Female Individuals		
MAW expenditure in ten millions ($2014)	0.00037*	0.00063***	-0.00011
	(0.00021)	(0.00023)	(0.00017)
Mean of dependent variable	0.389	0.364	0.119
Number of individuals	6,435	6,435	6,435
Number of observations	22,873	22,873	22,873
	Panel B: Male Individuals		
MAW expenditure in ten millions ($2014)	0.00028	0.00045*	-0.00016
	(0.00024)	(0.00026)	(0.00024)
Mean of dependent variable	0.315	0.301	0.064
Number of individuals	4,319	4,319	4,319
Number of observations	13,345	13,345	13,345
Demographics	Y	Y	Y
State older population	Y	Y	Y
State characteristics	Y	Y	Y

Notes: This table shows estimates of MAWs on care by gender of HRS individuals who had at least one parent alive in the period 1998-2014. Panel A shows the results on female individuals and panel B displays the results on male individuals. The dependent variable in column 1 is any care indicator of individuals who provided any care to their parents in the last two years: either errands care or personal care or both. The dependent variable in column 2 is errands care indicator of individuals who provided specific errands care to their parents in the last two years such as helping household chores, running errands, managing medications, and assisting with transportation. The dependent variable in column 3 is personal care indicator of individuals who provided specific personal care to their parents in the last two years such as help with dressing, eating, bathing, and toileting. All models control for individual FEs, year FEs, state-specific linear time trend, and expenditure of other state plans that might cover similar services in MAWs as well as all controls listed in column 4 of Table 4 such as demographics of individuals and their parents, growth of older population, and state characteristics. Details of each control can be referred to footnotes in Table 4. The mean row summarizes the mean of dependent variables in each column. Standard errors in parentheses are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.10

6.4 Shifting from nursing home to home-based care

The estimates show that MAWs positively affect informal caregiving. So far, our examination of the theory investigates the interior and corner solutions separately. As suggested by our model, MAW lowers the cost of home-based formal care, thus agents are more likely to end up in the corner solution where they completely opt out of nursing home services and turn to home-based care. We examine the switching effect next. First, we check whether MAWs affect individuals' enrollment in nursing homes by estimating the effect of MAWs on choices between in-home care and nursing home care. Specifically, the HRS asks respondents with whom their parents live. From this question, we construct the nursing home indicator if parents are in nursing institutions and the living with respondents indicator if respondents live together with their parents. In addition, respondents are asked whether their parents live nearby which we construct the living within 10 miles indicator. Further, we employ information on the percent of resident admissions into nursing home from home at the state level provided by the LTCfocus project to explore the mechanisms of aging waivers on informal care.

Columns 1 to 2 in Table 9 report the estimates of MAWs on being in nursing home for respondents' mothers and fathers, separately. The results show that MAWs indeed help the older population avoid institutionalization and they are less likely to be in nursing homes, consistent with the predictions in Section 3. The generosity of MAWs decreases the chances that one's mother lives in a nursing facility by 0.03 percentage points (0.43 percent) and by 0.01 percentage points (0.45 percent) for fathers. Table 9 columns 3 to 4 also demonstrate that parents who have access to a more generous MAWs are more likely to live with their adult children. A ten million dollar increase of policy funding increases the likelihood that a mother lives with her adult child by 0.02 percentage points (0.33 percent) while the magnitude of this effect for fathers is close to zero. Columns 5 and 6 further shows the estimates on probability of parents living within 10 miles with their adult children. The estimates on mothers and fathers are both positive and statistically significant. For mothers, the likelihood to live nearby with their children increases by 0.11 percentage points (26 percent). The magnitude for fathers is similar as that for mothers, 0.10 percentage points with 29 percent of a low base mean 0.34. As more people opt out of nursing homes, those who need nursing home service should find it easier to access. Column 7 reports the

Table 9: Channels through which MAWs Affect Informal Care

	Nursing Home		Living With Respondents		Living Within 10 Miles of Respondents	
	(1)	(2)	(3)	(4)	(5)	(6)
	Mother	Father	Mother	Father	Mother	Father
MAW expenditure in ten millions ($2014)	-0.00015	-0.00006	0.00023*	0.00000	0.00105***	0.00090**
	(0.00010)	(0.00007)	(0.00013)	(0.00006)	(0.00038)	(0.00037)
Mean of dependent variable	0.067	0.016	0.060	0.011	0.426	0.342
Number of individuals	10,754	10,754	10,754	10,754	8,785	4,374
Number of observations	36,218	36,218	36,218	36,218	28,989	12,962
Demographics	Y	Y	Y	Y	Y	Y
State older population	Y	Y	Y	Y	Y	Y
State characteristics	Y	Y	Y	Y	Y	Y

Notes: This table shows channels through which MAWs affect informal care of HRS individuals who had at least one parent alive in the period 1998-2014. The first two columns represent the channel of being in nursing homes for their mothers and fathers, respectively. Columns 3 and 4 refer to the indicator of living with individuals which is 1 if their parents live together with HRS respondents and 0, otherwise. Columns 5 and 6 refer to the indicator of living within 10 miles with respondents which is 1 if their parents live nearby and 0, otherwise. All models control for individual FEs, year FEs, state-specific linear time trend, and expenditure of other state plans that might cover similar services in MAWs as well as all controls listed in column 4 of Table 4 such as demographics of individuals and their parents, growth of older population, and state characteristics. Details of each control can be referred to footnotes in Table 4. The mean row summarizes the mean of dependent variables in each column. Standard errors in parentheses are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.10

estimates on the average admissions from home of residents at nursing facilities at the state level. The MAW significantly increases the chances for older people to be admitted into nursing homes from home which presents supportive evidence of our story that MAW optimizes the use of resource and make nursing home services available to those who have higher demand.

To further show evidence that the MAW makes home setting more attractive illustrated in the theory Section 3, we use the HRS respondents as potential care receivers from their children and limit the sample to those with age above 65. There are several advantages of using HRS respondents as potential aging parents. First, HRS surveys ask respondents questions of their physical difficulties that allow us to test whether old people delay institutionalization and have worsening health at home supported by MAWs. Second, the respondent level sample offers a much larger sample with longer panel that increases the accuracy of the estimates. Table 10 shows the estimates of MAWs on the number of difficulties in daily ADL activities. The policy does not have effect on individuals' living decisions with one or two ADLs and significantly increases the probability of individuals having more number of difficulties in ADL at the cutoff of 3 to 5. The findings provide substantial evidence that medically needy individuals with severe conditions that should have been placed in nursing homes stay at home cared through MAWs, which validates the channel of preference-shift effect in conceptual framework of Section 3.

6.5 Robustness

The key assumption of our identification strategy is that the within-individual variation of MAW spending over years is plausibly exogenous and individuals have less chances to anticipate their treatment status and change their informal caregiving behavior to respond to this anticipation. However, there might be several possibilities that could bias our results. First, one might be concerned that the variation of MAW spending could be driven by some unobservable shocks which could also affect our informal care outcomes. For example, during the covid-pandemic in 2020, the state government could reduce MAW spending and adult children find it difficult to provide informal care to their parents as well. To alleviate this concern, column 4 in Table 4 controls for detailed state-level demographic and economic factors and the results of MAW spending on informal care are quite robust.

Second, one goal of the implementation of MAWs is to reduce Medicaid spending in higher-cost

Table 10: The Results of MAWs on Number of ADL Limitations

	(1)	(2)	(3)	(4)	(5)
	ADL _one limitation	ADL _two limitations	ADL _three limitation	ADL _four limitations	ADL _five limitations
Aging waiver expenditure	0.0009	0.0191	0.0252*	0.0328***	0.0222**
	(0.0210)	(0.0160)	(0.0150)	(0.0130)	(0.0091)
Number of individuals	21,125	21,125	21,125	21,125	21,125
Observations	96,860	96,860	96,860	96,860	96,860
Adjusted R-squared	0.103	0.104	0.090	0.077	0.053
Demographic controls	Y	Y	Y	Y	Y
State characteristics controls	Y	Y	Y	Y	Y

Notes: The sample uses HRS respondents who are above 65 from 1996 to 2014. The ADL indicator means whether having difficulty in at least one item of walking, eating, dressing, bathing, and toileting. One limitation indicates individuals having difficulty in one item; two limitations indicates individuals having difficulty in two items etc. All models control for state plan expenditure, individual fixed effect, demographics of respondents, and state characteristics. Robust standard errors are clustered at state level in parentheses *** p<0.01, ** p<0.05, * p<0.10

settings such as nursing homes. One might be concerned that the increase in informal care could come from the decrease of Medicaid spent on nursing homes. To address this concern, Appendix Table A10 directly regresses Medicaid nursing home spending on informal care outcomes. Column 1 reports the estimates using our main specification and columns 2-5 add controls of nursing home capacity such as the number of facilities, the number of beds at nursing homes, and the number of residents at nursing homes. All of these estimates are small in magnitude and statistically insignificant. In addition, Appendix Table **??** reports estimates of MAW spending on informal care outcomes in specification 15 further controlling for nursing home variables. All of our main estimates are quite stable and robust across specifications.

