Long-Term Care and Informal Care Arrangements Among Siblings

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Abstract

This paper studies whether siblings risk-share when they are faced with long-term care demand from their aging parent. I find that the more children a single elderly individual has, the more likely they are to receive informal care and from multiple children. This is important as most studies examining the role of informal caregiving in the elderly individual's long-term care arrangement ignores the dimension of multiple caregivers and the potential risk-sharing among siblings. Gender composition of children is also an important determinant of caregiving patterns of siblings, which suggests that son's informal caregiving decision is highly responsive to whether he has a sister. Thus, policies such as providing compensation for informal caregivers may have heterogeneous effects on families based on number of children and the gender composition of children.

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1 Introduction

The elderly is facing significant health and financial risk due to long-term care needs in the United States. Approximately two thirds of individuals over 65 and over will need long-term care at some point, with a fifth of them needing long-term care for more than 5 years.Formal long-term care spending reached over $360 billion in 2017 and is expected to rise as demands for long-term care services increase due to demographic aging. For the average elderly, formal long-term care expenses are beyond their means as paid home care services cost more than $54,900 while a private room in nursing home costs around $100,000[1]. Despite the risk, less than 10% of the elderly owns private long-term care insurance and most are not qualified for public insurance through Medicaid due to its strict means-tested eligibility. This leaves the long-term care demand to be met by informal caregivers who are mostly the spouse and adult children of the elderly. In fact, informal caregivers provide more than half of long-term care in the United States with a total estimated cost at $522 billion a year in terms of lost earnings and reduced labor. The opportunity costs are particularly higher for adult children, most of whom are still in the labor market. While several studies have examined the role of one adult child in the elderly individual's long-term care decisions, none have focused on the potential role of multiple children and addressed the informal care arrangements among siblings. This can have important implications for proposals to include informal care compensation to family members through Medicaid or private long-term care insurance.

This paper has two main objectives. First, I assess the extent to which siblings coordinate to provide care to their sick parent. I identify the characteristics of siblings who provide informal care as opposed to the characteristics of siblings who do not provide care. Second, I categorize families in terms of characteristics that play an important role in different caregiving patterns of children. Particularly, since being a daughter is a big determinant of being the caregiving sibling, I analyze how siblings differ in their caregiving behavior based

[1]Long-term care spending and long-term care risks are obtained from Upadhyay and Weiner (2019), and formal care service costs are from Genworth (2021).

on whether they have brother(s) and sister(s), only sisters or only brothers. Given the scope of the paper, I focus on informal care in single elderly individuals as caregiving by adult children is the main caregiving arrangement for this group, as opposed to married elderly individuals, in which case spousal caregiving is the main arrangement. Given the scope of the paper, I also further focus on single individuals with more than one child, which is 82% of individuals[2].

I first discuss the substitutability between formal care use and number of children. Formal care use decreases with number of children. However, this relationship is driven by nursing home use. Paid home care services, on the other hand, may serve complementary to informal care as the rate of home care services stays stagnant across families. I then explore, whether informal caregiving increases with number of children. Individuals who have more children are more likely to receive informal care from their children. Not only they receive care from a child, they receive care from multiple children. More than 45% of families with three or more children receive care from more than two children. This demonstrates the risk-sharing among siblings in the face of long-term care shock the family faces.

Lastly, I explore the caregiving patterns by siblings based on family characteristics, paritcularly the gender composition of siblings. I find that sons provide more informal care when they do not have sisters and daughters provide equally high amount of informal care regardless of the gender composition of their siblings.

This paper contributes to strands of literature on the role of family on the elderly's long-term care arrangement. First, it complements studies that examine the role of adult children in the elderly individual's long-term care decision (Barczyk and Kredler 2018; Fahle 2020; Ko 2021; Mommaerts 2021) by focusing on the interaction between siblings. Using a cooperative framework between a parent and a child, Mommaerts (2021) proposes a bargaining process between them in determining demand for long-term care insurance. Ko (2021) has developed a non-cooperative framework between parent and child to allow for

[2]Author's calculation using the Health and Retirement Study 1998-2014 sample.

strategic non-purchase of long-term care insurance by the elderly while Barczyk and Kredler (2018) allow for exchange motive for children in providing care. Mommaerts (2021) and Ko (2021) focus on the implications of adult child on long-term care insurance demand while Barczyk and Kredler (2018) and Fahle (2020) focus on policy implications for public insurance such as Medicaid. In all papers, they only consider one adult child in parent's long-term care decision by picking either the main caregiver child or picking the most likely child to provide care. I focus on the interplay between multiple children to analyze the risk-sharing between siblings. Additionally, I contribute to empirical studies that have examined the role of multiple children in parent's long-term care decisions (M. Brown 2006; Engers and Stern 2002; Stern 2021).

Lastly, I contribute to studies examining policy implications of informal caregiving. For instance, Mommaerts (2018) shows that the expansion in Medicaid eligibility for LTC benefits reduces the probability of adult children co-residing with elderly parents and increases the use of nursing home care. (Van Houtven, Coe, and Skira 2013) also finds that significantly lowering the marginal cost of formal care, through state subsidies to LTC insurance coverage, induce less informal caregiving and lower co-residence with adult children.

The paper is organized as follows. Section 2 describes the long-term care in the United States. Section 3 shows the empirical evidence on formal care us and informal caregiving of individuals with multiple children. Section 4 concludes.

2 Long-Term Care in the United States

Population is aging rapidly in the United States. The share of individuals aged 65 and over is projected to outnumber children for the first time in history in 2034 (Bureau 2018). Due to higher life expectancy, the elderly individuals will live longer requiring long-term care (LTC) assistance, defined as assistance with activities of daily living (ADLs) or instrumental

activities of daily living (IADLs), for an extended period of time[3]. Due to a high risk of experiencing physical limitations or cognitive impairment, the elderly individuals face significant health and financial risks. Majority of long-term care is provided by informal (unpaid) caregivers, which comprise of mostly family members of the elderly. Formal (paid) long-term care is expensive in the United States with Medicaid covering more than 50% percent of LTC spending. This section reviews the intensity of long-term care needs the elderly are facing today, and what means they use in order to meet their long-term care needs by either using formal care services or receiving informal caregiving from their family members.

2.1 Long-Term Care Needs

Approximately two thirds of individuals aged 65 and over will need long-term care at some point (Brown and Finkelstein 2008). While some individuals may never need long-term care, a fifth of them will need long-term care for more than five years (Upadhyay and Weiner 2019). In addition to physical limitations, cognitive impairment is another factor in long-term care risk that the elderly faces, which is exacerbated by the rising dementia rate among the elderly. In addition, long-term care needs vary across population with women needing care longer for 3.7 years on average compared to men needing for 2.2 yearson average (Upadhyay and Weiner 2019).

