

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 expenditures 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 expenditures 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

¹Long-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.

²A 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 expenditures 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 expenditures 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 expenditures 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 expenditures of HCBS in 1992 and show that generous HCBS expenditures 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

³There 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. Section 7 analyzes the channels through which MAWs affect informal care. Section 8 probes robustness checks on the estimates. Section 9 concludes.

2 Institutional Background

Historically, Medicaid only funded LTC in institutional settings such as nursing homes and skilled nursing facilities. With costly nursing home care, Medicaid LTC expenditures increased significantly over years. To contain the massive growth in LTC expenditures and satisfy the public's preference for having LTC at home or in their communities, starting in the early 1980s, Medicaid implemented

the Home and Community-based Services (HCBS) program. Medicaid HCBS mainly funds three programs that comprise the majority of its enrollment and spending: a mandatory home health state plan, an optional personal care state plan, and optional waivers.⁴ The state plans are available to every Medicaid eligible person with limited resources similar as general Medicaid eligibility.⁵ The Medicaid optional waivers are special HCBS programs that are the focus of the paper. The waivers allow states to waive general requirements in the regular state plan programs. For example, Medicaid waivers can select a particular population to serve, set limits on participants, and expand coverage through generous financial requirements which are not allowed in state plans. Medicaid waivers “waive” these requirements to realize the specific purpose of these programs.

In this paper, we focus on Medicaid aging waivers (MAWs) that specifically target older adults who are 65 and above and have a certain level of LTC needs.⁶ To be eligible for MAWs, one also needs to have low income and assets that are below certain thresholds. However, these thresholds can differ across states. For the income eligibility cutoff, 79 percent of states use 300 percent Supplemental Security Income (SSI) (\$27,000/year for an individual); 16 percent use 100 to 300 percent SSI (\$9,000 to \$27,000); and 5 percent use 100 percent SSI (\$9,000) in 2018. For the asset limit, 11 percent of states use 0; 4 percent use \$1,600; 77 percent use \$2,000; and 8 percent use \$2,500 to \$4,000 in 2018. The mission of MAWs is to provide LTC for older adults at home as well as to improve their quality of life by allowing them to age in place.

There are several unique features of MAWs that we utilize to draw causal estimates on informal caregiving in Section 6. First, each state has flexibility to limit the scope of services subsidized and the coverage of each service offered to participants in MAWs. The common services provided by majority of the states are home-based services and equipment or technology modification service for the convenience of elderly individuals to stay at home. In 2018, 85 percent of states provided

⁴Medicaid HCBS also include other state plan programs such as Community First Choice providing supplementary services for people who prefer to stay at home and Section 1915(i), helping intellectual or developmental disabled people. In 2018, the spending of waivers is about \$62.5 billion, accounting for 58 percent of the total Medicaid spending. State plans expenditures are \$20.6 billion, comprising 23 percent of the total Medicaid funding. The size of Community First Choice is small, about 9 percent of the total Medicaid expenditures.

⁵In general, the eligibility limit for applicants is around \$2,313 per month in income and \$2,000 in assets. See details about the eligibility of each state: <https://www.medicaidplanningassistance.org/medicaid-eligibility/>.

⁶States have different names of providing HCBS for the older population if they have this program. 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 total expenditures of MAWs were approximately \$40 billion in 2017, making up 65 percent of the total waiver expenditures.

home-based services, 70 percent offered nursing or therapy services, 78 percent covered equipment and technology modifications, 40 percent included round-the-clock services, 61 percent furnished day services, and 62 percent had case management services. In addition, each state sets their own limits on how much each participant can be subsidized for a specific service. For example, the generous states might cover 30 hours of home-based services one week while the less states might cover at most 15 hours of similar services one week in the program. Furthermore, states are allowed to limit the geographic area served in the MAW.⁷

Second, the MAW needs to be cost neutral. The cost neutrality means that the total expenditures of participants covered at home in the MAW cannot exceed the spending if these participants were to be served in nursing facilities. Each state justifies this requirement in their waiver application and the federal Centers for Medicare and Medicaid Services (CMS) determines whether the requirement is met or not. The modification details of each application are not public available. In general, each initial application needs multiple revisions to get approved by CMS. The most commonly revisited parts are sections on caps of enrollments, service coverage, and units of services.⁸ As a consequence of this requirement, there are many people each year on the waiting list in each state.

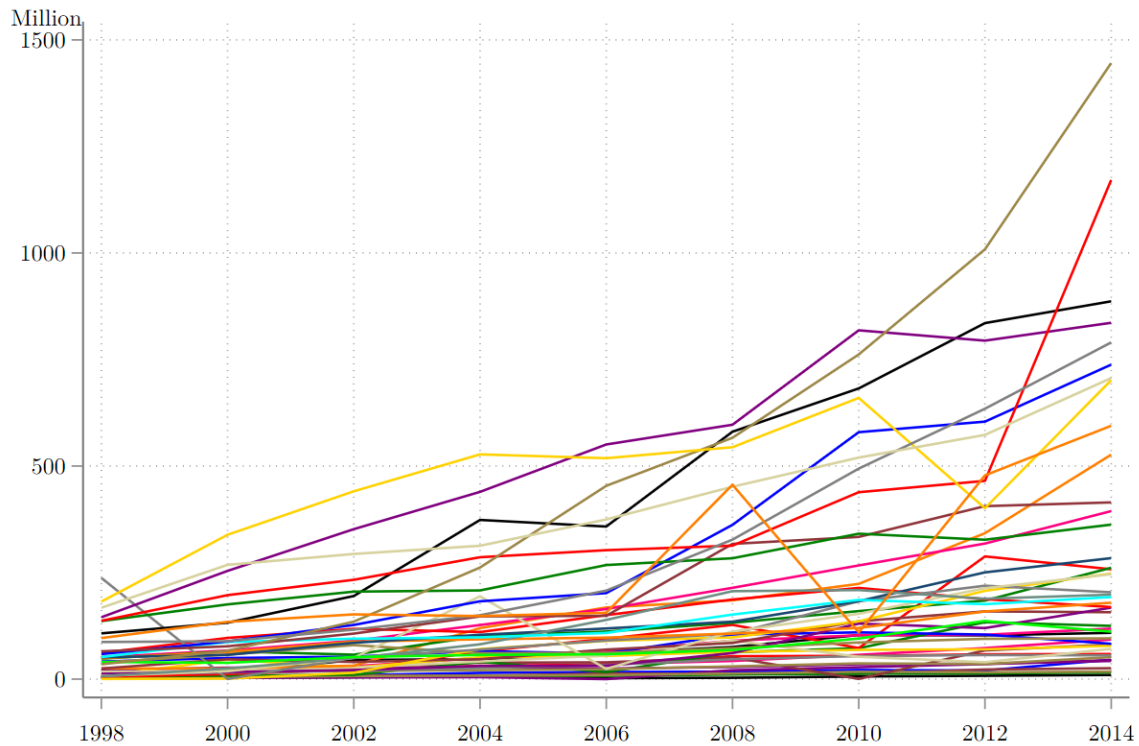
Third, the final realized expenditures of MAWs in each state depends largely on the development of service delivery system and the supply of qualified care providers. One state might propose a very generous aging waiver and get approved by CMS. However, if the delivery system does not match the ambitious serving goal, such as shortage of social workers and case managers, the final expenditures might be far less than the number proposed. Another big uncertainty comes from the representative agencies. CMS designates regional agencies to monitor and administer the operation of MAWs in each state. Any lack of an operational system and unexpected quality deviation of providers from the approved waiver detected by the representatives might cause expenditures different from proposed numbers in the application. Specifically, the qualifications and procedures for verifying the qualifications of service providers are detailed in the application. The agencies monitor and verify whether care providers of aging waivers meet the required licensure and certification standards.

⁷This geographic limitation is optional, and most states do not limit service by geographic coverage.

⁸For example, the number of users who utilize adult daycare, the average units per user, etc.

Figure 1 displays the variation of MAW expenditures change from 1998 to 2014 for all 50 states in the United States. Per the policy design, the pattern of expenditures of MAWs is unique in each state. To show clearer pattern for each state, Figure 2 draws the variation of policy generosity change into four sub-graphs. Each line corresponds to one state. The mean of funding of MAWs is approximately \$320 million. The funding change of MAWs from year to year is in ten million, which is the standard scale unit of policy variables. There is considerable variation in policy expenditure change across states, as shown in the Appendix Table A1. Some states amend their policies quite often, while some states rarely change them.

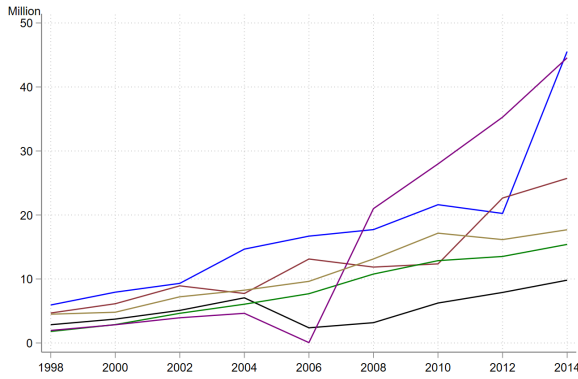
Figure 1: State Variation of MAW Expenditures 1998 to 2014



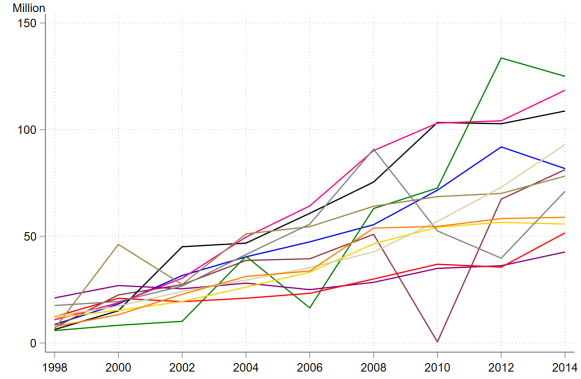
Notes: The plot draws the expenditures of MAWs across 50 states from 1998 to 2014. Each line corresponds to one state.