Third, one might be concerned that the main results might be sensitive to the construction of our informal care outcome. Our main estimates of Table 4 use zero hour as the cutoff to create informal care indicators. In HRS, the care questions are asked to respondents by recalling their total care hours in the previous two years since the interview date. Many papers have argued the credibility of these recall numbers. To check the sensitivity of our estimates, Appendix Table A11 reports the effect of MAW spending on informal care using different cutoffs. Column 1 presents the main estimates and columns 2-5 show the results on informal care with all the potential cutoffs utilized in the literature. The magnitude of the coefficients in all specifications is quite robust across dependent variables and across panels.

7 Conclusion

The effect of MAWs on informal care is theoretically ambiguous. On the one hand, in-home formal care might be a substitute for informal care because MAWs subsidize formal care at home for eligible older people. The relative lower price of formal care allows older parents to rely more on publicly funded formal care, and decrease informal caregiving by adult children. On the other hand, informal caregiving can also increase if MAWs successfully encourage more older parents stay at home longer. This paper provides empirical evidence on how MAWs affect informal care in home settings. The results show that the MAW increases overall informal caregiving for parents by older Americans. A 10 percent increase in MAW funding increases the probability of becoming an informal caregiver by 0.1 percentage points, about a 0.3 percent effect. we also find that the

increase is predominately on caregivers with errands help. A 10 percent increase MAW funding increases the probability of being an errands caregiver by around 0.4 percent. By contrast, the policy seems have no effect on personal care.

Why is there different results for errands and personal caregiving? One possibility is the fact that the funding of MAWs usually covers more services similar to personal care. Thus, the waivers act as a subsidy for personal care. Families respond by shifting their caregiving to take advantage of the subsidized services. we also find evidence that the main channel through which MAWs affect informal care is by helping parents avoid institutionalization and encouraging parents to live close to their adult children. This appears to lead to an increase in the number of informal caregivers. However, it is also clear that it leads to a shift in type of care children give parents which is more non-intensive type. It is likely that different types of caregiving have differential implicit costs, and thus caregivers optimize their response to the subsidy to reduce their burden.

Informal care is part of the social network to help older adults age with quality. The importance of family members in caring for their frail and old loved ones is less explored and discussed in the literature. One reason is that such informal care is unpaid and there is no explicit market to value the benefits of care provided by family members. Another reason might be the stereotype of caregiving. Anecdotally, when people think of caregivers, people picture the care given by daughters to their mothers. The role of males in the caregiving world is less studied by the literature. The results add to this discussion. we find that while both sons and daughters increase overall and errands caregiving to their parents in response to the policy, only daughters reduce personal caregiving. This is likely due in part to the fact that male caregivers have very low levels of personal caregiving hours to begin with. Regardless, the results suggest that the MAW program relieves some burdens on female informal caregivers.

How big are these estimates and how can we understand the value of the MAW in context? The elasticity estimate of MAW funding on informal caregiving is around 0.03 calculated at the mean, implying that a one percent increase in MAW funding leads to a 0.03 percent increase in the probability of becoming an informal caregiver. Suppose now we have 10 percent increase in MAW funding – which equals on average about a $20 million increase. We should therefore expect the likelihood of caregivers to increase by 0.3 percent. In 2014, the total number of informal caregivers was around 50 million. Therefore, the number of informal caregivers might increase by 150,000

with a 10 percent increase in policy funding. we also estimate the care hours for individuals who provide some care. A $20 million increase in MAW funding increases the care hours for informal caregivers by 30 hours over two years. If we assume the average hourly wage for a typical person is $20, the total value of these additional care hours for 150,000 informal caregivers is $90 million. Additionally, the MAW successfully helps families avoid costly nursing facilities. The elasticity on nursing home use is - 0.07, such that a 10 percent funding increase in MAW funding results in 0.7 percent decrease in Medicaid spending in institutional settings. The total nursing facility expenses paid by Medicaid in 2014 was approximately $55 billion. The Medicaid HCBS savings on nursing homes then would be $390 million. Thus, MAWs achieve the program goals of reducing Medicaid expenditure on nursing homes, but the goals are achieved by shifting some burden onto informal caregivers. However, it is still possible that families prefer this arrangement over having their loved one in institutional care.

What are the policy implications of the findings? First, theoretically and empirically, individuals respond differently to MAWs. This public program subsidizes in-home formal personal care more than errands care and shifts more care burden on errands caregivers. If MAW expansion allows more older adults to stay at home longer, the policy could exacerbate informal care burdens. The government can use different tools to balance off formal care and informal care. Second, MAWs affect female caregivers more than male caregivers. Public policy with intention to equalize the care burden by gender could design the scope of services to participants heterogeneously by gender of informal caregivers.

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Appendix

A Theoretical Framework

A.1 Solution when $h_n = 0$

The optimization in equation (12) can be express as by solving the value function such that

$$\begin{aligned}\mathcal{L} = V(C) + W(L) + \lambda_1 \left\{ L - \left[Q_c^\sigma \cdot f(h_c)^\sigma + Q_m^\sigma \cdot h_m^\sigma \right]^{\frac{1}{\sigma}} \right\} \\ + \lambda_2 \left\{ R + wT - wh_c - C - p_m h_m \right\}\end{aligned} \tag{16}$$

Taking the partial derivatives with respect to h_c and h_m, we can achieve that:

$$h_m = f(h_c) \cdot f'(h_c)^{\frac{1}{\sigma-1}} \cdot \left(\frac{p_m \cdot Q_c^\sigma}{w \cdot Q_m^\sigma} \right)^{\frac{1}{\sigma-1}} \tag{17}$$

By assuming $W'(L) = 1$, we can achieve the following:

$$\begin{aligned}\left[Q_c^\sigma \cdot f(h_c)^\sigma + Q_m^\sigma \cdot h_m^\sigma \right]^{\frac{1-\sigma}{\sigma}} \cdot Q_c^\sigma \cdot f(h_c)^{\sigma-1} \cdot f'(h_c) = -\frac{\lambda_2}{\lambda_1} \cdot w = w \cdot V'(C) \\ = w \cdot V'(R + wT - wh_c - p_m h_m)\end{aligned} \tag{18}$$

Combine equation (17) with (18), we can achieve that:

$$Q_c^\sigma \cdot f'(h_c)^{\frac{\sigma}{1-\sigma}} + Q_m^\sigma \cdot \left(\frac{p_m Q_c^\sigma}{w Q_m^\sigma} \right)^{\frac{\sigma}{\sigma-1}} = \left[\frac{w \cdot V'(R + wT - wh_c - p_m h_m)}{Q_c^\sigma} \right]^{\frac{\sigma}{1-\sigma}} \tag{19}$$

Therefore, the optimization allocation is equivalent to solve the following

$$\begin{aligned}Y &= Q_c^\sigma \cdot f'(h_c)^{\frac{\sigma}{1-\sigma}} + \left(\frac{p_m Q_c^\sigma}{w Q_m} \right)^{\frac{\sigma}{\sigma-1}} - \left[\frac{w \cdot V'(R + wT - wh_c - p_m h_m)}{Q_c^\sigma} \right]^{\frac{\sigma}{1-\sigma}} \\ &= Q_c^\sigma \cdot f'(h_c)^{\frac{\sigma}{1-\sigma}} + \left(\frac{p_m Q_c^\sigma}{w Q_m} \right)^{\frac{\sigma}{\sigma-1}} - \left\{ \frac{w \cdot V' \left[R + wT - wh_c - f(h_c) \cdot f'(h_c)^{\frac{1}{\sigma-1}} \cdot \left(\frac{p_m^\sigma \cdot Q_c^\sigma}{w \cdot Q_m^\sigma} \right)^{\frac{1}{\sigma-1}} \right]}{Q_c^\sigma} \right\}^{\frac{\sigma}{1-\sigma}}\end{aligned} \tag{20}$$