According to Brown and Finkelstein (2008), 75% of individuals aged 65 and over will not enter a nursing home but 10% of those who enter will spend more than 3 years there. On average, women have higher probability of using formal care services such as nursing home, assisted living facilities and paid home care (i.e. home health care). For example, men have 27% probability of using nursing home at some point in their lives compared to 44% of probability of it happening to women. Numbers are similar but lower for assisted

[3]ADLs refer to activities such as walking across a room, dressing, bathing, eating, getting in and out of bed, and using the toilet. IADLs include activities such as using a telephone, managing money, taking medications, shopping for groceries, and preparing hot meals.

living facilities (12% for men and 20% for women). As for paid home care, men have 29% of probability of using paid home care for an average of 2.3 years while women have 35% of probability for an average of 2.9 years[4].

Formal care services are costly. Monthly expenses for paid home care services is around $4,500 and a private room in nursing home costs $8,821 per month[5]. Assisted living facilities cost $4,300 per month whereas adult day health care is around $1,600 per month. Given the significant chance of needing long-term care, the price tags of formal care services are large[6]. Long-term care is not considered as "medical care" under federal legislation, thus prohibiting individuals to use either Medicare or private health insurance for the cost (Nordman 2016).

Instead, the cost of long-term care is financed through three options: out-of-pocket spending, private long-term care insurance, and public insurance of which Medicaid is the largest payer. The out-of-pocket spending is only possible for individuals in the the upper wealth quintile and for most elderly individuals, it is beyond their financial means. In addition, the private insurance take-up rate is low and the premium is still very expensive (e.g. $100 per day in 2000). Medicaid pays for half of the long-term care spending in the United States. However, the strict means-tested eligibility of Medicaid make it only available for the impoverished.

2.2 Private Long-Term Care Insurance and Medicaid

According to Nordman (2016), 52% of long-term care spending is paid for by Medicaid, 16% by out-of-pocket, 11% by private long-term care insurance (LTCI), and the rest of the 20% is paid for by other public and private insurances. Given the higher amount of out-of-pocket spending than private LTCI spending, the market for the LTCI is small. In fact, less than 10% of individuals own LTCI policy. Coverage rates increase with wealth, covering 19.2% in the top quartile (Brown and Finkelstein 2007). Given the high financial risk posed by LTC

[4]The numbers are taken from the simulated transition probabilities in Brown and Finkelstein (2008).
[5]The annual expense of a private room in nursing home sits at around $90,000.
[6]The estimated costs are taken from Genworth (2021).

needs but the low take-up rate of LTCI, an extensive amount of research has studied the puzzle.

On the supply side, Brown and Finkelstein (2007) uses an actuarial model of formal long-term care utilization probabilities and finds that LTCI market suffers from a monopolistic competition with an average markup of 18 percent for policies sold in 2002. In addition, Finkelstein and McGarry (2006) argues that the market faces multiple sources of private information and is adversely selected due to subjective knowledge about individual's nursing home risks. Braun, Kopecky, and Koreshkova (2019) considers the problem of a monopolist insurer who incurs high fixed and variable costs, and of individuals who have access to means-tested Medicaid benefits and private information about nursing home entry risks. They find that LTCI take-up rates are low across all levels of wealth. Low income individuals are denied LTCI coverage due to their eligibility to Medicaid benefits while middle income individuals are influenced by both Medicaid and administrative costs resulting in low take-up rates. As for wealthy individuals, the low take-up rate is due to administrative cost and private information.

On the demand side, the wealth stored in home ownership can be used to pay for nursing home (Davidoff 2010) or an incentive to leave bequest for the outliving spouse in a form of home ownership (Chang and Ko 2021). Bernheim, Shleifer, and Summers (1985) and Pauly (1990) considers a strategic non-purchase of long-term care insurance because individuals can leave bequests to their children and mitigate the opportunity cost of precautionary savings. Moreover, Courbage and Zweifel (2011), Zweifel and Struwe (1996) and Lockwood (2018) also provide evidence that a bequest motive drives people not to buy insurance, which leads to the fact that the elderly individuals rely on their adult children for long-term care needs. Recent studies have also studied the role of informal caregiving in explaining the low take-up rate of LTCI (Ko 2021; Mommaerts 2021; Fahle 2020), which will be discussed in the next section in details.

Given the low take-up rate of LTCI, Medicaid is another option that is available to the

elderly to pay for formal care services. Brown and Finkelstein (2007) argue that Medicaid can crowd out LTCI but they cannot alone explain the market failures associated with the LTCI market. Though Medicaid may be a substitute for LTCI for low to middle income households, not many individuals can qualify for Medicaid. The coverage varies state by state and they usually qualify individuals for Medicaid if the individuals is eligible for Supplemental Security Income (SSI) benefits. Some states may extend Medicaid eligibility to those with higher incomes[7]. Individuals who want to enroll need to spend down their assets to the state's threshold, which is $2,000 for an individual and $3,000 for a couple. The strict means-tested nature of Medicaid makes it only accessible for low wealth individuals leaving many others having to incur costs on their own or turn to their family members for informal caregiving.

2.3 Informal Care

Given the health and financial risks involving long-term care needs, a majority of caregiving is provided by family members of the elderly. Spousal caregiving and adult children caregiving are most common. Chari et al. (2015) estimates the opportunity costs of informal caregiving, in lost earnings and reduced labor, to be $522 billion a year, which is in contrast to total spending on formal LTC services, estimated at $211 billion a year in the United States. For married individuals, spousal caregiving is more prevalent whereas for single individuals, adult children provide bulk of the caregiving. According to the Health and Retirement Study (HRS) data, most adult children caregivers are adult daughters (Barczyk and Kredler 2019).

More than 75% of the adult children caregivers are female and they are less active in the labor market than other comparable children. In the HRS and the Survey of Health, Ageing, and Retirement in Europe (SHARE) data, having a daughter matters heavily in informal care decisions in all regions (except the North European countries with high public LTC spending) is more important than the numbers of children, which reflects the large share of women as heavy-helpers (those who provide more than 20 hours of care per week). Empirical studies

[7]See "Medicaid's Role in Meeting Seniors' Long-Term Services and Supports Needs" (2016)

have also demonstrated that working-age children that are caregivers face heavy demands on their time, and informal caregiving can come with significant opportunity costs (Skira 2015; Van Houtven, Coe, and Skira 2013). Moreover, Mommaerts and Truskinovsky (2020) finds that elasticity of time is higher for informal caregiving to adults as opposed to childcare.

Only paper that looks at the role of spousal caregiving in long-term care decision in a structural framework is Chang and Ko (2021) in the context of couples dissaving their housing wealth slower than singles for a bequest motive for their partner who is providing informal care. In terms of adult children providing care, several studies have fully, structurally modelled the role of adult child in long-term care arrangements (Barczyk and Kredler 2018; Ko 2021; Mommaerts 2021; Skira 2015; Fahle 2020).

Mommaerts (2021) uses a cooperative framework between a parent and a child to capture the role of bargaining process between the parent and child in deciding long-term care arrangements. The parent faces a long-term care shock and can use either informal care of formal care with a preference for informal caregiving by the child. In return, the child faces a permanent income shock and chooses to work and/or provide informal care to the parent. The parent can pay for formal long-term care through LTCI or Medicaid. In each period, they bargain with threat points as non-cooperation. For the child, not cooperating with their parent imposes a "guilt," which plays a crucial role in ensuring a cooperative equilibrium exists in every period. Ko (2021) also models the interaction between a parent and a child but in a non-cooperative framework where the parent can strategically not purchase LTCI to induce bequest motive for children to provide care. In both of these studies, parents only use formal care when the child cannot provide informal care, which the parent has preference for.