There are also some states in which expenditures for older people changes from MAWs to

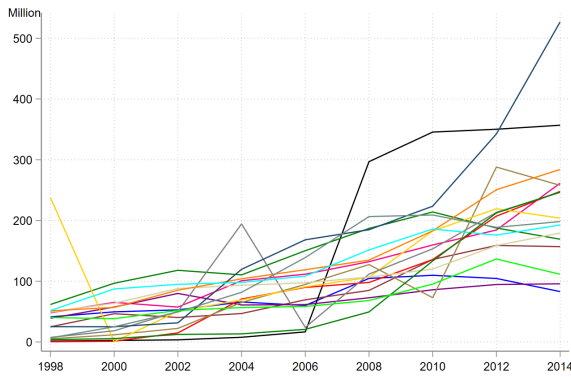
Figure 2: State Variation of MAW Expenditures 1998 to 2014



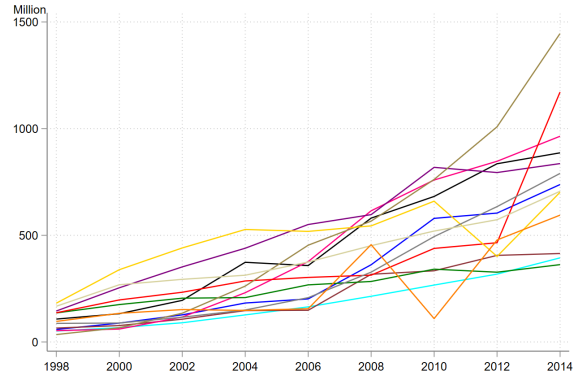
(a)



(b)



(c)



(d)

Notes: The four graphs draw the expenditures 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.

other state programs. For example, Vermont stopped offering the MAW independently from 2006. The MAW is consolidated into the Global Commitment Demonstration program. The services covered in MAWs are continually covered in the new demonstration program from 2006 to 2014 in the study period. Rhode Island stopped providing the stand-alone MAW and merged it into the Global Consumer Choice Compact Waiver in 2010. Enrollees from the MAW are served through the new global waiver. New Jersey replaced its MAW with Managed Long-Term Services and Supports (MLTSS) in 2014. Participants are automatically enrolled in the MLTSS program. Texas replaced

the MAW in 2014 and participants are covered in a transitional plan. Oregon used a new K plan to replace the aging waiver in 2014. The expenditures for these programs on old population in the changed years are re-calculated to reflect the true policy variation in these states. Figures [A2](#) to [A5](#) show the detailed funding pattern of MAWs for each state.

In addition to the MAW, other state plans under Medicaid HCBS might cover home-based care for the older population. As shown in the Appendix Table [A2](#), 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. There are some overlapping services offered in these programs and MAWs. However, these state plans are available to every Medicaid eligible state resident and serve only 15% of the older population.⁹ Nevertheless, we include the expenditures for older people provided by the state plans as additional controls since states with generous Medicaid HCBS funding might allocate more resources to both state plans and MAWs in Section 5.

3 Theoretical Framework

We build a simple model which represents a two-generation family with a near-elderly child, the potential informal caregiver, and an older parent, the potential informal care receiver, to illustrate how family decision-making may respond to public policy when the parent needs LTC.¹⁰ Our model is an extension of [Mommaerts and Truskinovsky \(2020\)](#) to allow for the distinction between informal care, formal home-based care, and formal nursing home care. With this model, we can derive testable predictions and channels of how MAWs affect informal caregiving.

The two-generation family in this model receives utility from consumption, C , and the parent's health quality, H . The parent's health depends on preference-adjusted LTC received. For simplicity, we use L to refer to LTC consumption. Therefore, the family maximizes utility, with the utility function, $U(C) + H(L)$, where U and H are increasing and concave functions. One way to interpret the LTC consumption in the utility function is that the marginal utility from LTC services becomes smaller when health status of parent is severe.

⁹In 2018, approximately 3 million enrollees received Medicaid HCBS, and 2.5 million beneficiaries received MAWs.

¹⁰The adult child and parent may not live together. The term "family" refers to a broader kin network ([Edmonds et al., 2005](#)).

The parent receives LTC from three different sources: informal care, formal home-based care, and nursing home care. The home-setting is denoted by H and the nursing home setting is denoted by N . The amount of LTC consumption from each source is indexed respectively by h_c , hours provided by an adult child at home; h_f^H , hours provided by formal home aids purchased with the price P_f^H ; and h_f^N , hours provided by an nursing home with the price P_f^N . The preference-adjusted LTC received by the parent is modeled as follows:

$$L = f(h_c) \cdot Q_c + h_f^H \cdot Q_f^H + h_f^N \quad (1)$$

in which Q_c and Q_f^H capture the preference of parents over options of receiving LTC relatively to nursing home, respectively. For example, given a certain preference for informal care over formal care, if the parent prefers to age at home than nursing homes, the value of Q_c and Q_f^H is larger; given a certain preference for LTC locations, if the parents prefers informal care over formal care, the value of Q_c is larger. We assume that f is an increasing and concave function to illustrate the idea that the longer period of informal care provided, the less value of such care.

Besides, the child spends her total non-leisure time, T , in two different ways: market work, h_w , for a wage, w , and informal care, h_c , so that $T = h_w + h_c$. The family allocates its total resources, which consist of an initial endowment, A , and labor income of the child, $w \cdot h_w$, on consumption, C , formal home-based care, $P_f^H \cdot h_f^H$, and nursing home care, $P_f^N \cdot h_f^N$.

We also assume that home-based care only serves limited LTC to parents so that $f(h_c) \cdot Q_c + h_f^H \cdot Q_f^H \leq \bar{L}$ (\bar{L} is exogenous). This assumption is reasonable for the fact that a very frail parent does not allow to be served at home setting and needs to be cared in nursing homes.

The family's maximization problem is:

$$\max_{C, h_c, h_f^H, h_f^N, h_w} U(C) + H(L) \quad (2)$$

s.t.

$$L = f(h_c) \cdot Q_c + h_f^H \cdot Q_f^H + h_f^N \quad (3)$$

$$f(h_c) \cdot Q_c + h_f^H \cdot Q_f^H \leq \bar{L} \quad (4)$$

$$h_c + h_w \leq T \quad (5)$$

$$C + P_f^H \cdot h_f^H + P_f^N \cdot h_f^N \leq A + w \cdot h_w \quad (6)$$

To solve this problem, we can get the value function and first-order conditions:

$$\begin{aligned} V = & U(C) + H(L) + \lambda_1(L - f(h_c) \cdot Q_c - h_f^H \cdot Q_f^H - h_f^N) \\ & + \lambda_2(\bar{L} - f(h_c) \cdot Q_c - h_f^H \cdot Q_f^H) + \lambda_3(T - h_c - h_w) \\ & + \lambda_4(A + w \cdot h_w - C - P_f^H \cdot h_f^H - P_f^N \cdot h_f^N) \end{aligned} \quad (7)$$

\Rightarrow

$$U'(C) = \lambda_4 \quad (8)$$

$$-\lambda_1 \cdot f'(h_c) \cdot Q_c - \lambda_2 \cdot f'(h_c) \cdot Q_c - \lambda_3 = 0 \quad (9)$$

$$-\lambda_1 \cdot Q_f^H - \lambda_2 \cdot Q_f^H - \lambda_4 P_f^H = 0 \quad (10)$$

$$-\lambda_1 - \lambda_4 P_f^N = 0 \quad (11)$$

$$-\lambda_3 + \lambda_4 w = 0 \quad (12)$$

\Rightarrow

$$f'(h_c) = \frac{w \cdot Q_f^H}{P_f^H \cdot Q_c} \quad (13)$$

From the optimal condition in Equation 13, we can explore how MAWs change informal care. First, the MAW reduces the financial burden of LTC for the parent staying at home by subsidizing professional providers and allows the eligible family to purchase in-home formal care at a cheaper price from the market. Therefore, P_f^H decreases.

$$\frac{\partial h_c^*}{\partial P_f^H} = \frac{-1}{f''(h_c^*)} \cdot \frac{w \cdot Q_f^H}{(P_f^H)^2 \cdot Q_c} \quad (14)$$

since f is a increasing and concave function, $f''(h_c^*) < 0$, so $\frac{dh_c^*}{dP_f^H} > 0$. Therefore, the informal care decreases in response to the cheaper formal care supported by MAWs.

Second, MAWs increases the attractiveness of aging in place so Q_c and Q_f^H increases. The MAW can offer part of professional services that would only be available otherwise in nursing

homes to eligible parents at home which makes LTC at home more attractive. In addition, for parents who prefer informal care over formal care, the value of unit of informal care received is larger.

$$\frac{\partial h_c^*}{\partial Q_c} = \frac{-1}{f''(h_c^*)} \cdot \frac{w \cdot Q_f^H}{(Q_c)^2 \cdot P_f^H} \quad (15)$$

since $f''(h_c^*) < 0$, so $\frac{dh_c^*}{dQ_c} > 0$. Therefore, the informal care increases in response to the increasing preference for aging at home allowed by MAWs.

4 Data

4.1 Medicaid HCBS and HRS data

The first data source is Medicaid policy information on MAW funding for each state for the years 1995 to 2014. The state application and annual report of MAWs are publicly available in the CMS website.¹¹ These applications and reports detail the services covered, service definitions, and the total expenditures in covered years. These annual reports also serve as the foundation for CMS to evaluate the cost-neutrality of the renewal applications. For some states, they may have more than one waiver serving the older population. The total expenditures of MAWs are calculated across each year, and these are used as the main treatment variable.

The second data source is the Health and Retirement Study (HRS), a longitudinal dataset which began in 1992. Respondents are surveyed every other year. The HRS is representative of Americans aged 51 and above. The survey includes different cohorts who become 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 about their demographics, health outcomes, employment status, financial situation, respondents'

¹¹<https://www.medicaid.gov/>

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. Table A3 in the Appendix shows how respondents in different cohorts enter the survey and the number of unique individuals in interview types. The survey also collects information on family members of respondents such as parents.¹²

The HRS restricted data includes the state of residence of respondents and their parents from 1998 to 2014. we combine the HRS data with the MAW funding data by merging the MAW policy data with HRS based on the state of residence of each of a respondent’s parent.¹³ The resulting data are a state-year panel from 1998 to 2014 with observations every other year for individuals and their parents.

The third data source is the American Community Survey (ACS) of state characteristics from 1998 to 2014. These state characteristics include the total population, the older population (65+), the unemployment rate, poverty rate, gender percentage, education level, and the political affiliation of governors. we use these state attributes to test the identification assumption in Section 8.

The fourth data source is about characteristics of nursing homes at state level. The CMS provides public data about the number of nursing homes, the number of beds at nursing homes, and the number of residents at each state. Also, we use the LTCfocus data, a product of the Shaping Long-Term Care in America project conducted by the Center for Gerontology and Healthcare Research at the Brown University. The LTCfocus provides variables on functional status of nursing home residents such as percent of difficulty in ADL and walking and percent of residents admitted from home.¹⁴ We utilize the details on nursing home to check the robustness and to test the identification assumption in Section 8.

4.2 Sample selection

To study how MAWs affect caregiving by HRS respondents, we first restrict the sample to respondents with at least one living parent when they enter the survey.¹⁵ Then we exclude the

¹²Since the HRS respondents are older themselves, the parents of these older respondents are more likely to be dead in the study years. Table A3 Panel B reports the number of respondents who do not have living parents across 1998 to 2014.