From equation (20), we can observe that Y is dependent on h_c, p_m, and Q_m. As a result, we

can calculate the partial derivatives of Y with respect to each of these variables.

$$\begin{aligned}
\frac{\partial Y}{\partial p_m} &= \frac{\sigma}{\sigma-1}\cdot\left(\frac{p_m Q_c^\sigma}{wQ_m}\right)^{\frac{1}{\sigma-1}}\cdot\frac{Q_c^\sigma}{wQ_m} \\
&\quad+\frac{\sigma}{1-\sigma}\cdot\left(\frac{w\cdot V'}{Q_c^\sigma}\right)^{\frac{2\sigma-1}{1-\sigma}}\cdot\frac{w}{Q_c^\sigma}\cdot V''\cdot\left[f(h_c)\cdot f'(h_c)^{\frac{1}{\sigma-1}}\left(\frac{Q_c^\sigma}{w\cdot Q_m^\sigma}\right)^{\frac{1}{\sigma-1}}\cdot\frac{\sigma}{\sigma-1}\cdot p_m^{\frac{1}{\sigma-1}}\right] \\
&= \frac{\sigma}{\sigma-1}\cdot\underbrace{\left(\frac{p_m Q_c^\sigma}{wQ_m}\right)^{\frac{1}{\sigma-1}}}_{>0}\cdot\underbrace{\frac{Q_c^\sigma}{wQ_m}}_{>0} \\
&\quad+\underbrace{\left[-\left(\frac{\sigma}{1-\sigma}\right)^2\right]}_{<0}\cdot\underbrace{\left[\frac{w\cdot V'}{Q_c^\sigma}\right]^{\frac{2\sigma-1}{1-\sigma}}}_{>0}\cdot\underbrace{\frac{w}{Q_c^\sigma}}_{>0}\cdot\underbrace{V''}_{<0}\cdot\underbrace{\left[f(h_c)\cdot f'(h_c)^{\frac{1}{\sigma-1}}\left(\frac{Q_c^\sigma}{w\cdot Q_m^\sigma}\right)^{\frac{1}{\sigma-1}}\cdot p_m^{\frac{1}{\sigma-1}}\right]}_{>0}
\end{aligned} \tag{21}$$

$$\begin{aligned}
\frac{\partial Y}{\partial Q_m} &= -\frac{\sigma}{\sigma-1}\cdot\left(\frac{p_m Q_c^\sigma}{wQ_m}\right)^{\frac{1}{\sigma-1}}\cdot\frac{p_m Q_c^\sigma}{w}\cdot\frac{1}{Q_m^2} \\
&\quad+\frac{\sigma}{1-\sigma}\cdot\left(\frac{w\cdot V'}{Q_c^\sigma}\right)^{\frac{2\sigma-1}{1-\sigma}}\cdot\frac{w}{Q_c^\sigma}\cdot V''\cdot\left[f(h_c)\cdot f'(h_c)^{\frac{1}{\sigma-1}}\left(\frac{p_m^\sigma Q_c^\sigma}{w}\right)^{\frac{1}{\sigma-1}}\cdot\frac{-\sigma}{\sigma-1}\cdot Q_m^{\frac{1-2\sigma}{\sigma-1}}\right] \\
&= \frac{-\sigma}{\sigma-1}\cdot\underbrace{\left(\frac{p_m Q_c^\sigma}{wQ_m}\right)^{\frac{1}{\sigma-1}}}_{>0}\cdot\underbrace{\frac{p_m Q_c^\sigma}{w}}_{>0}\cdot\underbrace{\frac{1}{Q_m^2}}_{>0} \\
&\quad+\underbrace{\left[\left(\frac{\sigma}{1-\sigma}\right)^2\right]}_{>0}\cdot\underbrace{\left(\frac{w\cdot V'}{Q_c^\sigma}\right)^{\frac{2\sigma-1}{1-\sigma}}}_{>0}\cdot\underbrace{\frac{w}{Q_c^\sigma}}_{>0}\cdot\underbrace{V''}_{<0}\cdot\underbrace{\left[f(h_c)\cdot f'(h_c)^{\frac{1}{\sigma-1}}\left(\frac{p_m^\sigma Q_c^\sigma}{w}\right)^{\frac{1}{\sigma-1}}\cdot Q_m^{\frac{1-2\sigma}{\sigma-1}}\right]}_{>0}
\end{aligned} \tag{22}$$

$$\begin{aligned}
\frac{\partial Y}{\partial h_c} &= Q_c^\sigma\cdot\frac{\sigma}{1-\sigma}\cdot f'(h_c)^{\frac{2\sigma-1}{1-\sigma}}\cdot f''(h_c) \\
&\quad+\left[\frac{w\cdot V'}{Q_c^\sigma}\right]^{\frac{2\sigma-1}{1-\sigma}}\cdot\frac{\sigma}{1-\sigma}\cdot\frac{w}{Q_c^\sigma}\cdot V''\cdot\left\{w+\left(\frac{p_m^\sigma Q_c^\sigma}{wQ_m^\sigma}\right)^{\frac{1}{\sigma-1}}\cdot\left[f'(h_c)^{\frac{\sigma}{\sigma-1}}+\frac{1}{\sigma-1}\cdot f(h_c)\cdot f'(h_c)^{\frac{2-\sigma}{\sigma-1}}\cdot f''(h_c)\right]\right\} \\
&= \frac{\sigma}{1-\sigma}\cdot\left\{\underbrace{Q_c^\sigma}_{>0}\cdot\underbrace{f'^{\frac{2\sigma-1}{1-\sigma}}}_{>0}\cdot\underbrace{f''}_{<0}+\underbrace{\left[\frac{w\cdot V'}{Q_c^\sigma}\right]^{\frac{2\sigma-1}{1-\sigma}}}_{>0}\cdot\underbrace{\frac{w}{Q_c^\sigma}\cdot V''}_{<0}\cdot\left[\underbrace{w}_{>0}+\underbrace{\left(\frac{p_m^\sigma Q_c^\sigma}{wQ_m^\sigma}\right)^{\frac{1}{\sigma-1}}}_{>0}\cdot\left(\underbrace{f'^{\frac{\sigma}{\sigma-1}}}_{>0}+\frac{1}{\sigma-1}\cdot\underbrace{f\cdot f'^{\frac{2-\sigma}{\sigma-1}}\cdot f''}_{<0}\right)\right.\right.
\end{aligned} \tag{23}$$

Further, from equations (21)-(23), we can get the following:

$$\begin{aligned}\frac{dh_c}{dp_m} &= -\frac{\frac{\partial Y}{\partial p_m}}{\frac{\partial Y}{\partial h_c}} \\ &= -\frac{\frac{\sigma}{\sigma-1}\cdot\left(\frac{p_m Q_c^\sigma}{wQ_m}\right)^{\frac{1}{\sigma-1}}\cdot\frac{Q_c^\sigma}{wQ_m}+\left[-\left(\frac{\sigma}{1-\sigma}\right)^2\right]\cdot\left[\frac{w\cdot V'}{Q_c^\sigma}\right]^{\frac{2\sigma-1}{1-\sigma}}\cdot\frac{w}{Q_c^\sigma}\cdot V''\cdot\left[f\cdot f'^{\frac{1}{\sigma-1}}\left(\frac{Q_c^\sigma}{w\cdot Q_m^\sigma}\right)^{\frac{1}{\sigma-1}}\cdot p_m^{\frac{1}{\sigma-1}}\right]}{\frac{\sigma}{1-\sigma}\cdot\left\{Q_c^\sigma\cdot f'^{\frac{2\sigma-1}{1-\sigma}}\cdot f''+\left[\frac{w\cdot V'}{Q_c^\sigma}\right]^{\frac{2\sigma-1}{1-\sigma}}\cdot\frac{w}{Q_c^\sigma}\cdot V''\cdot\left[w+\left(\frac{p_m^\sigma Q_c^\sigma}{wQ_m^\sigma}\right)^{\frac{1}{\sigma-1}}\cdot\left(f'^{\frac{\sigma}{\sigma-1}}+\frac{1}{\sigma-1}\cdot f\cdot f'^{\frac{2-\sigma}{\sigma-1}}\cdot f''\right)\right]\right\}}\end{aligned} \tag{24}$$