Barczyk and Kredler (2018) also models the interaction between a parent and a child in a non-cooperative framework (though the model is more stylized). The child first moves and chooses to provide care if only the financial transfer from the parent in the second period is high enough. Fahle (2020) also looks at a parent and a child and simulates Medicaid expansion policies and finds that providing payments to children or expanding access to home

care aides subsidize informal caregiving by families. In all four studies, only one child is selected as the child either provides most informal care hours or most likely to provide care (daughters or those who live within 10 miles to their parent). This assumes that the decision of the caregiver child is exogenous to the behaviors of their siblings. This paper explores the interaction between the siblings and endogenize the caregiving decision of the caregiver child to the decision (to not provide care) of their siblings.

Several studies have examined long-term care decisions within a multiple caregiver framework. Most of these studies are static (e.g (Engers and Stern 2002; Stern 2021); M. Brown (2006)), with a few exceptions (Hiedemann, Sovinsky, and Stern 2018), and none within a structural, life-cycle framework. The interaction between siblings is crucial for long-term care decisions. Since elderly individuals use less formal care as they have more children, potentially relying more heavily on informal care rather than formal care for long-term care needs (Mellor 2001). This can have a wide array of implications for long-term care insurance market as elderly individual's decision to purchase long-term care insurance or formal care use may depend on how many children they have. For instance, Mommaerts (2018) shows that the expansion in Medicaid eligibility for LTC benefits reduces the probability of adult children co-residing with elderly parents and increases the use of nursing home care. (Van Houtven, Coe, and Skira 2013) also finds that significantly lowering the marginal cost of formal care, through state subsidies to LTC insurance coverage, induce less informal caregiving and lower co-residence with adult children.

3 Empirical Evidence

As described in Section 2.3, the interaction between multiple children in long-term care arrangements to their parent has received very little attention by the literature. This section provides four empirical patterns of informal caregiving and multiple children. First, formal care use decreases with number of children, which is driven by lower use of nursing home stay. Second, informal caregiving increases with number of children, which suggests that nursing home use and informal caregiving likely to be substitutes. Third, daughters provide more informal care at the extensive and the intensive margin compared to sons. Fourth, sons provide more informal care when they do not have sisters and daughters provide equally high amount of informal care regardless of the gender composition of their siblings.

3.1 Formal Care Use and Multiple Children

Studies have shown that formal care and informal care are substitutes (Barczyk and Kredler 2019; Mellor 2001). Specifically, they examine the probability of having LTCI based on whether the individual has children. I focus on formal care use (instead of LTCI ownership) to investigate the rate of formal care use against number of children. By focusing on number of children and not just the presence of a child, I can examine the heterogeneity of formal care use across number of children.

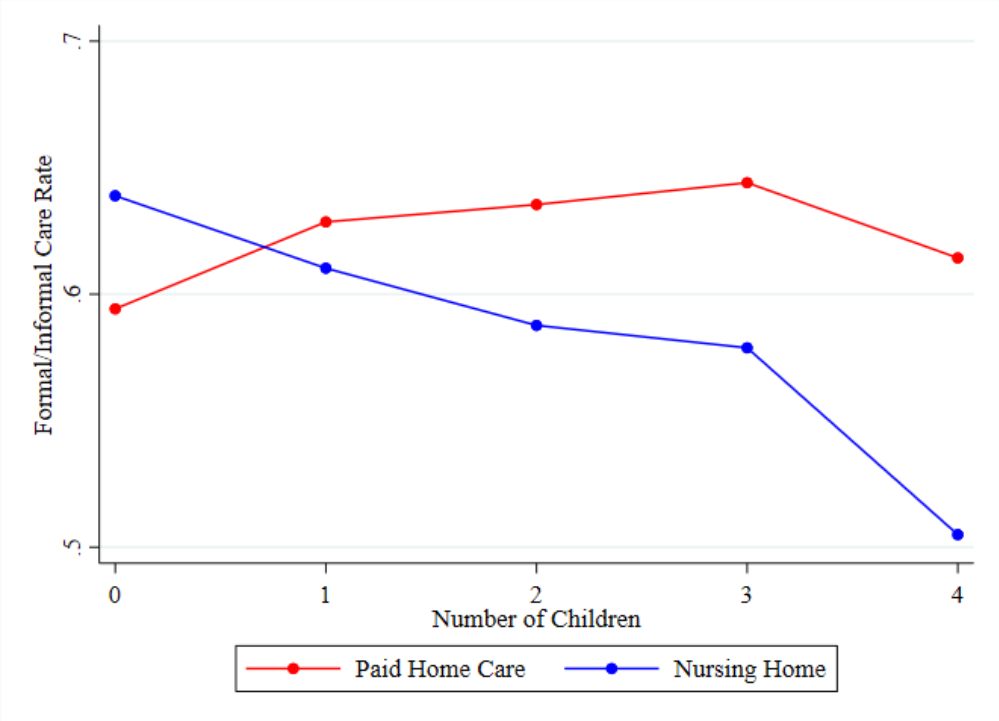
Figure 1 shows the fraction of individuals who use paid home care or nursing home over the 1998-2014 sample period, disaggregated by number of children. "Paid Home Care" equals to 1 if an individual uses paid home care services at least once over the sample period while "Nursing Home" equals to 1 if an individual stays in nursing home at least once during the period. Of families[8] with no child, approximately 59% use paid home care and 64% stay in nursing home at least once[9]. Paid home care use increases with number of children at a rate of 63% of families with one child to 65% of families with three children. The use drops

[8] I use families and single elderly individuals interchangeably throughout the paper. Families are often used when I refer to the elderly individuals with their adult children as a group.

[9] See Appendix A.1 for sample selection details.

to 61% for families with more than four children, however it is still higher than the rate of families with no child. On the other hand, nursing home stay decreases with number of children. For families with one child, the rate of use lowers to 61% and the rate drops to lowest at 50% for families with four or more children. This graphically suggest that informal care may be substitute for nursing home stay more strongly than paid home care services.

Figure 1: Formal Care Use and Number of Adult Children



Notes: The sample includes single individuals aged 65 and over in the pooled 1998-2014 Health and Retirement Study. The lines report share of individuals who use home paid care services ("Paid Home Care") and share of individuals who stay in nursing home stay (Nursing Home) at least once during the sample period, disaggregated by number of children. Number of children equals to 4 refers to families with 4 or more children.