¹³The policy funding is averaged between survey year and lagged one year to be merged with the HRS data. For example, the 2000 HRS wave is merged with expenditures of MAWs averaged in 2000 and in 1999.

¹⁴See the website <https://lctfocus.org/> for details.

¹⁵Since 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.

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 full sample*, consists of 36,904 observations and 10,893 unique individuals from 1998 to 2014. Table A4 in the Appendix Panel A demonstrates the number of individuals with at least one living parent when they are first surveyed from 1998 to 2014 and Panel B reports how many respondents are 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). 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.¹⁶ The same idea applies to personal care and errands care indicators. An intensive caregiving indicator is constructed using the cutoff of 1,000 hours over the last two years (about 10 hours one week), which is common in the literature (Van Houtven et al., 2013). Unfortunately, in the case that both parents are alive, the reported care hours in the HRS do not distinguish between care hours provided to mothers or fathers separately.¹⁷

In order to explore the channels through which the MAWs affect informal caregiving, first 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, 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,

¹⁶Unlike 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 the robustness check Section 8, several cutoffs are used to test the sensitivity.

¹⁷Since majority of living parents are living mothers, the care hours are provided more for mothers than fathers.

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

Table 1 shows the summary statistics of detailed care across the full sample. Panel A reports the statistics for all caregivers who offer either personal care or errands care or both. About 36 percent of respondents are caregivers who provide some care hours to their parents over 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. Among non-intensive caregivers, about 23 percent are only errands caregivers and 2 percent are only personal caregivers. Among intensive caregivers, only personal caregivers account for 4 percent; only errands caregivers make up 42 percent; caregivers who provide not only personal care but errands care constitute the majority, 54 percent. Panel B shows the care statistics for female caregivers and Panel C represents the statistics for male caregivers. The pattern in sub-samples is similar as that in the full sample. 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.

Table 2 reports the statistics on care hours, demographics of respondents, and their parents as well as policy variables across the full sample. Care hours are summed over personal and errands care hours provided in the last two years. The mean of total care hours is around 240 hours (2.4 hours a week), with 150 hours (1.5 hours a week) for errands care and 90 hours (about 1 hour a week) for personal care, separately. The standard deviation is much larger and the distribution of these care hours is diverse. Figure 3 shows the care distribution conditional on positive hours and Figure 4 plots the personal care and errands care hours, separately. The care hours are highly skewed. In the full sample, about 63 percent of HRS respondents are women. The average age of respondents is around 57. The typical HRS respondent has about 3 siblings and less than 1 sibling living nearby. For their parents, 43 percent of them are married. The mean education level

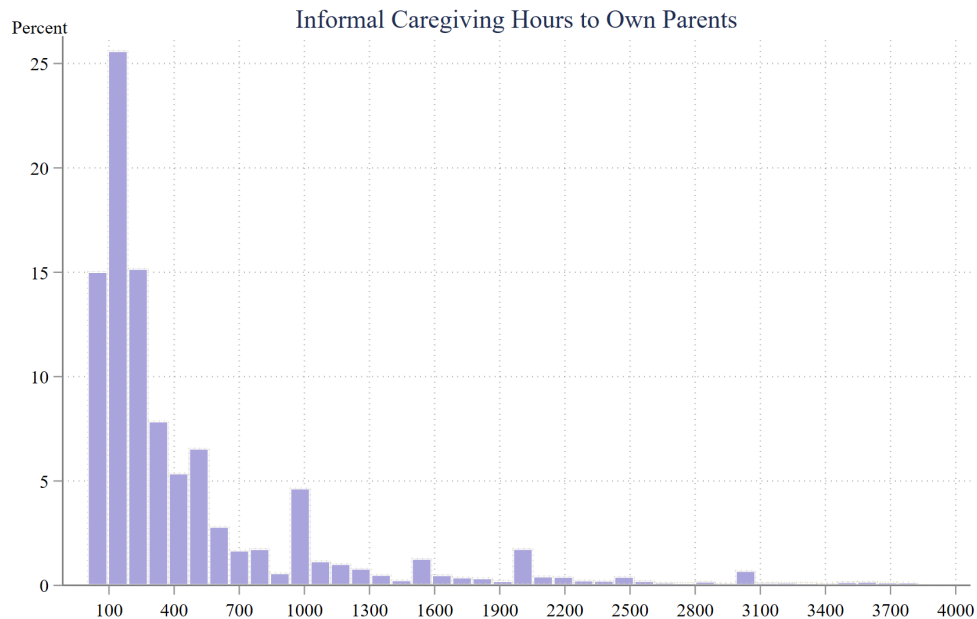
Table 1: Summary Statistics of Caregiving

	(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 is from HRS 1998 to 2014 full sample including individuals with at least one living parent. 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 give 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.

is approximately 11 years. The average age of parent at death is around 80. Approximately 7 percent of parents are in nursing homes. Approximately 24 percent of parents need personal care and 12 percent have memory-related disease who cannot be left alone for at least one hour. About 43 percent parents live close to their adult children. The frequency contact with respondents every month through phone, email, or visit in person is around 16 times. The average MAW funding is about \$32 million and the average change of funding since last year is \$20 million in 1998 to 2014 across states. The scale of policy change is in ten millions which is the standard unit of policy expenditures.

Figure 3: Distribution of Informal Care Hours



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

5 Estimation Strategy

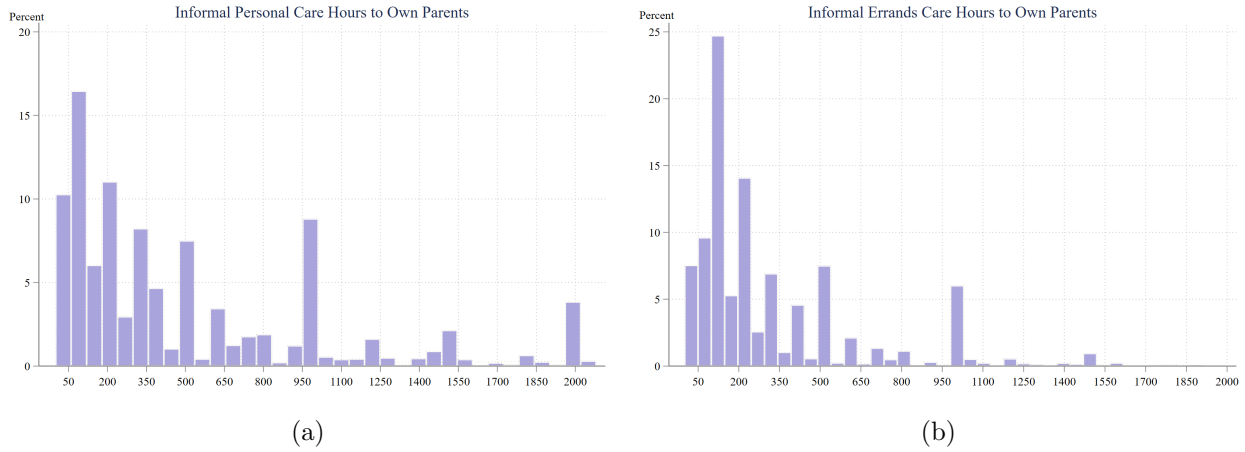
To estimate the effect of MAWs on informal care, we utilize a two-way fixed effects strategy by employing the unique design of this program. The two-way fixed effects strategy is essentially an

Table 2: Summary Statistics

		Full	
		Mean	S.D.
Caregiving (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 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
Policy (ten millions)			
	MAW expenditures	32.40	59.72
	MAW expenditures change	1.88	10.83
Unique individuals		10,892	
Observations		36,901	

Notes: The data used is from HRS 1998 to 2014 full sample including individuals with at least one living parent. The care hours are total hours of personal care or errands care hours provided by adult children 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. Aging waiver expenditures are the mean MAW funding in years 1998 to 2014 across states. Policy expenditures change is mean change of policy expenditures 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 policy expenditures.

Figure 4: Distribution of Care Hours by Type



Notes: The graphs are drawn using HRS 1998-2014 conditional on providing any care. 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.

extended difference-in-differences framework with a continuous treatment variable. Conceptually, in any given year, treatment states are those with relatively large changes in their MAW funding, while control states are those with relatively small or no change in funding. The identifying assumption is that, conditional on observable covariates, the timing and magnitude of funding changes at the state level are random. Several institutional details support this assumption. First, CMS monitors the operation and execution of MAWs across states. Any operational problems randomly detected by CMS and failure to meet certain requirements by CMS will cause amendments of MAW expenditures. Second, states usually cap the number of participants, hours of services and the total expenditures for each year in the MAW application to justify the cost-neutrality requirement. The caps on expenditures across covered years introduce another source of variation of the funding of MAWs. Third, the Medicaid HCBS resource allocation between different waivers across years creates another source of variation in the timing of MAW funding change.¹⁸ The estimation model is as follows:

$$Y_{ist} = \alpha_i + \delta_{DD} \text{Aging}_{s\bar{t}} + \eta_s + \mu_t + \eta_{st} + \beta_x X_{ist} + \epsilon_{ist} \quad (16)$$

¹⁸The common people covered in Medicaid waivers are children with intellectual development disabilities and older people.

where i indexes the individual adult child, s is the state where an individual’s parents live and t is year. Y_{ist} is the informal care outcomes provided to parents by an individual i in state s where parents reside and year t . α_i is an individual fixed effect. It controls for the unobservable factors that are constant within individuals such as underlying preferences for caregiving, and preference of their parents. $\text{Aging}_{s\bar{t}}$ is mean of the MAW funding in state s averaged in year t and year $t - 1$, the common continuous treatment variable. The lagged policy funding accounts for the fact that, due to the HRS design, there is a time inconsistency between survey years and policy years. For example, an individual’s informal care status in 2012 is a function of average policy expenditures in year 2011 and year 2012 with other controls. η_s is a state fixed effect which equals one when individual’s parents are from state s and zero otherwise. μ_t is a set of year dummies. They equal one if records in the data come from year t . η_{st} is a state-specific linear time trend which controls for the heterogeneous trends in aging waiver policy across states. X is a set of time-variant characteristics of individuals as well as their parents such as age, marital status, and number of living siblings. State plan expenditures are also controlled in X considering the fact that state plan programs offer similar and overlapping care services as in MAWs which can also affect informal care, see Table A2 for details. The standard errors are clustered at state level which is the level of policy variation.

Even with longitudinal data controlling unobserved individual characteristics, one needs to be careful to draw causal estimates between aging waiver expenditures and informal care. First, there might be unobserved time varying factors that make the policy expenditure change endogenous. We use several strategies to address this concern including pre-treatment balance test, controlling detailed state characteristics, and different specifications. Second, we consider the possibility that the funding change is correlated with nursing home funding change which might affect informal caregiving. We regress nursing home expenditures with and without aging waiver expenditures on informal caregiving to check the balance and bias due to this correlation. Third, we use different control groups to avoid any unobserved time-varying factors that may drive the results. For example, if the results are reliable, the effect of aging waivers should be main driven by people who stay at home than people who ever enter into nursing homes. Fourth, we treat the aging waiver expenditures are endogenous and estimate the effect on informal care using number of ADLs at state level as instruments. The detailed discussion of each strategy is conducted in

Section 6 and 8.