$$\begin{aligned}\frac{dh_c}{dQ_m} &= -\frac{\frac{\partial Y}{\partial Q_m}}{\frac{\partial Y}{\partial h_c}} \\ &= -\frac{-\frac{\sigma}{\sigma-1}\cdot\left(\frac{p_m Q_c^\sigma}{wQ_m}\right)^{\frac{1}{\sigma-1}}\cdot\frac{1}{Q_m^2}\cdot\frac{p_m Q_c^\sigma}{w}+\left[\left(\frac{\sigma}{1-\sigma}\right)^2\right]\cdot\left[\frac{w\cdot V'}{Q_c^\sigma}\right]^{\frac{2\sigma-1}{1-\sigma}}\cdot\frac{w}{Q_c^\sigma}\cdot V''\cdot\left[f\cdot f'^{\frac{1}{\sigma-1}}\left(\frac{p_m^\sigma Q_c^\sigma}{w}\right)^{\frac{1}{\sigma-1}}\cdot Q_m^{\frac{1-2\sigma}{\sigma-1}}\right]}{\frac{\sigma}{1-\sigma}\cdot\left\{Q_c^\sigma\cdot f'^{\frac{2\sigma-1}{1-\sigma}}\cdot f''+\left[\frac{w\cdot V'}{Q_c^\sigma}\right]^{\frac{2\sigma-1}{1-\sigma}}\cdot\frac{w}{Q_c^\sigma}\cdot V''\cdot\left[w+\left(\frac{p_m^\sigma Q_c^\sigma}{wQ_m^\sigma}\right)^{\frac{1}{\sigma-1}}\cdot\left(f'^{\frac{\sigma}{\sigma-1}}+\frac{1}{\sigma-1}\cdot f\cdot f'^{\frac{2-\sigma}{\sigma-1}}\cdot f''\right)\right]\right\}}\end{aligned} \tag{25}$$

The direction of $\frac{dh_c}{dp_m}$ thus depends on the value of σ

A.2 Discusstion when σ approaches 1

When $\sigma = 1$ and $h_n = 0$, the optimization problem can be writen as follows:

$$\begin{aligned}\max_{C,h_c,h_m,h_w}\quad & V(C)+W(L) \\ \text{s.t.}\quad & L = Q_c\cdot f(h_c)+Q_m\cdot h_m \\ & h_w+h_c\le T \\ & C+p_m\cdot h_m\le R+w\cdot h_w\end{aligned} \tag{26}$$

By solving for the optimal solution of equation (26), we obtain the following condition:

$$f'(h_c^*) = \frac{wQ_m}{Q_c p_m} \tag{27}$$

Therefore, the relationship between h_c^* and p_m is:

$$\frac{dh_c^*}{dp_m} = \frac{1}{f''(h_c)} \cdot \left(-\frac{wQ_m}{Q_c} \right) \frac{1}{p_m^2} > 0 \tag{28}$$

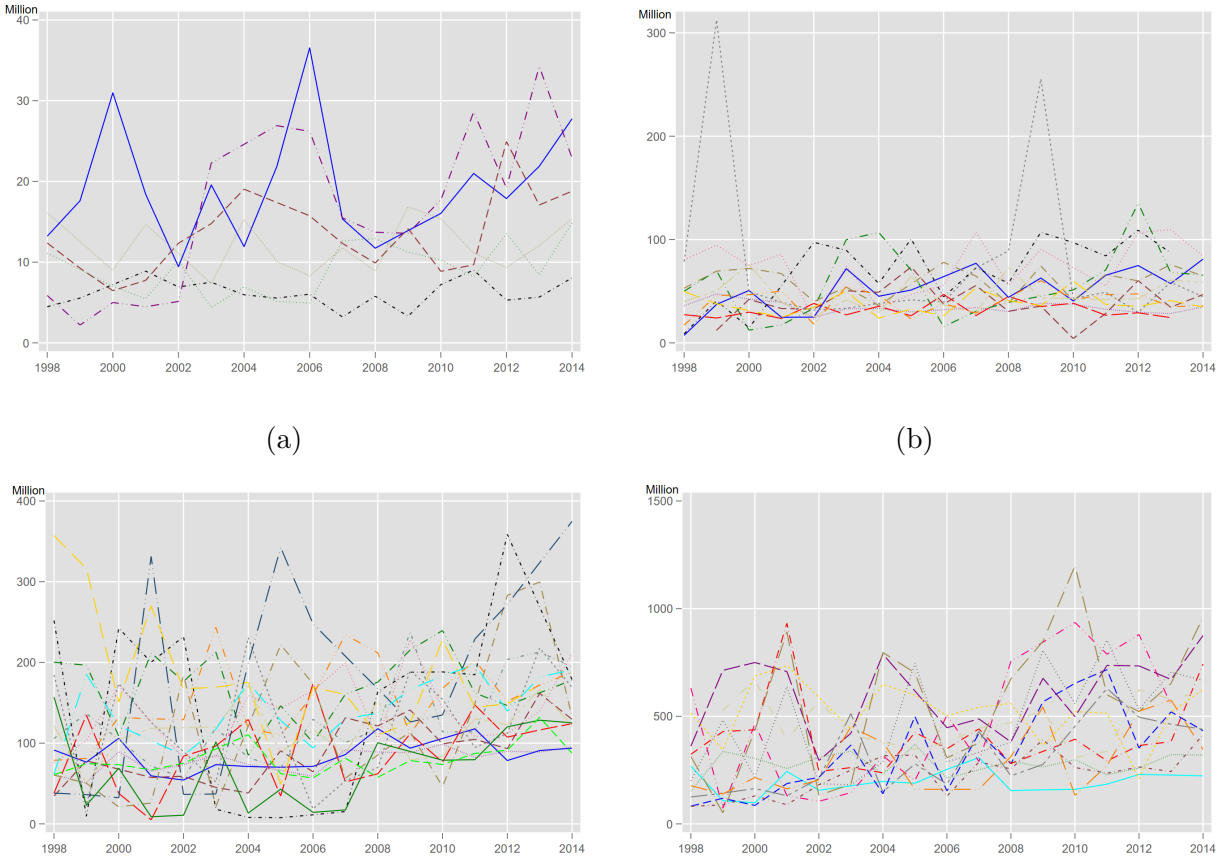
And the relationship between h_c^* and Q_m is:

$$\frac{dh_c^*}{dp_m} = \frac{1}{f''(h_c)} \cdot \left(\frac{wQ_m}{Q_c} \right) < 0 \tag{29}$$

Therefore, the expansion of the MAW policy will result in a decrease in p_m and an increase in Q_m, leading to a reduction in the supply of informal care.