Table 1 presents the marginal effects from probit regressions capturing the relationship between number of children and formal care use. Column (1) refers to whether the individual either stays at least one night in nursing home or uses paid home care in the last two years. Column (2) refers to the individual stays in nursing home in the last two years. Column (3) reports whether the individual uses paid home care services in the last two years. Controls include wealth, income, age, a quadratic in age, gender, race, education, health status, cohort

Table 1: Relationship Between Formal Care Use and Number of Children

	Formal Care	Nursing Home	Paid Home Care
	(1)	(2)	(3)
Has one child	-0.012	-0.014	0.00
	(0.014)	(0.011)	(0.011)
Has two children	-0.037***	-.046***	-0.00
	(0.012)	(0.009)	(0.010)
Has three children	-0.027**	-0.03***	0.001
	(0.013)	(0.010)	(0.011)
Has four children	-0.012	-0.025**	0.014
	(0.014)	(0.011)	(0.012)
Has five children	-0.037**	-0.046***	-0.007
	(0.017)	(0.012)	(0.014)
Has six or more children	-0.067***	-0.077***	-0.014
	(0.014)	(0.01)	(0.012)
Year Fixed Effects	yes	yes	yes
Cohort Fixed Effects	yes	yes	yes
Controls	yes	yes	yes
Observations	16,448	16,464	15,401

Notes: The sample includes single individuals aged 65 and over in the pooled 1998-2014 Health and Retirement Study. Marginal effects are from probit models of whether the elderly individual uses formal care services on number of children and controls. Column (1) shows the effects of number of children on whether the individual either stayed in nursing home or used paid home care services in the last two years. Column (2) shows the effects of number of children on whether the individual stayed in nursing home in the last two years. Column (3) shows the effects of number of children on whether the individual used paid home care services in the last two years. All estimates are in relation to individuals with no child. Controls include individual's wealth, income, age, a quadratic in age, gender, race, education, health status. Cohort and year fixed effects are included and robust standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, ***$p < 0.01$.

fixed effects and year fixed effects. As expected, the likelihood of elderly individual's formal care use lowers for families with more children and the relationship is driven by individual's nursing home stay, demonstrating the subtitutability between nursing home stay and informal care. For example, having two children lowers nursing home stay by 4.6% in the last two years as opposed to having no child. On the other hand, using paid home care services are not significantly associated with number of children, which suggests that individuals are likely to keep living independently with the help of both adult children and paid home care services.

3.2 Informal Caregiving and Multiple Children

Given that number of children are associated with lower nursing home stay, we can turn to the informal rate of individuals across number of children. Table 2 shows that individuals, who experience long-term care needs[10] during the sample period, are more likely to receive informal care when they have multiple children. About 83% of the sample has two or more children, demonstrating the importance of not neglecting interaction between siblings. 70.1% of individuals with one child receive informal care from their child at least once over the 1998-2014 sample period. However, the share of individuals increases to 79.6% and 79.3% for individuals with two and three children, respectively, and is highest at 89.9% for individuals with six or more children. Overall, 81% of the sample with long-term care needs receive informal care from their children. This is significant given that most elderly individuals in the sample experience long-term care shock at some point during the sample period[11]

Table 2: Number of Adult Children and Informal Caregiving

	Number of children						
	1	2	3	4	5	6+	Total
% of sample	17.1	26.8	19.9	13.6	7.9	14.7	100
% of sample receive informal care	70.1	79.6	79.3	89.4	83.0	89.9	81.0

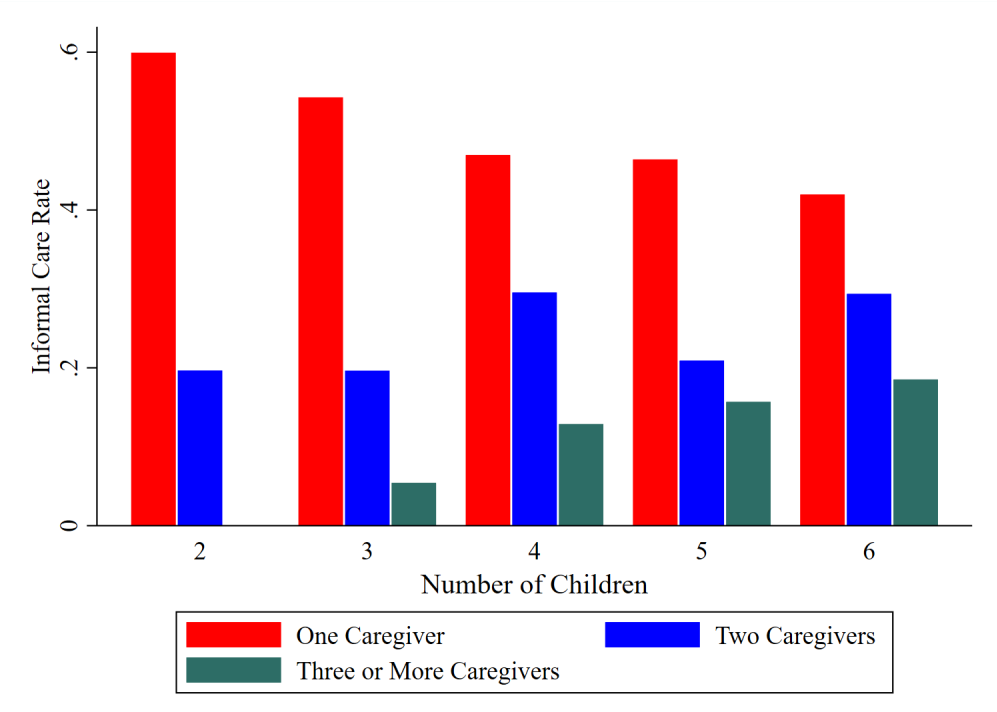
Notes: The sample includes 1,940 65+ single individuals who has at least one child and experience long-term care needs at some point in the pooled 1998-2014 Health and Retirement Study. The second rows show the percent of those who receive informal care from any child over the 1998-2014 sample period, split by number of children.

To explore whether having more children lead to one child providing care more often or multiple children coordinating to provide care to their parent, I decompose the individuals with multiple children in terms of how many caregivers they have throughout the 1998-2014 sample period in Figure 2.

[10]Long-term care needs and long-term care shocks are interchangeably used throughout the paper. Long-term care needs are defined in terms of total hours of help per month an individual receives for activities of daily living (ADL) or instrumental activities of daily living (IADL). The respondent is healthy if they need no help; has light LTC needs if they receive less then 100 hours of help per month; and has intensive LTC needs if they receive 100 or more hours of help per month. See Appendix A.1 for the definitions of ADL and IADL used, and the construction of the variable for long-term care shock in details.

[11]See Appendix A.2 for the sample details.

Figure 2: Number of Adult Children Caregivers



Notes: The sample includes single individuals aged 65 and over with at least one adult child in the pooled 1998-2014 Health and Retirement Study. Red bars refer to share of individuals who receive informal care from one adult child and blue bars refer to share of individuals who receive informal care from two children. Number of children equals to six when an individual has six or more adult children. See Appendix A.1 for number of observations.

Across number of children, getting help from only one child is the most common arrangement for individuals. However, share of families with one caregiver (red bars) decreases with number of children. For example, 60% of individuals with two children get informal care from one child but this share lowers to 42% when it comes to families with six or more children. Interestingly, for families with more children, multiple caregiver arrangements become more pervasive with around 20% of families with three children receiving informal care from two children, and the rate increases to 30% for families with four children. Receiving informal care from three or more children also increase with number of children, which essentially makes up more than 45% of families with three or more children. This suggests that, children may coordinate their efforts or work together to care for their sick parent. In fact, for families with multiple caregivers, two types of care arrangements are observed: multiple caregivers

take turns (one child providing care in some periods and another child providing care in other periods but never simultaneously) or they care for the parent simultaneously in the same period (over two years), as demonstrated in Appendix A.3.