6 Results

6.1 Results of MAWs on caregiving

Table 3 shows the estimates on the full sample by care type; each of the five columns shows estimates from a different specification of Equation 16. All specifications include state plan expenditures, individual, year fixed effects, and state-specific linear time trend. The specification in column 2 adds in the demographics of individuals and of their parents such as age, number of living siblings, and marital status; the third model further controls the size of state older population and the fourth model includes more state-level characteristics, such as the unemployment rate, education level, poverty level, racial/ethnicity percentage, and political affiliation of state governors. The state-level MAW funding is in ten million dollars, the standard unit of average year-to-year funding change across states. Panels A to C display the estimates separately on overall care, errands care, and personal care. Table 3 shows that an increase in MAW funding results in an overall increase in the likelihood that a respondent becomes an informal caregiver. A ten million dollar increase in policy funding is associated with a 0.03 percentage points increase of the probability of being an informal caregiver (Panel A). This amounts to a 0.08 percent increase on a baseline caregiving probability of 0.36. The effect on providing help with errands in Panel B is positive and larger in magnitude than that on the overall care shown in Panel A. The chance of providing errands care increases by 0.05 percentage points as a result of a ten million dollar increase in MAW funding, about 0.15 percent. The effect on being a personal caregiver in Panel C, however, is statistically insignificant. The probability of being a personal caregiver is indistinguishable from zero. These estimates are consistent across different specifications. The controls for demographics of respondents, of their parents, and the state level characteristics do not change the magnitude and statistical significance of these estimates.

6.2 Results of MAWs by gender of caregivers

Since females and males may face different implicit costs of giving care to their parents, we explore whether there are heterogeneous effects of MAWs on informal caregiving by gender of caregivers.

Table 3: Results of MAWs on Care for Full Sample

	(1)	(2)	(3)	(4)
Panel A Dependent variable: care indicator [.36]				
Aging waiver expenditures (ten millions)	0.00030*	0.00034**	0.00034**	0.00031**
	(0.00016)	(0.00015)	(0.00015)	(0.00014)
Adjusted R-squared	0.023	0.025	0.025	0.025
Panel B Dependent variable: errands care indicator [.34]				
Aging waiver expenditures (ten millions)	0.00046***	0.00050***	0.00050***	0.00046***
	(0.00016)	(0.00016)	(0.00015)	(0.00015)
Adjusted R-squared	0.018	0.020	0.020	0.020
Panel C Dependent variable: personal care indicator [.10]				
Aging waiver expenditures (ten millions)	0.00007	0.00007	0.00006	0.00002
	(0.00016)	(0.00017)	(0.00014)	(0.00013)
Adjusted R-squared	0.023	0.024	0.024	0.025
Unique individuals	10,892	10,795	10,795	10,795
Observations	36,901	36,605	36,605	36,605
State year trend	Y	Y	Y	Y
Demographics	N	Y	Y	Y
State older population	N	N	Y	Y
State characteristics	N	N	N	Y

Notes: This table shows estimates of policy on the full sample by care types. The full sample is that with individuals having at least one living parent. Panel A shows the results on overall care; panel B displays the results on errands care and panel C is the results on personal care. Demographics include characteristics of HRS respondents such as age, marital status, and number of living siblings and demographics of parents such as age, marital status, and health conditions varying across years. State characteristics are unemployment rate, poverty rate, percentage of education level, racial/ethnicity, and the political preference of state governor. All models control for state plan expenditures, individual and year fixed effect. The mean of dependent variable is in bracket. Robust standard errors are clustered at state level in parentheses *** p<0.01, ** p<0.05, * p<0.10

Panel A in Table 4 shows the effect of MAWs on female caregivers. A ten million dollar increase in aging waiver funding increases the probability of becoming an informal caregiver for daughters by approximately 0.03 percentage points (0.08 percent) while the significance disappears. The effect on errands care is larger: 0.04 percentage points (0.11 percent). Similar to the overall results, the effect on personal care is indifferent from zero, with a ten million dollar increase in the aging waiver

funding. Panel B shows the estimates of MAWs on male caregivers. The coefficient of the effect of MAWs on overall care for sons is approximately 0.05 percentage points (0.16 percent), which is larger than that on daughters. The likelihood of providing errands care increases by 0.07 percentage points (0.23 percent) with a ten million dollar increase in MAWs funding. The estimated effect on personal care for males is indistinguishable from zero and statistically insignificant.

Table 4: Results of MAWs on Care by Gender of Caregivers

	(1)	(2)	(3)
	Care indicator	Errands care indicator	Personal care indicator
Panel A: Female caregivers			
Aging waiver expenditures (ten millions)	0.00026 (0.00018)	0.00038** (0.00018)	0.00007 (0.00015)
Mean	0.39	0.36	0.12
Adjusted R-squared	0.035	0.029	0.032
Unique individuals	6,464	6,464	6,464
Observations	23,139	23,139	23,139
Panel B: Male caregivers			
Aging waiver expenditures (ten millions)	0.00047* (0.00023)	0.00072*** (0.00024)	-0.00022 (0.00030)
Mean	0.32	0.30	0.07
Adjusted R-squared	0.026	0.023	0.026
Unique individuals	4,331	4,331	4,331
Observations	13,466	13,466	13,466
State year trend	Y	Y	Y
Demographics	Y	Y	Y
State older population	Y	Y	Y
State characteristics	Y	Y	Y

Notes: This table shows estimates of policy on the full sample by gender of caregivers. The full sample includes individuals with at least one living parent. Panel A shows the results on female caregivers and panel B displays the results on male caregivers. The dependent variable in column 1 is overall care, personal care in column 2, and errands care in column 3. Demographics include characteristics of HRS respondents such as age, marital status, and number of living siblings and demographics of parents such as age, marital status, and health conditions varying across years. State characteristics are unemployment rate, poverty rate, percentage of education level, racial/ethnicity, and the political preference of state governor. All models control for state plan expenditures, individual fixed effects, year fixed effect, controls of individuals and their parents as well as state characteristics. Robust standard errors are clustered at state level in parentheses *** p<0.01, ** p<0.05, * p<0.10

Second, Table 5 reports the results of aging waivers by care intensity. Columns 1 to 3 show the estimates on non-intensive care indicator and columns 4 to 6 present the estimates on intensive care indicator. Following the literature that uses HRS data to study caregiving, the intensive care is defined as providing at least 1,000 care hours over two years and the non-intensive care is vice versa. The magnitude on total care is about 0.03 percentage points and it is statistically insignificant. The effects of MAWs on informal care seem to be driven by non-intensive care as shown in column 2. Specifically, the policy generosity increases the likelihood of being an errands caregiver who provide less than 1,000 hours care over two years by 0.05 percentage points (0.17 percent). The effect on personal care is statistically insignificant and indistinguishable from zero. The results from columns 4 to 6 show that the policy seems to have negative effect on intensive care regardless of care type but these estimates are statistically insignificant.

6.3 Heterogeneous effects of aging waivers on informal caregiving

Per the design of MAWs, the policy helps old population who are most likely in need of LTC care age at home. To provide supportive evidence that MAWs increase errands caregiving, Table 6 reports the heterogeneous effects of this program on errands care provided by adult children. First, parents who are older are more vulnerable to be dependent on informal care and be targeted by the policy. Panel A in column 1 shows the results for parents who are at least 75 and 85 separately. Adult children are about 0.02 percentage points more likely to provide errands care if their parents are much older. Second, parents who are at risk of needing LTC are supposed to make choices between formal care and informal care. Panel B presents the results for parents who have memory disease and who need personal care. Among parents who have difficulty in memory, the complementary relationship is much stronger: adult children are about 0.05 percentage points more likely to help with errands with parents having memory problems. Among parents who need personal care, the probability for adult children to help with errands is about 0.03 percentage points higher. Third, the effect on informal care should be stronger for parents who always stay at home since the MAWs specifically provide care services at home. Panel C shows that for parents who are never in nursing homes, the estimate of policy on errands care is much similar to the magnitude shown in the Table 3. The magnitude of estimate for parents who ever entered into nursing homes is much smaller and insignificant.

Table 5: Results of MAWs by Care Intensity

	(1)	(2)	(3)	(4)	(5)	(6)
	Non-intensive Care			Intensive Care		
	Care	Errands care	Personal care	Care	Errands care	Personal care
Aging waiver expenditures (ten millions)	0.00036** (0.00018)	0.00055*** (0.00017)	0.00001 (0.00011)	-0.00005 (0.00010)	-0.00009 (0.00009)	0.00001 (0.00009)
Mean	0.29	0.30	0.07	0.07	0.05	0.03
Adjusted R-squared	0.009	0.011	0.014	0.016	0.009	0.011
Unique individuals	10,795	10,795	10,795	10,795	10,795	10,795
Observations	36,605	36,605	36,605	36,605	36,605	36,605
State year trend	Y	Y	Y	Y	Y	Y
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 estimates of policy by care intensity on the full sample including individuals with at least one living parent in Panel A. The first three columns show the results on intensive care indicators which equal 1 if care hours are no less than 1,000 and 0, otherwise. The dependent variable in column 1 is care indicator, personal care indicator in column 2, and errands care indicator in column 3. Column 4 to 6 show the estimates on non-intensive care indicators which equal 1 if care hours are less than 1,000 and 0, otherwise. All models control for state plan expenditures, individual fixed effects, year fixed effect, controls of individuals and their parents as well as state characteristics. Robust standard errors are clustered at state level in parentheses *** p<0.01, ** p<0.05, * p<0.10

7 Channels of MAWs on Informal Caregiving

The estimates show that MAWs positively affect informal caregiving. To interpret and understand these findings, one needs to explore the channels through which the MAW affects care behavior. First, we check whether MAWs affect individuals' preference over 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

Table 6: Heterogeneous Effects of MAWs on Errands Care

	(1)	(2)
	Yes	No
Panel A		
Policy # Age above 75	0.00048*** (0.00015)	0.00028* (0.00016)
Policy # Age above 85	0.00058*** (0.00014)	0.00034** (0.00015)
Panel B		
Policy # Memory Disease	0.00094*** (0.00017)	0.00037** (0.00015)
Policy # Need personal care	0.00065*** (0.00016)	0.00039** (0.00015)
Panel C		
Policy # Ever in nursing home	0.00014 (0.00016)	0.00052*** (0.00015)
Unique individuals	10,796	10,796
Observations	36,608	36,608
Demographic controls	Y	Y
State characteristics controls	Y	Y

Notes: This table shows heterogeneous estimates of policy on errands care using the sample including individuals with at least one living parent. All models control for individual fixed effects, year fixed effect, controls of individuals and their parents as well as state characteristics. Robust standard errors are clustered at state level in parentheses *** p<0.01, ** p<0.05, * p<0.10

information on the percent of resident admissions into nursing home from home at state level provided by the LTCfocus project to explore the mechanisms of aging waivers on informal care.