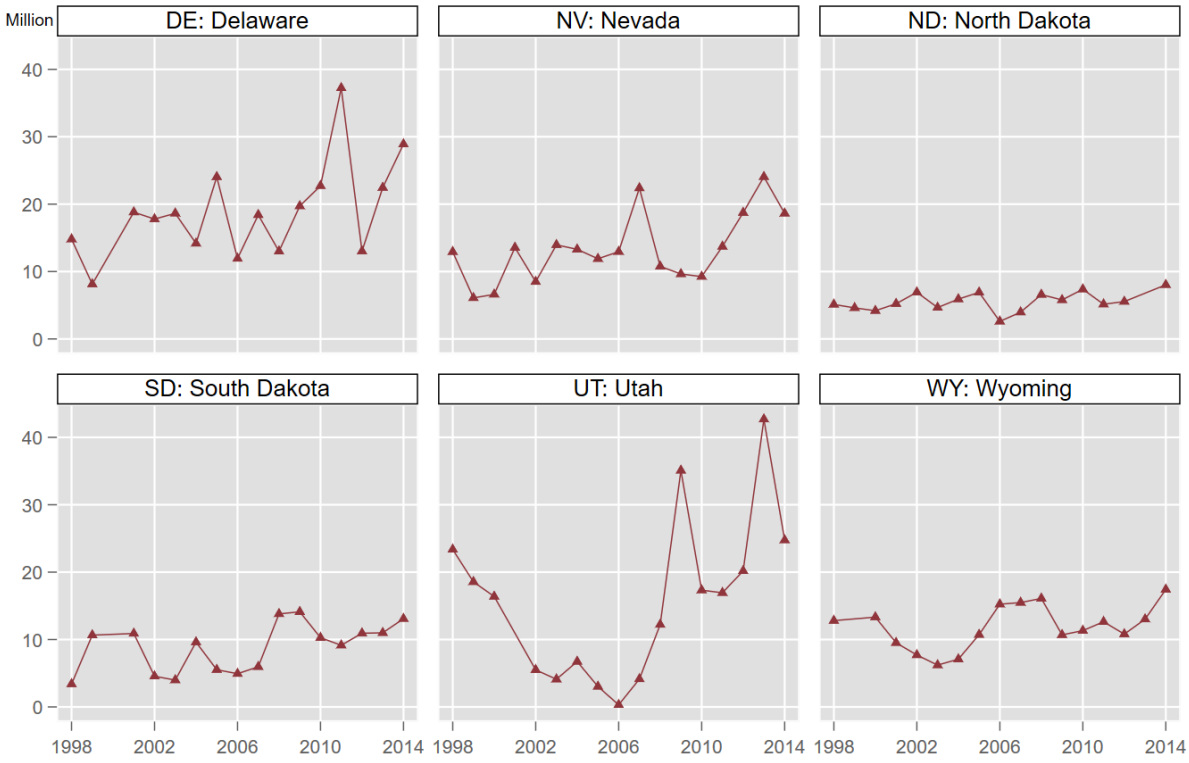
B Figures

Figure A1: Variation of MAW Expenditure by State in 1998-2014



Notes: The four graphs draw the expenditure of MAWs from year 1998 to 2014 across states. Each line of the sub-graph (a) corresponds to states in Delaware, Nevada, North Dakota, South Dakota, Utah, and Wyoming; each line of sub-graph (b) corresponds to states in Alaska, Hawaii, Idaho, Indiana, Iowa, Louisiana, Maine, Montana, Nebraska, New Hampshire, New Mexico, Rhode Island, and Vermont; each line of sub-graph (c) corresponds to states in Alabama, Arizona, Arkansas, Connecticut, Kansas, Kentucky, Maryland, Massachusetts, Michigan, Mississippi, Missouri, New Jersey, New York, Oklahoma, South Carolina, Tennessee, and West Virginia; each line of sub-graph (d) corresponds to states in California, Colorado, Florida, Georgia, Illinois, Minnesota, North Carolina, Ohio, Oregon, Pennsylvania, Texas, Virginia, Washington, and Wisconsin.

Figure A2: Variation of MAW Expenditure Across States

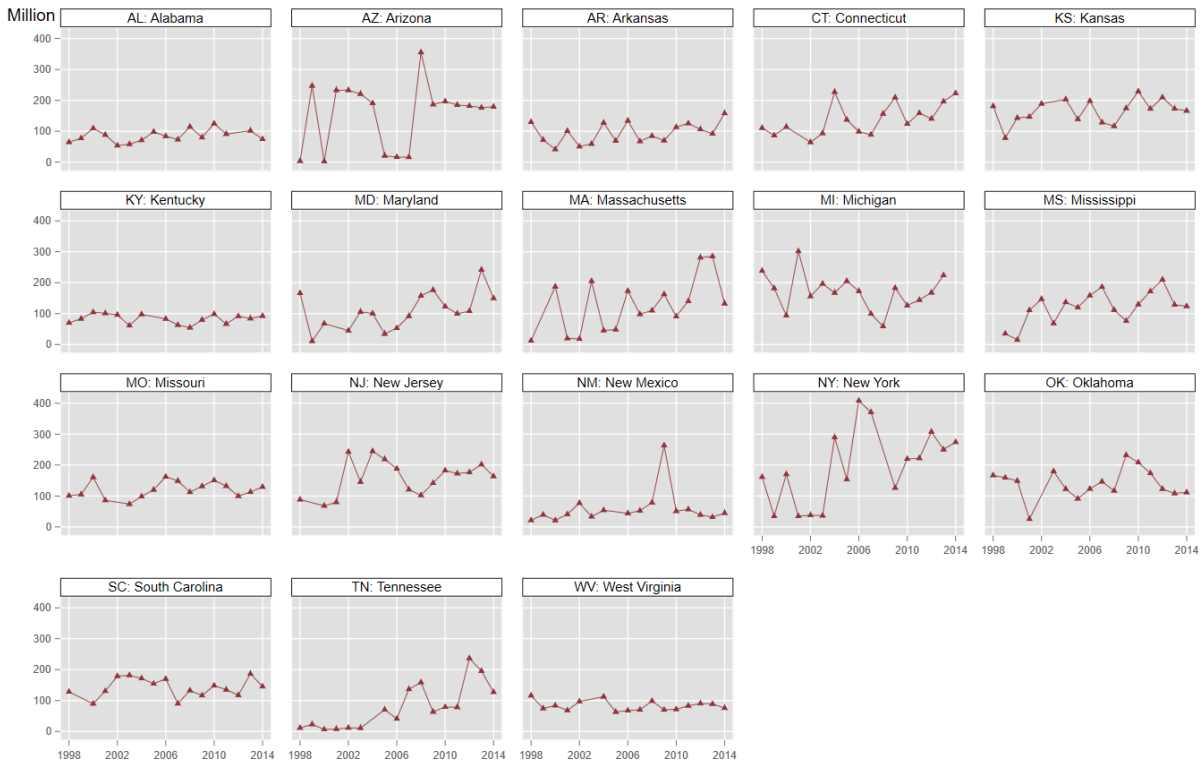


Notes: The plot draws the variation of MAW expenditure by state for years 1998-2014. Each sub-graph plots the MAW policy change for a specific state.

Figure A3: Variation of MAW Expenditure Across States

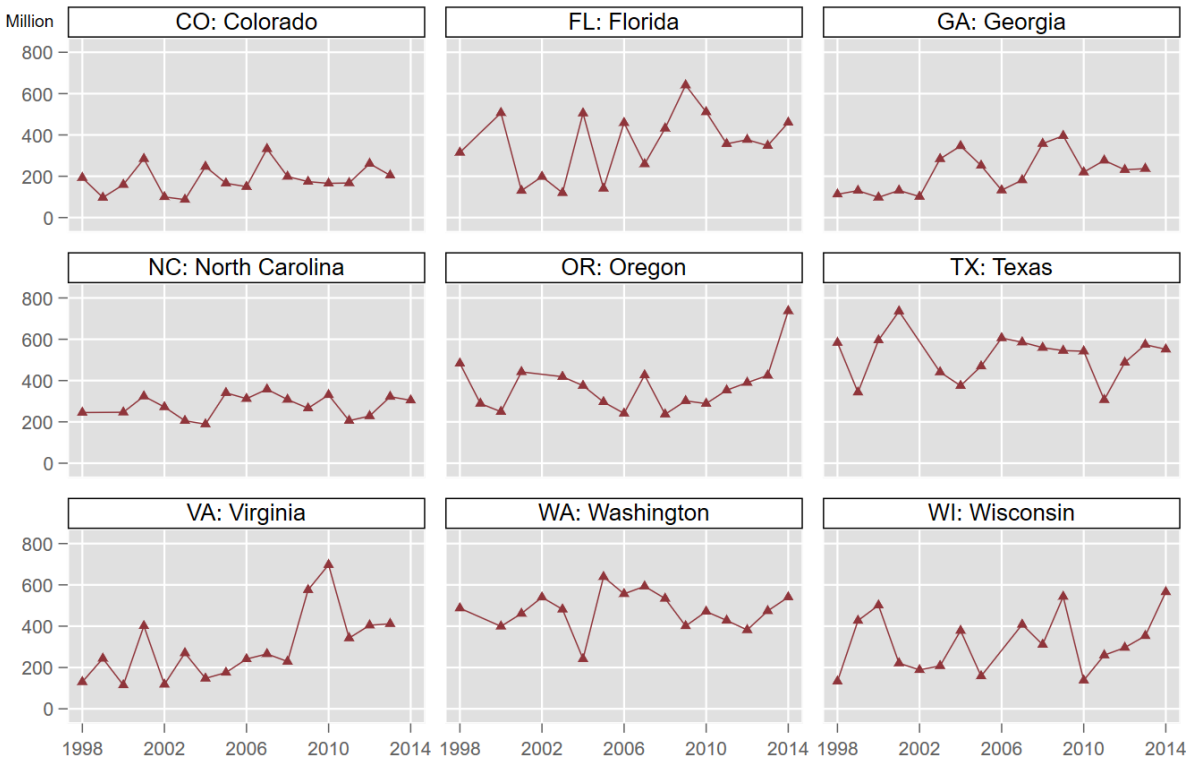
Notes: The plot draws the variation of MAW expenditure by state for years 1998-2014. Each subgraph plots the MAW policy change for a specific state.