Table 3 presents the distribution of informal care hours between multiple caregivers compared with the hours provided by one caregivers (where one child is the only caregiver among their siblings). For families with one caregiver, the caregiver spends 24.2 hours of informal care per week on average. However, the mean is highly driven by those providing intensive care on the right tail as the median hour is only 7.5 hours. In fact, 29% of the time the caregivers (that are the only providing care among their siblings) spent more than 20 hours per week providing care.

Table 3: Caregiving Patterns

	One caregiver	Multiple Caregivers
Informal care hours (mean/median)	24.2/7.5	18.2/6
Informal care hours | main caregiver		26.1/7.75
Provides $\geqslant$ 20 hrs/wk	0.29	0.23
Provides $\geqslant$ 20 hrs/wk | main caregiver		0.33
% of hours by main caregiver	100.0	0.73

Notes: The sample includes 24,973 person-wave observations of 4,967 adult children of 65+ single individuals who has multiple children and receive informal care from at least once child in the pooled 1998-2014 Health and Retirement Study. The table reports the characteristics of children based on whether they provide care to their parent during the sample period, and on how many hours they provide care. Main caregiver is defined as the child that provides the most total hours of informal care to their parent over the sample period.

For multiple caregivers, I first define a main caregiver among the multiple caregivers for each family by choosing the caregiver that provide the most total hours of informal care hours to their parent over the sample 1998-2014 period. For all caregivers in families with multiple caregivers, they spend 18.2 hours of informal care on average with a median of 6 hours. However, when I only focus on the main caregivers from each family with multiple caregivers, the mean rises to 26.1 hours and the median rises to 7.75 hours. Additionally, only 23% of the time all caregivers from families with multiple caregivers spend more than 20 hours per week compared to 33% of the time the main caregivers among the multiple caregivers spending more than 20 hours of care per week to their parent. This suggests that

even though multiple caregivers are common for families with multiple children, the bulk of the care work is still done by one main caregiver among the multiple caregivers, which resembles similar caregiving patterns to the caregivers in families with only one caregiver. In fact, 73% of the total informal care hours are done by the main caregiver in families with multiple caregivers[12].

This section provides evidence that informal care rate increases with number of children. The increase in informal care rate comes from more than one child caregiver as number of children increases, suggesting that children may coordinate their efforts in caring for their parent. However, for families with multiple caregivers, most of the informal care is done by the main caregiver, defined as the one who provided the most amount of care to the parent over the sample period. The main caregiver among the multiple caregivers show similar caregiving patterns as the caregiver who is the only caregiver among their siblings. Since I am interested in how the caregiver child (main or the only) ends up being the caregiver to their parent, I explore the characteristics of the caregiver children compared to those with their siblings who do not provide care or do not provide as many hours in the following section.

3.3 Characteristics of Children and Informal Caregiving

This section focuses on the characteristics of caregivers among families with multiple children and what characteristics of an adult child are associated with to be the caregiver over their siblings. As noted in the previous section, regardless of how many caregivers a family has, still one child bears the brunt of most of the informal care hours to their parent.

Table 4 presents the characteristics of adult children based on what level of informal care they provide to their sick parent. The sample focuses on parents who has two or more children and receive informal care from at least one child during the 1998-2014 sample period to ensure every child belongs to a family with at least one sibling providing care. Non-caregiver siblings are more likely to be male (66%), and less likely to live within 10 miles of the parent

[12]This finding is consistent with those found in Mommaerts (2015) though she uses slightly different sample selection (see details in Appendix on Multiple Children in her paper) and focuses on 1998-2010 sample period.

(31%). Interestingly, siblings who provide provide care are more likely to be female. 70% of caregivers who provide 20 or more hours and and 59% of those who provide less than 20 hours per week are female. Siblings who provide care are more likely to live closer to their parent. This suggests that, on the extensive margin, living closer and being a daughter are important determinants of providing care to the parent[13].

Table 4: Characteristics of Adult Children by Caregiving Patterns

	Provide Care		Not Provide Care
	$\geqslant$ 20 hrs/wk	<20 hrs/wk	
Age	53.5	53.5	53.6
Female	0.70	0.59	0.44
Married	0.49	0.69	0.69
Home ownership	0.51	0.74	0.66
College	0.21	0.32	0.24
Working full-time	0.48	0.63	0.62
Working part-time	0.10	0.09	0.07
Not working	0.42	0.27	0.31
Earns >$35,000	0.37	0.64	0.60
Earns >$70,000	0.05	0.12	0.12
Lives within 10 miles	0.75	0.61	0.31
Informal care (hrs/wk)	45/28	5/3	-
Observations	3,271	7,176	14,526

Notes: The sample includes 24,973 person-wave observations of 4,967 adult children of 65+ single individuals who has two or more children and receive informal care from at least once child in the pooled 1998-2014 Health and Retirement Study. The table reports the characteristics of children based on whether they provide care to their parent during the sample period, and on whether they provide more than 20 hours of care during the sample period. For informal care hours, the mean/median hours are reported.

Siblings who provide less than 20 hours of informal care per week have quite similar characteristics to those who do not provide care in terms of marital status, home ownership, working status and earnings. For example, light caregivers (those providing less than 20 hours per week) are equally likely to be married as non-caregiver siblings, owns home at 74% even more than non-caregivers. In terms of working, light caregivers work full-time at 63%

[13] Ko (2021) finds similar patterns and uses these two characteristics to choose the informal caregiver child within a structural framework between a parent and one child caregiver. She also conducts simulations where long-term care insurance companies price their premium based on whether the elderly individual has a daughter or a child that lives within 10 miles.

close to non-caregivers working full-time at 62%, and they actually work part-time more than non-caregivers. Light caregivers and non-caregivers earn more than $70,000 at the same rate though light caregivers are more likely to earn more than $35,000 than non-caregivers. This may imply that living close to their parent and being a daughter may explain informal caregiving at the extensive margin, having their own family and home, and working and earning more may explain informal caregiving on the intensive margin better. This explains the large heterogeneity in characteristics between the children who provide care more than 20 hours of care and less than 20 hours of care. Those who provide more than 20 hours of care per week less likely to be married, and less likely to own home.

These descriptions, however, do not demonstrate the causal direction between informal caregiving and the sibling's characteristics such as geographical proximity to parent, marriage, home ownership, working and earning. Siblings providing care may move close to the parent either when the parent is sick or in anticipation of the parent providing care. Similarly, children may sell their home and move closer to or live together with their parent to provide care once a parent faces long-term care shock. As for working and earning, it's possible that children who work and earn less become the caregiver due to less opportunity cost compared to their siblings, but at the same time studies have shown that caregiver children work less and lose earnings because of their role as the main caregiver (see Skira 2015).

There are multiple channels that are at work in determining informal caregivers and intensive informal caregivers. Living closer to parent could be an important determinant such that children who live close to parent end up providing care. This can certainly be the case; however, children who anticipate to be the caregiver can also make endogenous decisions to move closer to the parent even before the parent is sick. Daughters are more likely to live close to parent even before the long-term care shock. Being a daughter and living close to a parent appear to explain a lot about who the caregiver will be. However, at the intensive margin, opportunity costs may play more role in how much care each child provides. Children who work more or earn more tend to give much less informal care hours.