Columns 1 to 2 in Table 7 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

Table 7: Channels through which MAWs Affect Informal Care

	Nursing Home		Living with Respondents		Living within 10 miles of Respondents		Admissions from Home	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
	Mother	Father	Mother	Father	Mother	Father	Parent	Parent
Aging waiver expenditures (ten millions)	-0.00035*** (0.00013)	-0.00010** (0.00005)	0.00020** (0.00010)	0.00000 (0.00006)	0.00107** (0.00043)	0.00104** (0.00040)	0.03135** (0.01642)	
Mean	0.07	0.02	0.06	0.01	0.43	0.34	7.75	
Adjusted R-squared	0.098	0.029	0.020	0.014	0.012	0.017	0.793	
State year trend	Y	Y	Y	Y	Y	Y	Y	Y
Demographics	Y	Y	Y	Y	Y	Y	Y	Y
State older population	Y	Y	Y	Y	Y	Y	Y	Y
State characteristics	Y	Y	Y	Y	Y	Y	Y	Y

Notes: This table shows channels of estimates through which MAWs affect informal care. The first two columns represent the channel of being in nursing homes for mothers and fathers, separately. Columns 3 and 4 refer to the outcome of living with respondents which is 1 if parents living together with respondents and 0, otherwise. Columns 5 and 6 refer to the outcome of living within 10 miles with respondents which is 1 if parents living nearby and 0, otherwise. Column 7 refers to the average admissions of nursing home residents from home per 1,000 people at state level. Demographics include characteristics of HRS respondents such as age, marital status, and number of living siblings and demographics of parents such as age, marital status, and health conditions varying across years. State characteristics are unemployment rate, poverty rate, percentage of education level, racial/ethnicity, and the political preference of state governor. All models control for state plan expenditures, individual fixed effect, demographics of respondents and their parents, and state characteristics. Robust standard errors are clustered at state level in parentheses *** p<0.01, ** p<0.05, * p<0.10

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 7 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. Column 7 reports the estimates on the average admissions from home of residents at nursing facilities at 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 people are allowed to stay at home until their health status deteriorates to the point of nursing home admission.

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 8 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.

Table 8: 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 expenditures	0.0009 (0.0210)	0.0191 (0.0160)	0.0252* (0.0150)	0.0328*** (0.0130)	0.0222** (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 expenditures, 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

8 Robustness

The key assumption of the identification strategy is that the timing of state changes in the generosity of MAW funding is exogenous and plausibly random. Per the unique features introduced in Section 2, we argue that individuals are less likely to anticipate their likelihood to be treated and respond to this anticipation. In the two-way fixed effects design, this means that there is no pre-trend for each state before its policy change. However, one may concern that states might choose when to increase the size of aging waivers which might also affect informal caregiving, and hence the timing of funding change might be endogenous. For example, the growth in older population may increase the informal care as well as expanding the growth in public expenditures. The performance of labor market which potentially links with informal caregiving may determine the resources available to MAWs. We try several ways to test the assumption of identification. First, we regress the observable state level characteristics on state level MAW expenditures for 50 states from year 1998 to 2014. Table A5 in the Appendix shows the results using the state-year panel. State older population significantly predicts the funding level of MAWs without state and year fixed effect. State years with larger older populations are more likely to have generous resources available to serve the aging population when they implement this program at the very beginning. This is not surprising since MAWs cover specifically on older population. After controlling for state and year fixed effect, however, the timing of funding changes of MAWs is effectively random with no observable state characteristic correlated with this policy. As shown in Table 3, the results on informal caregiving are robust to the inclusion of controlling for the size of the older population.

Second, we try to do a pre-treatment test on state characteristics to check how balanced the variables are. Table A6 in the Appendix reports the estimates of MAW expenditures on state characteristics. The policy generosity has significant effects on the size of older population and the size of low-educated population. Other state level characteristics such as the unemployment rate, the percentage of married people, and the percentage of female individuals do not correlate with the expenditures of this program. Since the aging waivers are means-tested, the significant relationship between poor people and the funding level of aging waivers is expected. We also use information about health status at state level from LTCfocus data to test whether the variables are balanced since one may have concerns that the decision to provide informal care is mainly determined by

the health status of parents which might also affect the size of MAW. As shown in the last two columns of Table A6, the policy is not correlated with physical difficulties of ADL and walking at state level. We argue that conditional on the state level characteristics, the time changing the size of policy is independent of unobserved variables that affect informal caregiving at the individual level.

It might still be possible that the timing of policy change is driven by some unobservable shock which may also affect the informal care outcomes. For example, if states experience unexpected economic hardships like the pandemic in 2020, states could cut MAW funding and adult children might also find it difficult to provide informal care to their parents. To address this concern, different specifications with state characteristics are estimated on the full sample as shown in Table 3. The results are robust, and the coefficients do not change across specifications. Furthermore, we explore potential instruments to address the exogenous identification assumption concern. The good instruments should highly correlate with MAW expenditures and affect informal caregiving only through the policy channel. We use variables indicating the nursing home capacity and number of ADL difficulties at state level as potential instruments. As the Section 2 discusses, the goal of aging waivers is to reduce expenses on nursing homes. We argue that the caregiving decision of individuals is not affected by the overall capacity of nursing homes at state level. Also, the health status of parents does not affect by the overall health status at state level. Table A8 in the Appendix reports the estimates using these instruments. The magnitude of estimates on overall care and errands care is larger than that shown in the main results of Table 3. The F statistics is larger than 10, satisfying the rule of thumb.

One goal of MAWs at home or community setting is to reduce the Medicaid expenses at nursing homes. One may concern that the resources of this policy of interest in the paper might be driven by the allocation change on nursing home expenditures. Table A7 in the Appendix shows the results of nursing home expenditures on care indicators. The model in the first three columns regresses only the nursing home expenditures on informal care and the model in the last three columns regresses nursing home expenditures and aging waiver expenditures together on informal care. As discussed in Eggers et al. (2021), the former model is more informative to assess whether nursing home expenditures are balanced and the latter model is more informative to the bias due to nursing home expenditures. None of the results are significant and different from 0 which

presents supportive evidence that the factors affecting the size of MAWs are not driven by the factors changing the expenditures on nursing home expenditures. In addition, we collect number of nursing homes, number of nursing beds, and number of nursing residents at state level as further controls to confirm the evidence. Table A9 in the Appendix reports the estimates after further controlling the availability of nursing homes on informal care. The estimates are robust to the main results shown in Table 3.

Another concern might come from how the care indicators are constructed in the paper. In the main estimates, the care indicators created use zero hour as the cutoff. Per the design of HRS, the care questions are asked to HRS respondents by recalling their total care hours in the previous two years since interview date. Many papers have argued the credibility of these recall numbers. To check the sensitivity of the estimates, Table A10 in the Appendix reports the effect of policy on care indicators using different cutoffs. Column 1 presents the main estimates shown in Table 3. Columns 2 to 5 show the results of all the potential cutoffs utilized in the literature. The magnitude of the coefficients in all specifications is quite robust across panels.

One may also be interested to see the results using MAW expenditures per capita and log format of policy expenditures. Table A11 in the Appendix reports the results using the per capita expenditures among older people who are 65 and above and log form of expenditures as independent variables. For the total care in column 1, the estimate is positive but statistically insignificant. The result on errands care in column 2 is positive as expected and statistically significant at 10 percent level. The magnitude of the coefficient on personal care in column 3 is indistinguishable from zero, same as the main result in Table 3. As shown in the last three columns using log form of policy expenditures, the estimates are insignificant. We try to show evidence that the per person and log form expenditure transformation might be due to the fact that the panel of living parents of HRS respondents is short and such transformation alleviates the variation using expenditures per se as shown in Figure A6 in the Appendix.

9 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 expenditures 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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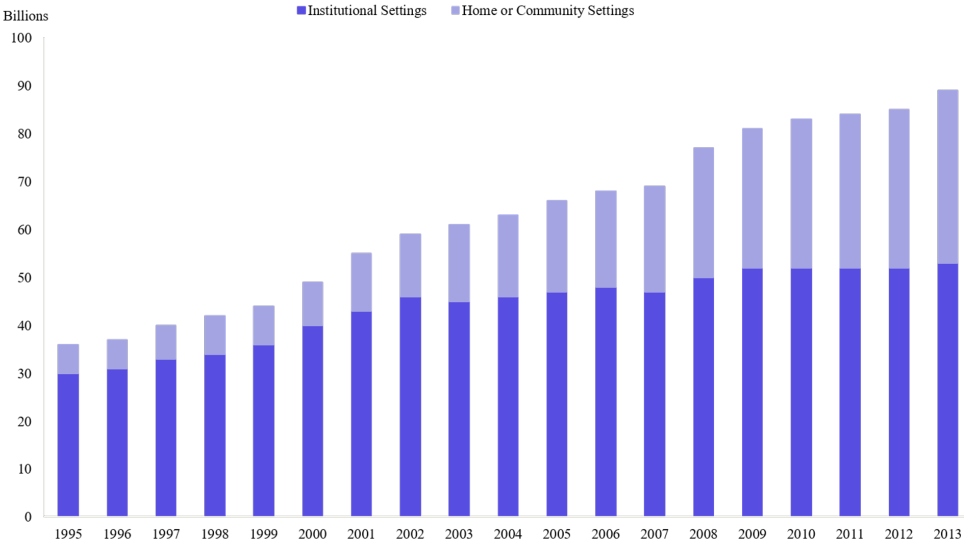
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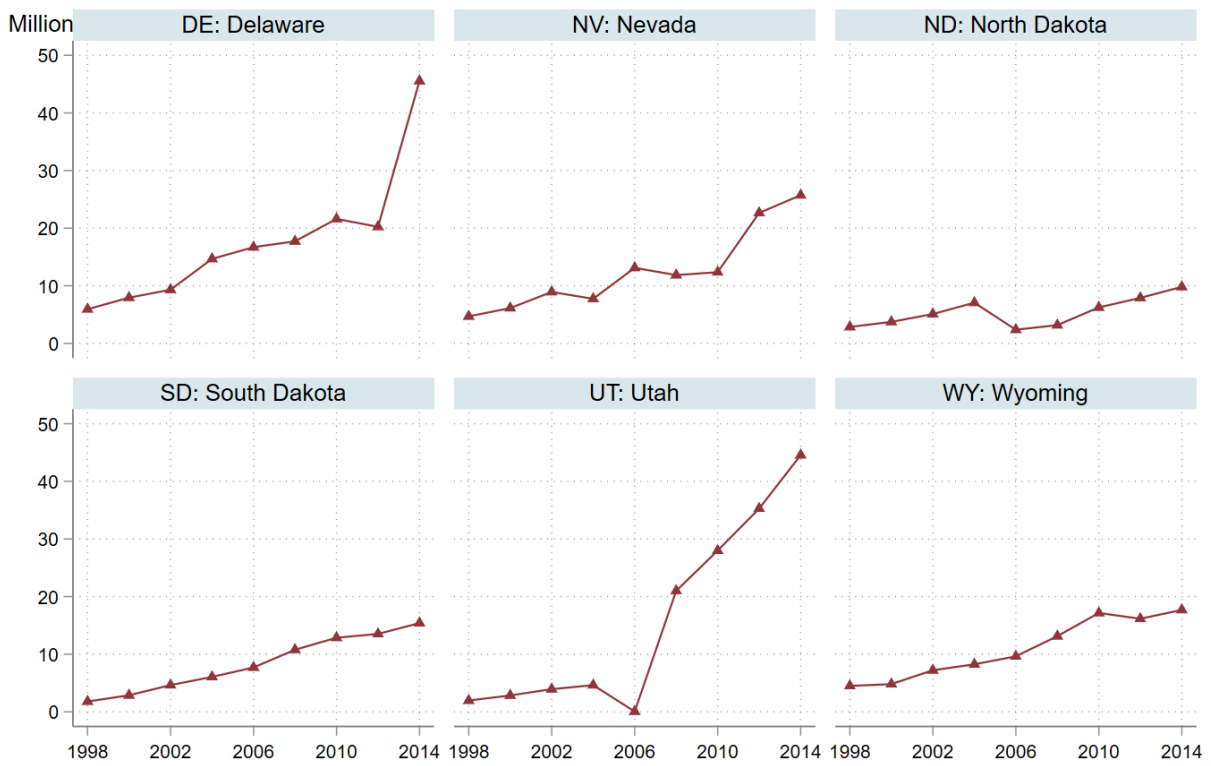
Appendix