Figure A4: Variation of MAW Expenditure Across States



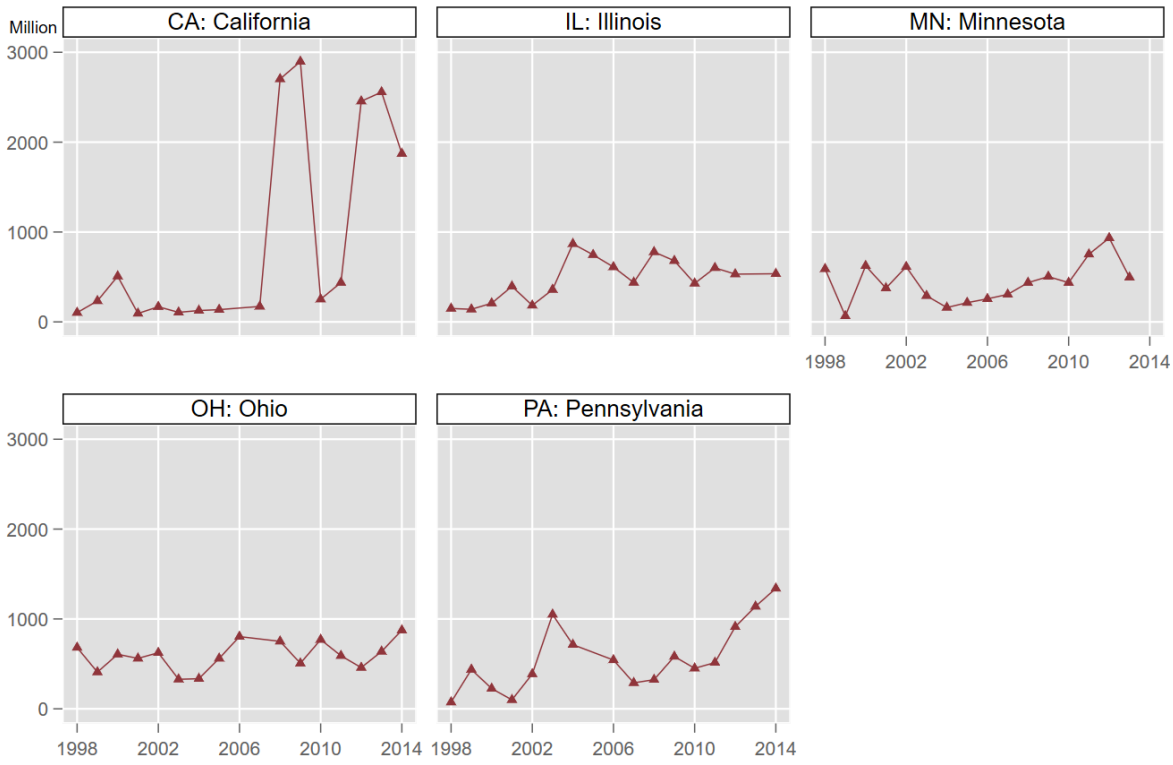
Notes: The plot draws the variation of MAW expenditure by state for years 1998-2014. Each sub-graph plots the MAW policy change for a specific state.

Figure A5: Variation of MAW Expenditure Across States



Notes: The plot draws the variation of MAW expenditure by state for years 1998-2014. Each sub-graph plots the MAW policy change for a specific state.

Figure A6: Variation of MAW Expenditure Across States



Notes: The plot draws the variation of MAW expenditure by state for years 1998-2014. Each subgraph plots the MAW policy change for a specific state.

C Tables

Table A1: Services Covered in Medicaid HCBS Programs

Home Health State Plan (Eligible for every resident)
Skilled nursing care
Medical social services such as home health aide, home care, counseling and support
Medical supplies, equipment, and appliances support
Optional therapy services like physical, occupational and speech pathology
Personal Care State Plan (Eligible for every resident)
Assistance with self-care (e.g., bathing, dressing, grooming, and personal hygiene)
Household activities (e.g., preparing meals)
Assistance with mobility and ambulation
Work sites, foster care, or assisted living facilities
MAWs at Home and Community
Home and community-based services (assistance with daily living activities)
Long-term care (nursing home care, assisted living, and other types of long-term care services)
Home modifications(accessible for individuals with disabilities)

Notes: The table shows detailed services covered under each Medicaid HCBS program. The Medicaid home health state plan refers to the provisions in a state's Medicaid State Plan that cover home health care services. Medicaid home health services are designed to provide medical and health-related services in the home, with the goal of helping individuals recover from an illness or injury or manage a chronic condition. The specific home health services covered under the Medicaid home health state plan can vary by state. The Medicaid personal care state plan refers to the provisions in a state's Medicaid State Plan that cover personal care services. Medicaid personal care services are designed to provide assistance with activities of daily living (ADLs) and instrumental activities of daily living (IADLs) for individuals who have difficulty performing these tasks on their own due to a physical, cognitive, or behavioral condition. The specific personal care services covered under the Medicaid personal care state plan are optional and can vary by state. MAWs are programs that allow states to offer Medicaid services in a way that deviates from traditional Medicaid coverage. The specific services that are covered under MAWs can vary depending on the state. It's important to note that home health services under the Medicaid state plans may be limited in scope and may not cover the full range of home and community-based services available through MAW programs. The services for MAW coverage can vary greatly from state to state. See texts for details. The information is adjusted from the annual Kaiser Family Foundation Waiver Program Survey.

Table A2: HRS 1998-2014

	Panel A: HRS Design								
Interview year	1998	2000	2002	2004	2006	2008	2010	2012	2014
Cohorts	HRS	HRS	HRS	HRS	HRS	HRS	HRS	HRS	HRS
	AHEAD	AHEAD	AHEAD	AHEAD	AHEAD	AHEAD	AHEAD	AHEAD	AHEAD
	CODA (1924-1930)	CODA	CODA	CODA	CODA	CODA	CODA	CODA	CODA
	WB (1942-1947)	WB	WB	WB	WB	WB	WB	WB	WB
				EBB(1948-1953)	EBB	EBB	EBB	EBB	EBB
Interview type							MBB (1954-1959)	MBB	MBB
Core yes	21,383	19,572	18,165	20,127	18,468	17,217	22,033	20,553	18,746
Core no	2,158	2,462	2,238	2,321	2,195	2,144	2,223	2,240	2,513
Exit	1,416	1,935	2,239	1,824	1,641	1,591	1,833	1,565	1,691
Unique individuals	24,957	23,969	22,642	24,272	22,304	20,952	26,089	24,358	22,950
	Panel B: Observations of Respondents Without Living Parents								
Interview year	1998	2000	2002	2004	2006	2008	2010	2012	2014
Unique individuals	13,977	12,517	11,262	11,278	10,104	9,134	10,465	9,522	8,436

Notes: The table summarizes the sample design of respondents who are interviewed every two years in the longitudinal HRS. Panel A reports the cohorts and new cohorts (birth years in the parenthesis) added in each survey year. The initial HRS cohort was born 1931 to 1941 who were first interviewed in 1992. The Asset and Health Dynamics Among the Oldest Old (AHEAD) cohort was born before 1924 and added into the survey in 1993. The HRS is replenished every six years with younger cohorts: the Children of the Depression (CODA) cohort who was born 1924 to 1930 and the War Babies (WB) cohort who are born 1942 to 1947 was added in 1998; the Early Baby Boomers (EBB) cohort who was born 1948 to 1953 was added in 2004; and the Mid-Baby Boomers (MBB) cohort who was born 1954 to 1959 was added in 2010. The core survey is the main part of HRS which interviews respondents about one and a half to three hours. The core yes interview type indicates a respondent being successfully interviewed and the core no indicates a respondent refusing answering the core survey. The exit interview is administered on a proxy family member of deceased respondents about information during their final stages of life and information about their disposition of assets after death. Panel B reports the number of unique individuals whose parents were deceased in core surveys during the period 1998-2014. The observations with no living parents are excluded from our main regression sample in the paper.