Daughters are more likely to have all these characteristics in terms of living closer and having lower opportunity cost.

3.4 Gender Composition of Children and Informal Caregiving

Since being a daughter plays a big role in determining who, among the children, will provide care to their parent, I categorize families with two or more children into three groups based on the gender composition of their children: families that have at least one son and at least one daughter (Mixed-Gender), families that have only daughters (Daughters-Only) and families that have only sons (Sons-Only)[14].

Table 5 presents the share of families who have two or more children and experience long-term care needs at some point during the 1998-2014 sample period and show the number of caregivers across the three family types. Most individuals (52%) receive care from one child despite having multiple children while a significant share (39%) still receives informal care from more than one child. Among all family types, families with only sons have the highest share that do not receive any informal care from their children at 27.7%. Receiving care from only one child is more common for families with only daughters or only sons.

Table 5: Number of Children Caregivers by Family Types

	Mixed-Gender	Daughters-Only	Sons-Only	Total
% with no caregiver	14.8	15.7	27.7	16.7
% with one caregiver	49.7	58.4	55.9	52.0
% with multiple caregivers	35.5	25.9	16.4	31.3
Total	100.0	100.0	100.0	100.0

Notes: The sample includes 1,609 65+ single individuals who have two or more children and experience LTC needs at some point in the pooled 1998-2014 Health and Retirement Study. The rows represent the percent of families by number of children caregivers over the sample period, split by three family types. "Mixed-Gender" refers to the set of families that have both sons and daughters, "Daughters-Only" refers to the set of families that only have daughters, and "Sons-Only" refers to the set of families that have only sons.

This makes sense given that these families have mostly two or three children whereas families with daughter(s) and son(s) have more uniform distribution across number of children,

[14]See Appendix A.4 for the distribution of number of children across family types.

as shown in Appendix A.2. Having more children increases the likelihood that more children providing care as this appears to the case for families with daughter(s) and son(s). However, despite resembling similar distribution of children for Daughters-Only and Sons-Only families, one child caregiver and multiple children caregivers are still significantly lower for the latter. This may suggest that families with only sons may resort to more formal care services such as paid home care or even nursing home in the case of intensive long-term care needs from the parent.

Table 6: Characteristics and Gender Composition of Children

	Mixed-Gender		Daughter-Only	Sons-Only
	(1)	(2)	(1)	(2)
Age	52.9	53.5	54.8	55.5
Married	0.63	0.68	0.65	.77
College	23.7	24.02	0.32	0.40
Working Full-Time	0.56	0.66	0.51	0.67
Working Part-time	0.10	0.07	0.11	0.06
Earns $\geqslant \$35,000$	0.53	0.59	0.63	0.70
Lives within 10 miles	0.50	0.42	0.49	0.52
Provides care	0.49	0.30	0.58	0.58
Provides $\geqslant$ 20 hrs/wk	0.17	0.07	0.19	0.16
Informal care (hrs/wk)	23.7	15.0	24.1	14.25
Observations	10,454	10,315	2,442	1,762

Notes: The sample includes adult children of 65+ single individuals with long-term care needs who has two or more children and experience long-term care needs in the pooled 1998-2014 Health and Retirement Study. Column (1) refers to the sample of daughters and Column (2) refers to the sample of sons. "Mixed-Gender" refers to the set of families that have both sons and daughters, "Daughters-Only" refers to the set of families that only have daughters, and "Sons-Only" refers to the set of families that have only sons.

In Table 6, I focus on the sample of children of families with long-term care needs and have more multiple children, based on family types. Column(1) refers to daughters in each family and Column(2) refers to sons in each family type. Percents of children providing care to their parent are highest for families with only daughters and only sons. Despite parents in these families receiving less informal care from their children overall, as shown in Table 5, note that they have less children on average from Mixed-Gender families. Almost 60% of the children in Same-Gender families provide care to their parent. In contrast, 49% of daughters and

30% of sons provide care in Mixed-Gender families. Interestingly, the difference in caregiving patterns between sons in Mixed-Gender and sons in Sons-Only families are starkest when it comes to caregiving for more intensive hours. 16% of sons with no sister provide more than 20 hours per week care to parent, almost comparable to 17% and 19% by daughters in Mixed-Gender and Daughters-Only families, compared to 7% of sons with sister(s). However, the care hours on average are not much different suggesting that once sons in Mixed-Gender families provide care, they provide equal amount of hours as sons in Sons-Only families, though both are much lower compared to hours by daughters in both types of families.

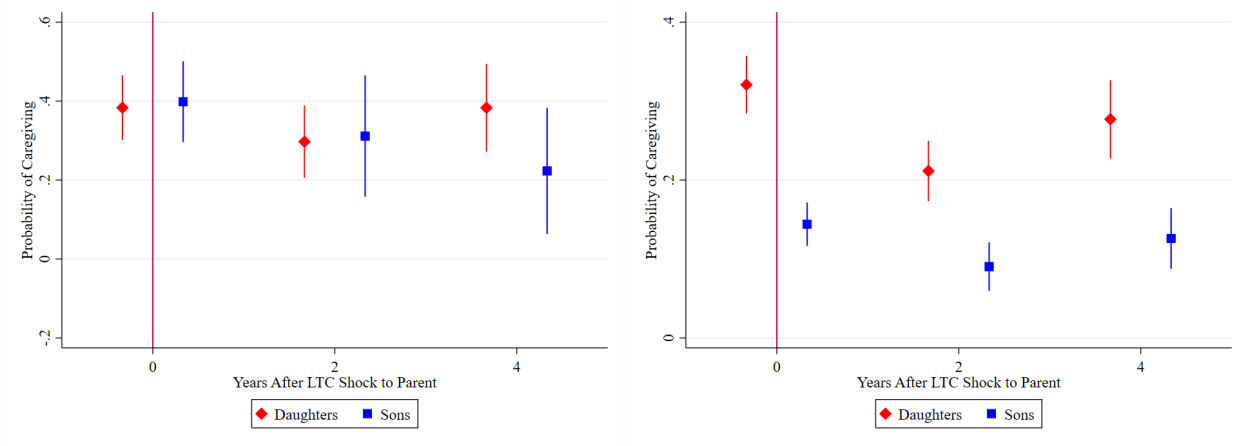
To further explore the caregiving patterns of sons and daughters across family types, I conduct an event-study estimation of long-term care shock on the probability of providing informal care, as shown in Table 7. Following the standard event-study specification, I include dummies for the event, the time and age for each children sample. The reference point for the independent variables are two years before the long-term care shock. Note that there were some small amount of hours where children provide care to their parent before they have a shock, which could be helping with chores or around the hours including reasons other than ADL/IADL limitations. The probability of providing care increases by 32% for Daughters in Mixed-Gender families as opposed to 38% increase for daughters in Same-Gender families. For all daughters, the persistence of caregiving continues till four years after the event; however, for sons, they lower more as time goes by and the effects are even lower for sons in Mixed-Gender families. The coefficients are graphically shown in Figure 3.