Figure A1: Medicaid LTC Spending by Service Settings



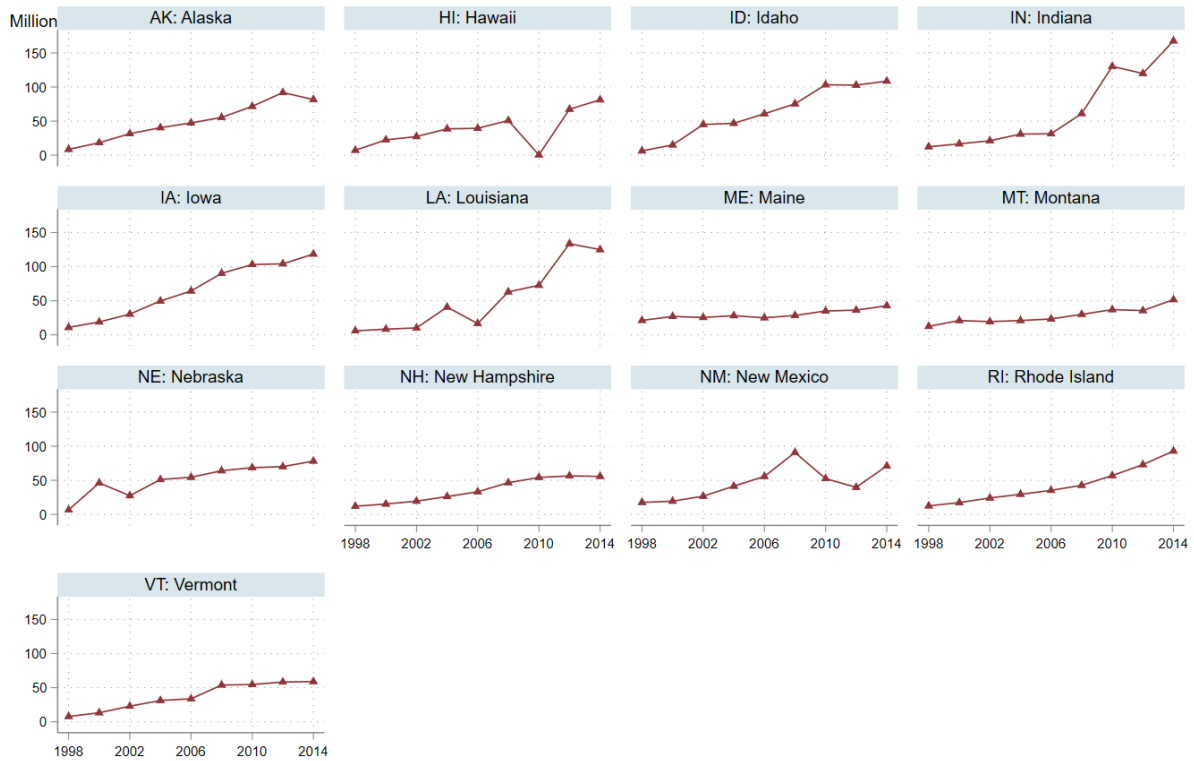
Notes: The graph shows the Medicaid LTC spending by service settings, institutional setting and home or community-based setting across years 1995 to 2013. Spending on institutional setting seems to dominate for years and that on home or community-based setting begins to rise dramatically for recent years. The data source is from annual CMS 64 form.

Figure A2: State Variation of Aging Waiver Expenditures



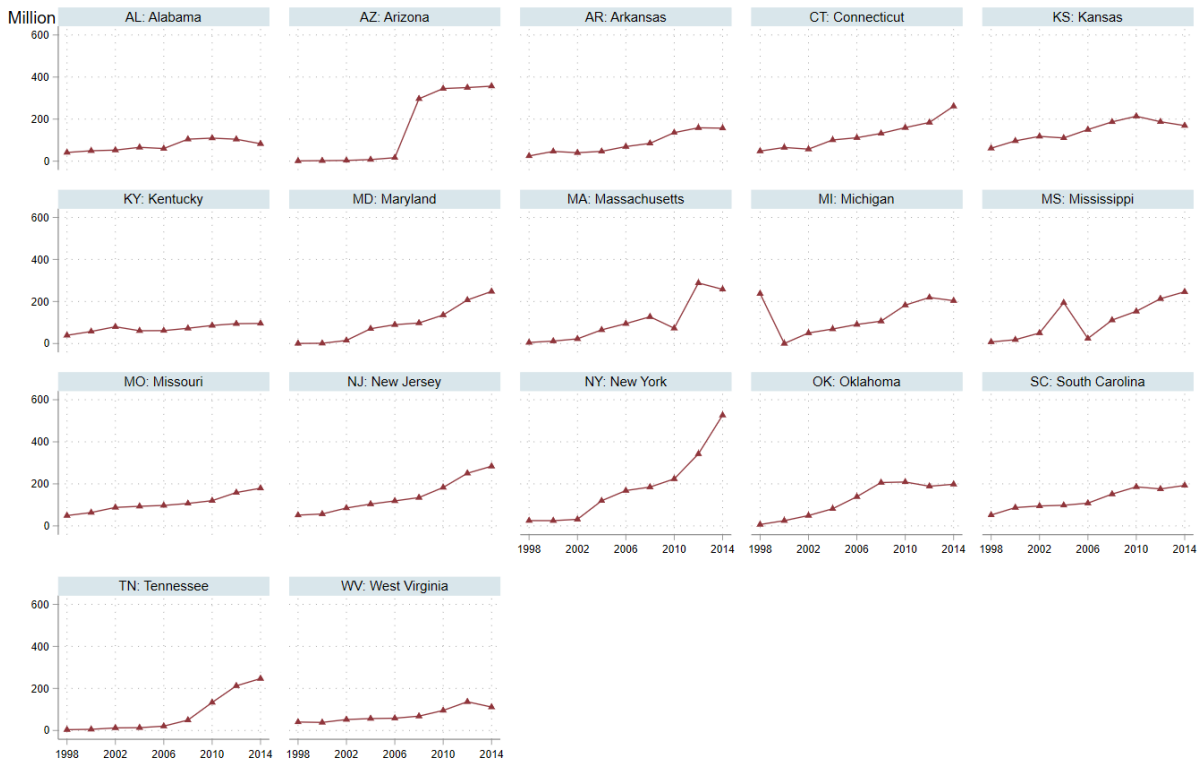
Notes: The plot draws the variation of expenditures of MAWs across years and across states. . Each line indicates a state in Delaware, Nevada, North Dakota, South Dakota, Utah, and Wyoming.

Figure A3: State Variation of Aging Waiver Expenditures



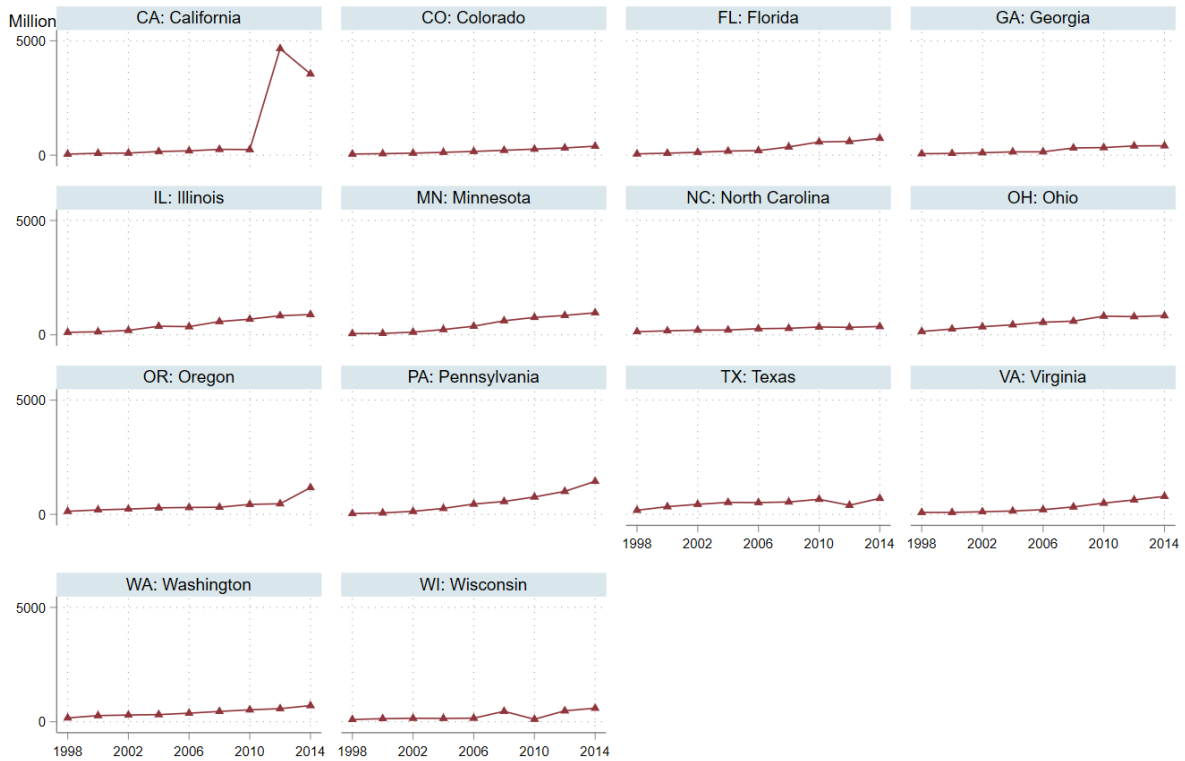
Notes: The plot draws the variation of expenditures of MAWs and HCBS across years and across states. Blue line indicates the total HCBS state plan expenditures including home health and personal care stat plans and red line is the MAW expenditures. Each line indicates a state in Alaska, Hawaii, Idaho, Indiana, Iowa, Louisiana, Maine, Montana, Nebraska, New Hampshire, New Mexico, Rhode Island, and Vermont.