Table A3: HRS Respondents Who Had Parents Alive in 1998-2014

Interview year	1998	2000	2002	2004	2006	2008	2010	2012	2014
Unique individuals with living parents	7,406	7,055	6,903	8,849	8,364	8,083	11,586	11,031	10,310
Unique individuals excluded missing informal care values	6,024	5,065	4,302	5,623	4,742	3,973	7,014	6,279	5,093
Unique Individuals further excluded missing values on the state of parents	3,999	3,265	3,369	4,666	3,774	3,124	5,784	4,938	3,982
Repeated individuals in previous and current years		3,042	2,461	2,523	3,584	2,944	2,391	4,658	3,747

Notes: This table reports how our working sample of HRS in the paper is selected in 1998-2014. The second row summarizes the number of respondents who answered core surveys and who had living parents in any survey years in 1998-2014. The third and fourth rows report the number of individuals who did not have values on informal care and who had no information about the state of residency of their parents, respectively. The last row reports the longitudinal feature of HRS that respondents were both interviewed in the previous and current survey years 1998-2014.

Table A4: Summary Statistics of Informal Care in HRS 1998-2014

	(1)	(2)	(3)
%	Caregivers (0+)	Non-intensive caregivers (0, 1000)	Intensive caregivers (1000+)
Panel A		All caregivers	
Total care	36.32	29.22	7.11
Only errands care	26.12	23.16	2.96
Only personal care	2.15	1.84	0.31
Panel B		Female caregivers	
Total care	38.93	30.25	8.68
Only errands care	26.69	23.25	3.45
Only personal care	2.56	2.12	0.43
Panel C		Male caregivers	
Total care	31.88	27.45	4.43
Only errands care	25.14	23.02	2.12
Only personal care	1.47	1.36	0.11

Notes: The data used are our working sample of HRS individuals who had at least one parent alive in the period 1998-2014. The caregiving indicator is constructed based on the care hours cutoff in parenthesis. Column 1 describes the statistics of caregivers who provide some care hours over two years. Column 2 indicates the statistics of caregivers who provide care hours between 0 and 1,000 hours over two years. Column 3 is the statistics of intensive caregivers who provide at least 1,000 hours over two years. Panel A shows all caregivers. Panel B and Panel C represents female caregivers and male caregivers, respectively. Only personal care indicator includes help only with personal care needs but errands care needs. Only errands care indicator includes help only with errands care needs but personal care needs. Personal care includes basic personal needs such as dressing, eating, bathing, and toileting. Errands care include household chores, running errands, managing medicine, and transportation help.

Table A5: Summary Statistics

	Mean	S.D.
Informal care (from last wave)		
Care hours	240.74	842.70
Errands care hours	150.64	508.85
Personal care hours	90.43	531.11
Demographics of respondents		
Female	0.63	0.48
Age	57.24	6.93
Number of living siblings	3.15	2.36
Number of siblings living within 10 miles from parents	0.54	0.91
Demographics of HRS respondents' parent		
Marital status	0.43	0.84
Education	10.78	3.41
Age at death	79.67	10.14
In nursing home	0.07	0.26
Need personal care	0.24	0.43
Memory-related disease	0.12	0.33
Be left alone for 1h+	0.88	0.32
Live within 10 miles of respondent	0.43	0.49
Frequency contact with respondent every month	16.41	54.40
MAW spending (ten millions)		
MAW expenditure	32.40	59.72
MAW expenditure change	1.88	10.83
Unique individuals	10,892	
Observations	36,901	

Notes: The data used are our working sample of HRS individuals who had at least one parent alive in the period 1998-2014. The care hours are total hours of personal care or errands care hours provided by HRS individuals in the last two years since interview year. Personal care includes basic personal needs such as dressing, eating, bathing, and toileting. Errands care include household chores, running errands, managing medicine, and transportation help. MAW expenditure are the mean MAW spending in 1998-2014 across states. Policy expenditure change is mean change of policy expenditure from year to year in 1998 to 2014 across states. The scale of policy change is in ten millions which is the standard unit of MAW expenditure.

Table A6: The Effects of MAW Expenditure on State Characteristics in HRS 1998-2014

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Poverty	High School	White	Marriage	PCE	PI	Employment	Political Affiliation
MAW spending ($2014)	0.003	0.001	0.000	-0.002	-0.905	2.656	0.001***	-0.004***
	(0.002)	(0.002)	(0.001)	(0.002)	(0.766)	(2.018)	(0.000)	(0.001)
Mean	18.10	85.16	79.61	7.34	30,056	37,344	4.05	0.57
Number of individuals	10,795	10,795	10,795	10,754	10,795	10,795	10,795	10,795
Number of observations	36,605	36,605	36,605	36,218	36,605	36,605	36,605	36,605

Notes: The data used are our working sample of HRS individuals who had at least one parent alive in the period 1998-2014. The demographic and employment variables are from Census Bureau and BLS, personal income (PI), personal consumption expenditure (PCE) is from the Bureau of Economic Analysis Regional Analysis Accounts. The dependent variable is MAW spending in millions in 2014 real dollars of each state. All models control for individual FEs, year FEs, state-specific linear time trend as well as demographics of individuals and their parents such as age and marital status. See details in text. The mean row summarizes the mean of dependent variables in each column. Standard errors are clustered at the state level and shown in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

Table A7: Definitions of Health-related Variables

Variable	Definition
Self-reported health	Respondent's self-reported general health status, one for excellent, two for very good, three for good, four for fair, and five for poor.
Mobility difficulty	Index of mobility difficulties ranging from 0 to 5, indicating respondents having any problem in walking 1 block, walking several blocks, walking across a room, climbing 1 flight of stairs, and climbing several flights of stairs
ADL difficulty	Index of difficulties in Activities of Daily Living (ADL) ranging from zero to five, indicating whether respondents are having any difficulties in bathing, eating, getting dressed, getting in/out of bed, and walking across a room
IADL difficulty	Index of difficulties in Instrumental Activities of Daily Living (IADL) ranging from zero to five, indicating whether respondents having any difficulties in using the phone, managing money, taking medications, shopping for groceries, and preparing hot meals
Depression scores	Index of mental health ranging from zero to eight based on the score on the Center for Epidemiological Studies Depression (CESD) scale, which represents the sum of five negative indicators minus two positive indicators. The negative indicators measure sentiments all or most of the time: depression, everything is an effort, restless sleep, feeling alone, sad, and cannot get going. The positive indicators measure whether respondents feel happy and enjoy life
Cognition scores	The total cognition score is the sum of the total word recall and mental status test scores ranging from zero to 35. The word recall index sums the immediate and delayed word recall test scores. The mental status index includes the scores for serial 7's, counting backwards from 20, naming objects, recalling dates, and naming the president/vice-president
Hospital stays	Dichotomous indicator of whether an individual reports any overnight hospital stay over two years since the last interview
Doctor visits	Dichotomous indicator of whether a respondent reports any doctor visit over two years since last interview
Medication	Dichotomous indicator of whether a respondent reports regular use of prescription drugs over two years since last interview
Nursing home stay	Dichotomous indicator of whether a respondent reports any overnight nursing home stay over two years since last interview

Notes: The table demonstrates the definitions of health variables used in Table 2 in section 5 of testing the identification assumption.