Table 7: Probability of Caregiving by Gender Composition of Siblings

	Mixed-Gender		Daughter-Only	Sons-Only
	(1)	(2)	(1)	(2)
At event	0.32***	0.14***	0.38***	0.39***
	(0.018)	(0.014)	(0.041)	(0.051)
Two years after	0.21***	0.09***	0.29***	0.31***
	(0.019)	(0.015)	(0.045)	(0.076)
Four year after	0.28***	0.13***	0.38***	0.22***
	(0.025)	(0.019)	(0.055)	(0.079)
Observations	2,744	2,636	560	420

Notes: The table reports the event-study estimates on the probability of providing informal to a parent when a parent is hit by a long-term care shock. Column (1) refers to the sample of daughters and Column (2) refers to the sample of sons. "Mixed-Gender" refers to the set of families that have both sons and daughters, "Daughters-Only" refers to the set of families that only have daughters, and "Sons-Only" refers to the set of families that have only sons. The reference point is the year two years before the long-term care shock. Robust standard errors clustered at the family level are in parentheses. * p<0.10, ** p<0.05, ***p<0.01

Figure 3: Probability of Caregiving by Gender Composition of Children



(a) Same-Gender

(b) Mixed Gender

Notes: The sample includes adult children of single individuals aged 65 and over with two or more children and at least one onecaregiver in the pooled 1998-2014 Health and Retirement Study. Figure (a) refers to adult children in same-gender sibling groups and Figure (b) refers to adult children in mixed-gender sibling groups.

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Appendix A Sample Details

A.1 Sample Selection

Parents Sample. I choose single individuals aged 65 and over in 1998, who are followed till death (if applicable) without missing any interview between 1998 and 2014, stayed single throughout the sample period (N=3,685; n=16,773). Most analyses require sample with at least one adult child aged 21 and over that are alive while the individual is alive (N=3,110; n=14,385) or sample with two or more children (N=2,587; n=12,325).

Children Sample Of the original 3,685 individuals, I choose families with at least one adult child that are alive while the individual is alive. This gives us 3,110 individuals with 9,653 adult children with 45,958 child-wave observations. Of those, 9,128 children have a sibling, which constitutes 43,896 child-wave observations.

A.2 Construction of Long-Term Care Shock

Following Mommaerts(2021), I define long-term care shock in terms of how many hours a respondent gets help for activities of daily living (ADL) or instrumental activities of daily living (IADL)[15] in the last month. An individual is healthy if a respondent does not receive any help; an individual has light long-term care needs if the respondent gets less than 100 hours of help; an individual has intensive long-term needs if the respondent gets more than 100 hours of help.

Imputation. The question asking how many hours the respondent received help has missing values for the 1998 wave as the survey added the question starting in 2000. To

[15]The set of ADL tasks include: walking across a room, getting in and out of bed, bathing, dressing, using the toilet and eating. The set of IADL tasks include: using a telephone, managing money, taking medications, grocery shopping and preparing hot meals. A dummy variable indicating limitations with each ADL/ IADL task is 1 when a respondent answers "yes" to a question "Because of a health or memory problem do you have any difficulty with [insert ADL or IADL task], excluding any difficulties you expect to last less than three months? If a respondent answers "no", the corresponding dummy variable is set to zero. If respondent answers "yes" to having difficulty with any of the ADL/IADL tasks, the respondent then asked if they receive help from anyone and how many hours in total they receive help for.

not miss information on other variables in 1998, I impute the long-term care needs for the 1998 wave as: healthy if the respondent had no ADL/IADL limitation; light if they have 1-2 ADL/IADL limitations (corresponding to an average of 59 hours of help per month in the data); and intensive if they have 3-6 ADL/IADL (an average of 159 hours of help per month).

As shown in Table Table 1, 83% of the 3,685 individuals died during the 1998-2014 sample period at an average age of 83.7. In addition, 61% of individuals experienced either light or intensive long-term care needs. The age distributions of the two events are shown in Figure 4. The transition matrix for the long-term care needs is shown Table 2. A significant number of individuals died without (or being observed) experiencing long-term care shock. In fact, an individual in a healthy period in wave t has

A.1: Long-Term Care Shock and Death

	% of individuals	Average age
Experienced LTC shock	61.4	83.7
Died during 1998-2014	82.8	87.2
Total # of individuals	3,685	

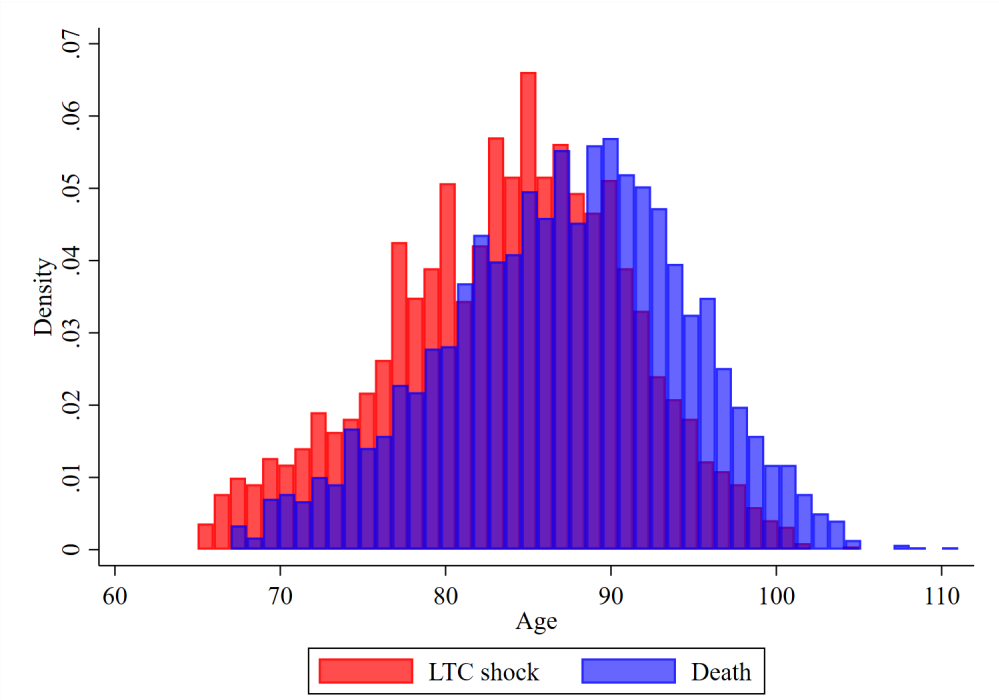
Notes: The sample single individuals aged 65 and over in the pooled 1998-2014 Health and Retirement Study. The additional selection criterion requires that individuals do not miss an interview during the sample period, including when the individual dies, a proxy answers questions about the prior state of the individual before death in an exit interview.