Figure A4: State Variation of Aging Waiver Expenditures



Notes: The plot draws the variation of expenditures of MAWs and HCBS across years and across states. Blue line indicates the total HCBS state plan expenditures including home health and personal care stat plans and red line is the MAW expenditures. Each line indicates a state in Alabama, Arizona, Arkansas, Connecticut, Kansas, Kentucky, Maryland, Massachusetts, Michigan, Mississippi, Missouri, New Jersey, New York, Oklahoma, South Carolina, Tennessee, and West Virginia.

Figure A5: State Variation of Aging Waiver Expenditures



Notes: The plot draws the variation of expenditures of MAWs and HCBS across years and across states. Blue line indicates the total HCBS state plan expenditures including home health and personal care stat plans and red line is the MAW expenditures. Each line indicates a state in California, Colorado, Florida, Georgia, Illinois, Minnesota, North Carolina, Ohio, Oregon, Pennsylvania, Texas, Virginia, Washington, and Wisconsin.

Figure A6: Distribution of Expenditures

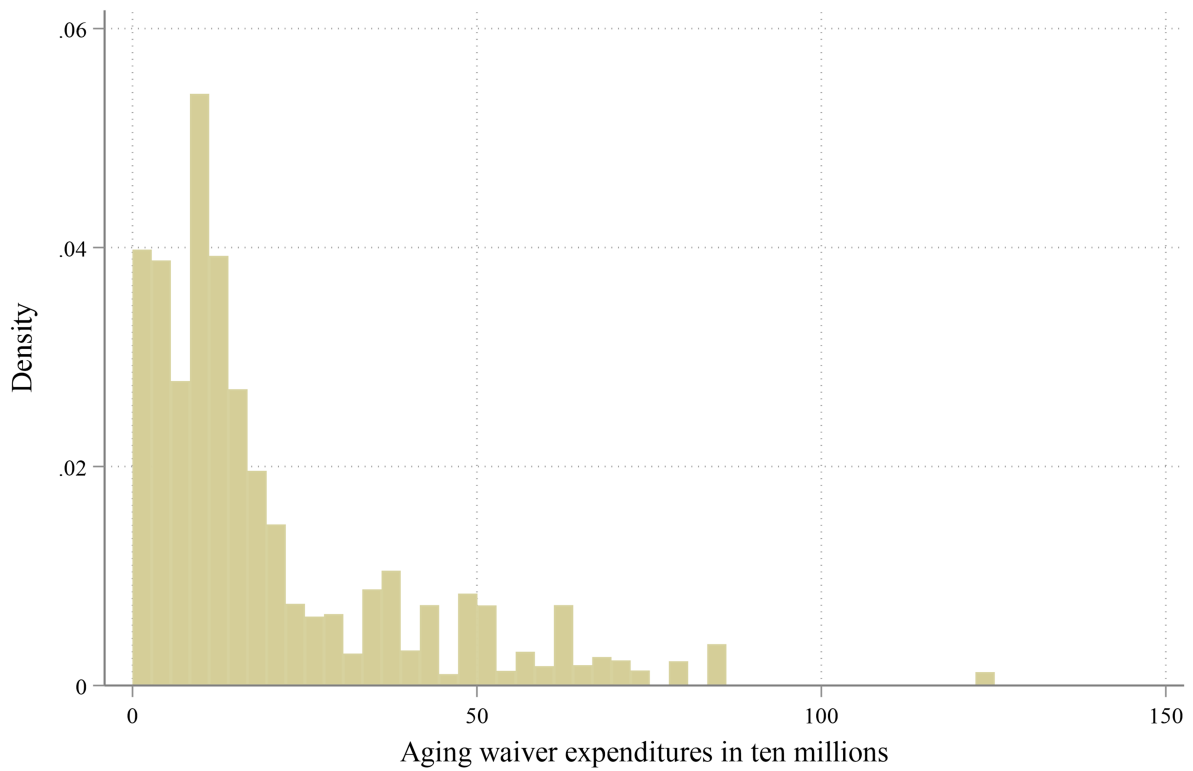
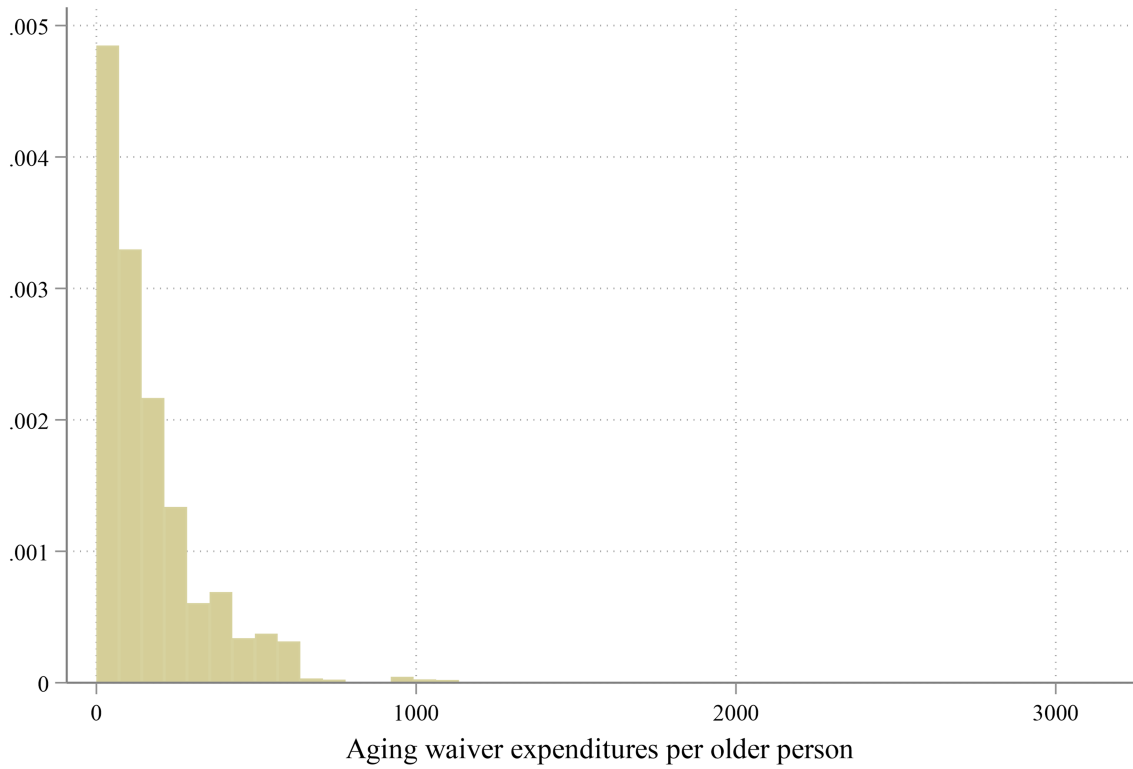


Table A1: Variation in Timing of MAW Funding Change

State	1998	2000	2002	2004	2006	2008	2010	2012	2014
AK		X	X				X		X
AL	X	X				X			X
AR		X			X	X	X		
AZ									
CA		X	X					X	
CO				X					X
CT			X	X					X
DE				X					X
FL			X			X			X
GA				X		X		X	
HI		X		X			X		
IA						X			
ID		X	X						
IL			X	X		X		X	
IN						X	X		
KS				X				X	X
KY				X					
LA	X			X	X	X		X	
MA			X						X
MD	X			X				X	X
ME									
MI			X				X		X
MN					X		X		
MO									
MS			X			X			
MT								X	
NC					X		X		
ND					X				
NE			X						
NH						X			
NJ							X		X
NM				X			X	X	X
NV					X				
NY				X	X			X	
OH		X							
OK				X				X	
OR							X		X
PA				X				X	X
RI							X		
SC						X		X	
SD									
TN							X		X
TX					X			X	
UT					X	X			
VA						X			
VT					X				
WA									
WI						X	X	X	
WV							X		
WY			X						

Notes: The table shows years when states change the expenditures of MAWs dramatically. The data is expenditures of MAWs from 1998 to 2014. Per the design of HRS, the timing change in odd policy year t attributes to the HRS year $t - 1$ and the timing change in even policy year t attributes to the exact HRS year t . For example, the change of policy in year 1999 is HRS year 1998.

Table A2: Medicaid HCBS Programs

Home Health State Plan (Eligible for every resident)

Nursing services
Home health aide services
Medical supplies, equipment and appliances
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)
Household activities (e.g., preparing meals)
Cueing or monitoring
Injections by nurses
Work sites, foster care or assisted living facilities

MAWs

Round-the-clock services (in-home residential habilitation)
Home-based services like personal care, chore/homemaker and respite care
Day services (day habilitation and adult day health services)
Case management service

Notes: The table shows detailed services covered under each Medicaid HCBS authority. Mandatory home health state plan mainly covers home-based aide services and professional services to all Medicaid qualified participants. Personal care state plan provides mostly ADL and IADL help to eligible people. Aging waiver helps with more round-the-clock services that are intensive as well as ADL and IADL assistance. The information is adjusted from the annual Kaiser Family Foundation Waiver Program Survey.