Table A8: Effect of Lagged State Economic Conditions on MAW Expenditure

Unemployment rate lag 1	100.806	-555.51							-433.68
	(75.69)	(448.28)							(485.89)
Unemployment rate lag 1^2		92.68							84.16
		(75.47)							(85.02)
Unemployment rate lag 1^3		-3.91							-4.38
		(3.27)							(4.33)
Employment rate lag 1					-60.28	-2,264.11			-4,885.61
					(54.76)	(3,403.71)			(3,595.02)
Employment rate lag 1^2						31.03			77.77
						(51.86)			(57.28)
Employment rate lag 1^3						-0.14			-0.41
						(0.26)			(0.30)
Unemployment rate lag 2			207.21	275.11					322.61
			(165.64)	(528.02)					(667.86)
Unemployment rate lag 2^2				-54.21					-68.72
				(90.361)					(114.090)
Unemployment rate lag 2^3				3.830					4.73
				(4.91)					(6.17)
Employment rate lag 2							-91.42	27.48	4,534.34
							(83.31)	(3,836.61)	(4,923.31)
Employment rate lag 2^2								-9.91	-71.66
								(61.18)	(78.92)
Employment rate lag 2^3								0.09	0.37
								(0.33)	(0.42)

Notes: The data used are a state-year panel from 1998 to 2014. The unemployment and employment level is from BLS, the state population is from Census Bureau, the GDP, personal income (PI), personal consumption expenditure (PCE) is from the Bureau of Economic Analysis Regional Analysis Accounts. The dependent variable is MAW spending in millions in 2014 real dollars of each state in years 1999-2014. Each cell reports estimates from a separate specification. The last column includes lagged income controls such as GDP per capita, PI per capita, and PCE per capita. All regressions include state, year fixed effects and weighted using the state population. Standard errors are clustered at the state level and shown in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

Table A9: Robustness Checks of Nursing Home Expenditure on Informal Care

	(1)	(2)	(3)	(4)	(5)
	Panel A Dependent Variable: Any Care				
Nursing home expenditure ($2014)	0.00014	0.00013	0.00016	0.00016	0.00011
	(0.00012)	(0.00011)	(0.00012)	(0.00013)	(0.00015)
Mean of dependent variable	0.362	0.362	0.362	0.362	0.362
	Panel B Dependent Variable: Errands Care				
Nursing home expenditure ($2014)	0.00016	0.00015	0.00017	0.00017	0.0001
	(0.00015)	(0.00015)	(0.00015)	(0.00017)	(0.00019)
Mean of dependent variable	0.341	0.341	0.341	0.341	0.341
	Panel C Dependent Variable: Personal Care				
Nursing home expenditure ($2014)	-0.00001	-0.00001	-0.00003	-0.00006	-0.00005
	(0.00007)	(0.00007)	(0.00007)	(0.00007)	(0.00008)
Mean of dependent variable	0.099	0.099	0.099	0.099	0.099
Number of nursing homes		Y			Y
Number of beds at nursing homes			Y		Y
Number of residents at nursing homes				Y	Y

Notes: This table shows robustness checks of Medicaid nursing home spending on informal care. The working sample is HRS individuals having at least one living parent in the period 1998-2014 with 10,754 unique individuals and 36,218 observations. Column 1 reports the estimates of Medicaid spending on nursing homes on informal care variables using the main specification in column 4 of Table 4. Column 2 reports the estimates of nursing home expenditure on informal care which adds the number of nursing homes in each state, column 3 shows the sensitivity estimates of nursing home expenditure on informal care to the number of beds at nursing homes of states, and column 4 controls the number of residents at nursing homes in each state, column 5 tests the results of nursing home expenditure on informal care controlling for all the nursing home relevant variables in column 2-4. These nursing home data are collected from CMS websites in the period 1998-2014 at the state level. All models control for individual FEs, year FEs, state-specific linear time trend, and expenditure of other state plans that might cover similar services in MAWs as well as all controls listed in column 4 of Table 4 such as demographics of individuals and their parents, growth of older population, and state characteristics. Details of each control and panel can be referred to footnotes in Table 4. The mean row summarizes the mean of dependent variables in each column. Standard errors in parentheses are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.10

Table A10: Robustness of Effects of MAWs on Informal Care to Nursing Home Variables

	(1)	(2)	(3)	(4)	(5)
	Panel A Dependent Variable: Any Care				
MAW expenditure ($2014)	0.00027*	0.00032**	0.00032**	0.00024	0.00019
	(0.00015)	(0.00015)	(0.00015)	(0.00021)	(0.00022)
Mean of dependent variable	0.362	0.362	0.362	0.362	0.362
	Panel B Dependent Variable: Errands Care				
MAW expenditure ($2014)	0.00052***	0.00055***	0.00055***	0.00049**	0.00044*
	(0.00016)	(0.00016)	(0.00016)	(0.00023)	(0.00024)
Mean of dependent variable	0.341	0.341	0.341	0.341	0.341
	Panel C Dependent Variable: Personal Care				
MAW expenditure ($2014)	-0.00007	-0.0001	-0.00011	-0.0001	-0.00005
	(0.00013)	(0.00013)	(0.00013)	(0.00014)	(0.00015)
Mean of dependent variable	0.0988	0.0988	0.0988	0.0988	0.0988
Number of nursing homes	Y				Y
Number of beds at nursing homes		Y			Y
Number of residents at nursing homes			Y		Y
Medicaid expenditure on nursing homes				Y	Y

Notes: This table shows robustness checks to controlling nursing home variables of MAWs on informal care. The working sample is HRS individuals having at least one living parent in the period 1998-2014 with 10,754 unique individuals and 36,218 observations. Column 1 reports the estimates of MAWs on informal care which are robust to adding the number of nursing homes in each state, column 2 shows the sensitivity estimates of MAWs on informal care to the number of beds at nursing homes of states, and column 3 controls the number of residents at nursing homes in each state, column 4 tests the main results of MAWs on informal care controlling for the Medicaid spending on nursing homes at the state level, and column 4 includes all the nursing home relevant variables to show robustness of our main results in Table 4. These nursing home data are collected from CMS websites in the period 1998-2014 at the state level. All models control for individual FEs, year FEs, state-specific linear time trend, and expenditure of other state plans that might cover similar services in MAWs as well as all controls listed in column 4 of Table 4 such as demographics of individuals and their parents, growth of older population, and state characteristics. Details of each control and panel can be referred to footnotes in Table 4. The mean row summarizes the mean of dependent variables in each column. Standard errors in parentheses are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.10

Table A11: Robustness of Effects of MAWs on Informal Care to Different Cutoffs

	(1) Cutoff at 0	(2) Cutoff at 25	(3) Cutoff at 50	(4) Cutoff at 75	(5) Cutoff at 100
	Panel A Dependent Variable: Any Care				
MAW expenditure ($2014)	0.00032**	0.00029	0.00029*	0.00029*	0.00026
	(0.00015)	(0.00018)	(0.00017)	(0.00016)	(0.00019)
Mean of dependent variable	0.362	0.347	0.324	0.315	0.248
	Panel B Dependent Variable: Errands Care				
MAW expenditure ($2014)	0.00055***	0.00047***	0.00051***	0.00048***	0.00028*
	(0.00016)	(0.00016)	(0.00015)	(0.00014)	(0.00016)
Mean of dependent variable	0.341	0.326	0.301	0.291	0.215
	Panel C Dependent Variable: Personal Care				
MAW expenditure ($2014)	-0.0001	-0.00003	-0.00006	-0.00002	0.00002
	(0.00013)	(0.00012)	(0.00013)	(0.00012)	(0.00014)
Mean of dependent variable	0.099	0.094	0.090	0.089	0.075

Notes: This table shows robustness checks of MAWs on informal care constructed with different cutoffs. The working sample is HRS respondents having at least one living parent in the period 1998-2014 with 10,754 unique individuals and 36,218 observations. Column 1 reports the main estimates of MAWs on informal care variables defined using the cutoff at 0 in Table 4, column 2 shows the sensitivity estimates on informal care created using the cutoff at 25 hours, and column 3 uses the cutoff at 50 hours to create care indicators, column 4 tests the main results on informal care constructed at cutoff 75 hours, and column 4 reports the robustness results using the cutoff at 100 hours to define informal care dummies. All dependent variables are equal to 1 if the care hours provided by respondents in the last two years are above the cutoffs and 0, otherwise. All models control for individual FEs, year FEs, state-specific linear time trend, and expenditure of other state plans that might cover similar services in MAWs as well as all controls listed in column 4 of Table 4 such as demographics of individuals and their parents, growth of older population, and state characteristics. Details of each control and panel can be referred to footnotes in Table 4. The mean row summarizes the mean of dependent variables in each column. Standard errors in parentheses are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.10