A.2: Transition Matrix of Long-Term Care Shock

	Time $t+1$				
Time t	Healthy	Light	Intensive	Dead	Total
Healthy	72.6	11.15	3.97	12.25	100
Light	17.79	36.55	14.23	31.43	100
Intensive	8.53	18.82	31.00	41.66	100
Dead	0.00	0.00	0.00	100	100
Total	30.45	9.19	4.75	55.60	100

Notes: The sample single individuals aged 65 and over in the pooled 1998-2014 Health and Retirement Study. Long-term care shock is defined in terms of total hours of help per month a respondent receive for activities of daily living (ADL) or instrumental activities of daily living (IADL). The respondent is healthy if they need no help; has light LTC needs if they receive less then 100 hours of help; and has intensive LTC needs if they receive 100 or more hours of help.

A.4: Age Distribution at LTC Shock and Death



Notes: The sample single individuals aged 65 and over in the pooled 1998-2014 Health and Retirement Study.

A.3 More on Multiple Children Caregivers

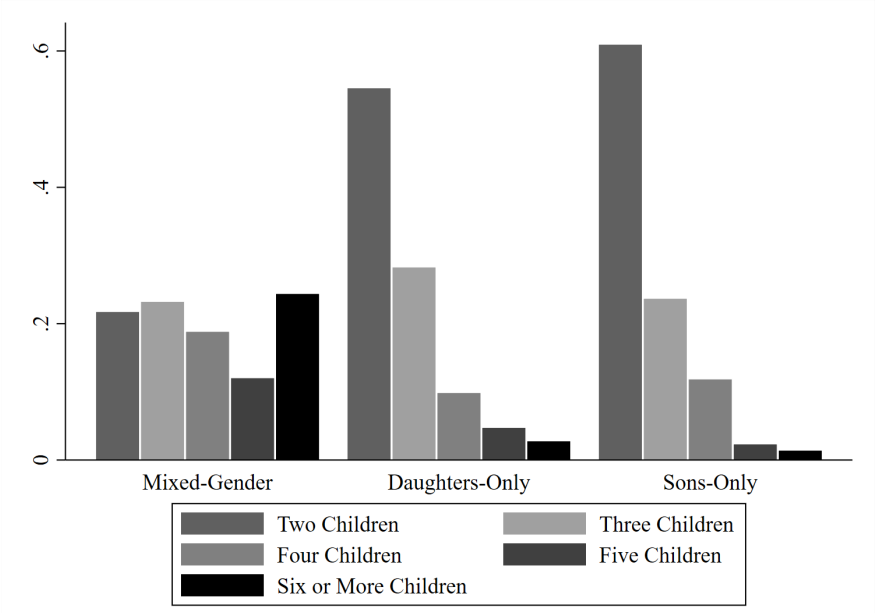
A.3: Caregiving Arrangement by Number of Caregivers

		Caregiving Arrangement	
	Provide care	Take turns	Simultaneous
One caregiver	82%	-	-
Multiple caregivers	88%	52%	48%

Notes: The sample includes 3,261 observations when a parent is sick, disaggregated by how many caregivers the parent has over the 1998-2014 sample period. The observations are from 1,340 parents aged 65 and over with multiple multiple children and at least one caregiver. Provide care refers to the periods when a caregiver child provides care to the sick parent. For multiple children caregivers, in each period they either take turns (i.e. one providing care in some periods and another providing care in other periods) or provide care simultaneously in the same period (over two years).

A.4 More on Gender Composition of Children

A.5: Distribution of Adult Children By Family Types



Notes: The sample includes single individuals aged 65 and over with at least one adult child in the pooled 1998-2014 Health and Retirement Study. "Mixed-Gender" refers to the set of families that have both sons and daughters, "Daughters-Only" refers to the set of families that only have daughters, and "Sons-Only" refers to the set of families that have only sons.

A.4: Characteristics and Gender Composition of Children: Families with One Caregiver

	All		Mixed-Gender		Daughters-Only		Sons-Only	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Age	59.2	58.8	58.7	58.4	60.1	60.1	60.7	61.0
Female	0.63	0.44	0.68	0.42				
Married	0.62	0.70	0.59	0.70	0.60	0.68	0.79	0.79
Home ownership	0.66	0.69	0.65	0.68	0.65	0.76	0.70	0.77
College	0.28	0.24	0.26	0.23	0.27	0.27	0.37	0.37
Working full-time	0.56	0.61	0.57	0.62	0.47	0.51	0.63	0.66
Working part-time	0.10	0.07	0.11	0.07	0.12	0.09	0.06	0.06
Earns >$35,000	0.55	0.62	0.53	0.60	0.56	0.71	0.61	0.72
Lives within 10 miles	0.70	0.31	0.72	0.31	0.69	0.28	0.62	0.34
Informal care (hrs/wk)	24.3	-	25.5	-	26.3	-	15.9	-
Provides >20 hrs/wk	0.29	-	0.30	-	0.28	-	0.23	-
Observations	8,784	3,934	2,630	7,270	697	858	607	626
Total	12,718		9,900		1,555		1,233	

Notes: The sample includes adult children of 65+ single individuals with long-term care needs who has two or more children with only one child as caregiver in the pooled 1998-2014 Health and Retirement Study. Column (1) refers to the child who provides informal care to the parent and Column (2) refers to the rest of the children who do not provide informal care. "All" refers to the whole sample, "Mixed-Gender" refers to the set of families that have both sons and daughters, "Daughters-Only" refers to the set of families that only have daughters, and "Sons-Only" refers to the set of families that have only sons.

A.5: Characteristics and Gender Composition of Children: Families with Multiple Caregivers

	Mixed-Gender			Daughters-Only			Sons-Only		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Age	52.3	52.7	52.9	54.8	53.4	54.4	55.3	54.7	57.0
Female	0.68	0.60	0.41						
Married	0.58	0.65	0.67	0.67	0.68	0.60	0.59	0.77	0.83
Home ownership	0.61	0.72	0.60	0.72	0.78	0.50	0.62	0.73	0.88
College	0.25	0.26	0.20	0.32	0.40	0.34	0.49	0.44	0.22
Working full-time	0.55	0.63	0.63	0.46	0.60	0.53	0.66	0.77	0.72
Working part-time	0.10	0.09	0.08	0.11	0.10	0.13	0.09	0.03	0.05
Earns >$35,000	0.50	0.56	0.57	0.58	0.69	0.51	0.72	0.85	0.87
Lives within 10 miles	0.67	0.60	0.34	0.66	0.49	0.35	0.72	0.65	0.31
Informal care (hrs/wk)	26.5	8.8	-	28.6	13.5	-	16.5	5.2	-
Provides >20 hrs/wk	0.34	0.11	-	0.34	0.19	-	0.18	0.03	-
Observations	2296	3083	5490	335	377	175	200	222	77
Total		10,869			887			499	

Notes: The sample includes adult children of 65+ single individuals with long-term care needs who has two or more children with more than one child as caregivers in the pooled 1998-2014 Health and Retirement Study. Column (1) refers to the child who provides the most informal care hours to the parent over the sample period, Column (2) refers to the children who provide some (but not most) informal care hours over the sample period, and Column (3) refers to the rest of the children who did not provide informal care hours to their parent. "Mixed-Gender" refers to the set of families that have both sons and daughters, "Daughters-Only" refers to the set of families that only have daughters, and "Sons-Only" refers to the set of families that have only sons.