Table A3: HRS 1998-2014

Panel A: HRS Sample												
Interview year	1998	2000	2002	2004	2006	2008	2010	2012	2014			
Cohorts	HRS	HRS	HRS	HRS	HRS	HRS	HRS	HRS	HRS	HRS	HRS	HRS
	AHEAD	AHEAD	AHEAD	AHEAD	AHEAD	AHEAD	AHEAD	AHEAD	AHEAD	AHEAD	AHEAD	AHEAD
	CODA (1924-1930)	CODA	CODA	CODA	CODA	CODA	CODA	CODA	CODA	CODA	CODA	CODA
	WB (1942-1947)	WB	WB	WB	WB	WB	WB	WB	WB	WB	WB	WB
Interview type				EBB(1948-1953)	EBB	EBB	EBB	EBB	EBB	EBB	EBB	EBB
							MBB (1954-1959)	MBB	MBB	MBB	MBB	MBB
Core yes	21,383	19,572	18,165	20,127	18,468	17,217	22,034	20,554	18,747			
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	26,090	24,359	22,951			
Panel B: No Living Parent Sample												
Interview year	1998	2000	2002	2004	2006	2008	2010	2012	2014			
Unique individuals	19,267	18,230	16,926	16,394	14,538	13,328	14,719	13,287	12,206			

Notes: The HRS surveys respondents every two years. The sample is replenished every six years with the Asset and Health Dynamics Among the Oldest Old (AHEAD) cohort who are born before 1924; the Children of the Depression (CODA) cohort who are born 1924 to 1930; the Health and Retirement Study (HRS) cohort who are born 1931 to 1941; the War Babies (WB) cohort who are born 1942 to 1947; the Early Baby Boomers (EBB) cohort who are born 1948 to 1953; and the Mid-Baby Boomers (MBB) cohort who are born 1954 to 1959. Panel A shows how each HRS cohort is entered and exited from surveys and demonstrates records of unique individuals each year as well as total person-year observations. No living parent sample in panel B is the sample having no living parents in any survey year.

Table A4: Sample with Living Parents

Panel A: Sample with living parents in at least one survey wave										
Interview year	1998	2000	2002	2004	2006	2008	2010	2012	2014	
Unique individuals	5,690	5,655	5,587	7,756	7,579	7,426	11,100	10,765	10,398	
Individuals with missing caregiving values	302	594	595	763	950	979	1,137	1,187	1,607	
Individuals with deceased parents		21	705	1,373	1,887	2,476	2,948	3,299	3,697	
Individuals with living parents and care values	5,388	5,040	4,287	5,620	4,742	3,971	7,015	6,279	5,094	
Individuals with state of parent missing	1,389	1,775	918	954	968	847	1,230	1,340	1,111	
Panel B: Sample without any missing										
Unique individuals	3,999	3,265	3,369	4,666	3,774	3,124	5,785	4,939	3,983	
Old individuals from previous wave		3,042	2,461	2,523	3,584	2,944	2,391	4,659	3,748	
New individuals			902	2,077	192	175	3,287	285	232	

Notes: This table reports how the sample is selected from HRS 1998-2014. Panel A shows the sample where individuals have at least one living parent in at least one survey year. In this sample, it includes individuals with missing informal caregiving values, individuals whose parents died during the survey years and those that miss the state of residence information of their parents. Panel B demonstrates the individuals across years without any missing key values when they are first observed. Old individuals from previous wave indicates the number of individuals who also answer surveys in the last wave and new individuals are that who have information in the survey year but not previous year.

Table A5: Funding Level Predicted by State Characteristics

	(1)	(2)
	Funding (ten millions)	Funding
Older population (65+ million)	12.653***	13.456
	(3.947)	(20.579)
Political governor (D/R)	-2.433	2.152
	(2.503)	(3.211)
125% of poverty	75.060	152.029
	(238.661)	(201.525)
Married couple families	6713.038	4558.212
	(12,578.670)	(8,421.728)
Unemployed	215.368*	176.819
	(124.411)	(270.909)
Less than high school diploma	-28.409	89.948
	(53.740)	(90.308)
White	-15.033	-30.116
	(15.836)	(159.556)
Black or African American	68.614*	15.225
	(34.946)	(200.065)
Spanish/Hispanic/Latino descent	-33.968	-419.053
	(41.196)	(306.019)
Males	-235.647	64.067
	(197.208)	(113.760)
State FE	N	Y
Year FE	N	Y
Observations	450	450

Notes: Funding level is in ten millions and older population is in millions. State and year fixed effect are included in column 2. The state characteristics are from the American Community Survey 1998 to 2014 with every two years for 50 states.

Table A6: Balance Tests of MAW Expenditures

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Poverty Level	Unemployment Rate	Married	White	Female	Nurse Home Beds	Aged above 65	High School	ADL	Walking
Aging waiver expenditures (ten millions)	0.00012 (0.000010)	-0.00001 (0.000001)	0.00001 (0.000005)	0.00029 (0.000021)	0.00002 (0.000002)	-124.905 (91.05880)	-3,897.04995* (2,290.32000)	0.00013*** (0.000004)	0.0063 (0.000914)	0.05517 (0.03843)
Unique individuals	10,796	10,796	10,796	10,796	10,796	10,796	10,796	10,796	10,796	10,796
Observations	36,608	36,608	36,608	36,608	36,608	36,608	36,608	36,608	36,608	36,608
State year trend	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Individual fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Notes: This table shows the balance tests of MAW expenditures on state characteristics. Poverty in column 1 means the percentage of people whose income is below 300 percent of federal poverty line. Unemployment in column 2 means the percentage of unemployment rate at state level. Married in column 3 means the percentage of people being married at state level. White in column 4 means the percentage of people being white at state level. Female in column 5 means the percentage of people being female at state level. Nurse home beds in column 6 means the average number of beds at nursing homes in each state. Age above 65 in column 7 means the percentage of people aged above 65 at state level. High school in column 8 indicates the percentage of people who have education less than high school. ADL in column 9 indicates the percentage of people with scores in difficulty of ADL at state level for nursing home residents. Walking in the last column indicates the percentage of people having difficulty in walking independently at state level. All models control for individual fixed effects, year fixed effects, and state year trend.

Table A7: Effects of Nursing Home Expenditures on Informal Care

	(1)	(2)	(3)			
	Care	Errands care	Personal care	Care	Errands care	Personal care
Nursing home expenditures						
(ten millions)	0.00016	0.00015	0.00004	0.00012	0.00008	0.00004
	(0.00015)	(0.00017)	(0.00008)	(0.00016)	(0.00018)	(0.00008)
Mean	0.36	0.34	0.10	0.36	0.34	0.10
Unique individuals	10,796	10,796	10,796	10,796	10,796	10,796
Observations	36,608	36,608	36,608	36,608	36,608	36,608

Notes: This table shows robustness check of nursing home expenditures on care indicators. The sample is individuals with having at least one living parent. Nursing home expenditures are Medicaid expenditures spent in nursing homes. The model in the first three columns regresses only nursing home expenditures on informal care and the model in the last three columns regresses nursing home and aging waiver expenditures together on informal care.

Table A8: IV Results of Aging Waiver Expenditures on Informal Care

	(1)	(2)	(3)
	Care dummy	Errands care dummy	Personal care dummy
Aging waiver expenditures (ten millions)	0.00082** (0.00040)	0.00085** (0.00042)	0.00038 (0.00029)
F statistics		11.52	
Unique individuals	10,796	10,796	10,796
Observations	36,608	36,608	36,608

Notes: This table shows iv results of aging waiver expenditures on care indicators. The sample is individuals with having at least one living parent. The instruments are the number of nursing homes, number of beds at nursing homes, number of nursing residents, and average ADL difficulty at state level. Robust standard errors are clustered at state level in parentheses *** p<0.01, ** p<0.05, * p<0.10

Table A9: Effects of Nursing Home Capacity on Informal Care

	(1)	(2)	(3)
Panel A Dependent variable: care indicator			
Aging waiver expenditures (ten millions)	0.00025 (0.00015)	0.00031** (0.00015)	0.00031** (0.00015)
Panel B Dependent variable: errands care indicator			
Aging waiver expenditures (ten millions)	0.00042*** (0.00015)	0.00046*** (0.00015)	0.00047*** (0.00015)
Panel C Dependent variable: personal care indicator			
Aging waiver expenditures (ten millions)	0.00001 (0.00014)	0.00003 (0.00013)	0.00003 (0.00014)
Unique individuals	10,796	10,796	10,796
Observations	36,608	36,608	36,608
All controls	Y	Y	Y
Number of nursing homes	Y		
Number of beds		Y	
Number of residents			Y

Notes: This table shows robustness check of controlling nurse home availability on informal care. The sample is individuals with having at least one living parent. Column 1 shows the estimates after controlling the number of nursing homes at state level; column 2 controls the number of beds in nursing homes at state level and column 3 controls the number of residents in nursing homes at state level.

Table A10: Results of MAWs on Care with Different Cutoffs

	(1)	(2)	(3)	(4)	(5)
	Cuoff 0	Cutoff 25	Cutoff 50	Cutoff 75	Cutoff 100
Panel A Dependent variable: care indicator					
Aging waiver expenditures (ten millions)	0.00031** (0.00014)	0.00034* (0.00020)	0.00038* (0.00019)	0.00036* (0.00020)	0.00035* (0.00019)
Mean	0.36	0.35	0.34	0.32	0.31
Panel B Dependent variable: errands care indicator					
Aging waiver expenditures (ten millions)	0.00046*** (0.00015)	0.00043** (0.00016)	0.00045** (0.00016)	0.00046*** (0.00014)	0.00044*** (0.00013)
Mean	0.34	0.33	0.32	0.29	0.29
Panel C Dependent variable: personal care indicator					
Aging waiver expenditures (ten millions)	0.00002 (0.00013)	0.00005 (0.00014)	0.00006 (0.00013)	0.00009 (0.00013)	0.00010 (0.00013)
Mean	0.10	0.10	0.10	0.09	0.09

Notes: This table shows estimates of policy on the full sample by care types using different cutoffs. The full sample is that with individuals having at least one living parent. Panel A shows the results on overall care; panel B displays the results on errands care and panel C is the results on personal care. Each column shows the results using the corresponding cutoff to create care indicators. Column 1 corresponds to the results in Column 4 in Table 3 All models use the saturated model including all controls. Robust standard errors are clustered at state level in parentheses *** p<0.01, ** p<0.05, * p<0.10

Table A11: Effect of MAWs per Person and Log MAW on Care

	(1)	(2)	(3)	(4)	(5)	(6)
	Care	Errands Care	Personal Care	Care	Errands Care	Personal Care
	Per person			Log form		
MAW expenditures	0.00002 (0.00002)	0.00005* (0.00003)	-0.00001 (0.00001)	0.00155 (0.00728)	0.00735 (0.00869)	-0.00194 (0.00411)
Number of individuals	10,795	10,795	10,795	10,795	10,795	10,795
Observations	36,605	36,605	36,605	36,605	36,605	36,605
State year trend	Y	Y	Y	Y	Y	Y
Demographics	Y	Y	Y	Y	Y	Y
State characteristics	Y	Y	Y	Y	Y	Y

Notes: This table shows robustness check of estimates of policy expenditure transformation for the full sample. The full sample is that with individuals having at least one living parent. Robust standard errors are clustered at state level in parentheses *** p<0.01, ** p<0.05, * p<0.10