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Essays on Intergenerational Transfers

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Sean Patrick Fahle

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Abstract of the Dissertation

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The chapters of this dissertation examine transfers between generations across three distinct contexts: a potential role for informal care in U.S. long-term care policy (Chapter 1), the effect of caregiving on bequests (Chapter 2), and making inferences about intra-household allocations using data on intergenerational transfers (Chapter 3).

The first chapter poses the question: how can government policy leverage family caregiving to make Medicaid financing of long-term care more sustainable without compromising the well-being of elderly beneficiaries and their families? This question is addressed using a partial equilibrium life-cycle model augmented with a repeated game played between an elderly parent and her adult child over long-term care and living arrangements. The results indicate that policies which either expand access to consumer-directed home care or provide direct financial compensation to caregivers can result in a substantial reduction in the use of institutional care, an increase in informal caregiving, and a decrease in government expenditures.

The second chapter is one of the first studies to examine bequest patterns and their determinants using data on actual bequests from a large and approximately representative, longitudinal survey of the U.S. population over age 50. The results indicate that caregiving from and co-residence with adult children are important predictors of the division of assets among children, with child caregivers receiving larger bequests than non-caregivers. The effects are strongest for bequests of housing assets. The salience of housing assets is further

supported by evidence of a relationship between ownership of housing assets and the receipt of informal care from children near the end-of-life.

The third chapter utilizes a novel source of variation, intergenerational financial transfers from parents to children, to recover the intra-household allocation of resources (the "sharing rule") in a collective model of household behavior. The identifying assumption is that financial transfers from a household to, for instance, the wife's own children (the stepchildren of her husband) can be regarded as the private consumption (an "assignable" good) of the wife. The results indicate that married women receive roughly half of household resources and that an increase in a wife's wage increases her share of household income.

The dissertation of Sean Patrick Fahle is approved.

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Table of Contents

List of Figures

List of Tables

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CHAPTER 1

Harnessing the Potential of Family Caregivers: A Solution to the U.S. Long-Term Care Crisis?

1.1 Introduction

In 2010, 6.7 million Americans aged 65 and older required long-term care for assistance with functional impairment, with researchers projecting a significant increase in the number of those needing long-term care in the coming decades (Commission on Long-Term Care (2013)).[1,2] Providing care for these individuals is costly. In 2013, the median private pay daily rate for a private room in a nursing home in the U.S. was $280, slightly more than $100,000 for a year's worth of care (Genworth (2014)).[3] Few families can afford to pay these amounts, and there is evidence that a significant share of the elderly deplete all of their savings on out-of-pocket medical spending at the end of their lives (Kelley et al. (2013)). Meanwhile, despite these risks, only about 10 percent of older Americans hold private long-term care insurance, and new issuance of these policies has been declining (Brown and

[1]Long-term care (LTC) is defined as assistance with activities of daily living ("ADLs", e.g., bathing, dressing, and eating) and instrumental activities of daily living ("IADLs", e.g., meal preparation and medication management) provided to people who cannot perform these activities due to a physical, cognitive, developmental, or chronic health condition expected to continue for an extended period. According to Kemper et al. (2006), 69 percent of individuals who turned 65 in 2005 will experience some period of ADL or IADL impairment during the remainder of their lives. Seventeen percent will be impaired for a year or less, but twenty percent of these individuals will experience more than 5 years of impairment.

[2]Kaye et al. (2010) estimate that the number of Americans of all ages needing long-term care will increase from 12 million in 2010 to 27 million in the year 2050. In addition, it is estimated that today one in eight Americans over 65 has Alzheimer's. The annual number of new cases is projected to double by 2050 (Alzheimer's Association (2013)).

[3]Medicaid's reimbursement rates for nursing home care are somewhat lower. The mean daily rate reimbursed by Medicaid in 2012 was $178 (2012 Eljay Survey of State Nursing Homes). For comparison, the median private pay daily rate in an assisted living facility was $117, and the median hourly prices for a homemaker or home health aide were $18 and $19 per hour, respectively (Genworth (2014)).

Finkelstein (2007, 2008, 2011); Commission on Long-Term Care (2013)).

Due in part to the high costs of formal care, the majority of long-term care is provided informally by family and friends. Of older adults with functional limitations, two-thirds receive care exclusively from family members, 26 percent receive care from both family and paid help, and just 9 percent use only paid help (O'Keefe et al. (2000)). It is estimated that 61.6 million individuals provided care to an individual with long-term care needs in 2009, and some estimates put the economic value of that care as high as $450 billion (AARP Public Policy Institute (2011)). This figure is more than twice as large as the value of all spending on paid care in 2012, which was $219 billion, or 9.3 percent of all U.S. personal health care spending (National Health Policy Forum (2014)).

However, the reliance of the long-term services and supports (LTSS) system on informal caregiving is not without problems.[4] Caregiving can place a physical, financial, and emotional burden on the caregiver. In addition, demographic change in the U.S. may reduce the future availability of informal caregivers.[5] Yet, at the same time, many states are contending with a shortage of formal long-term care workers. Low and stagnant compensation, few benefits, and limited opportunities for career advancement have resulted in high turnover and low retention in this sector. As a result, researchers question whether formal long-term care could compensate for a decline in informal caregiving.

Of the long-term care not provided by informal caregivers, the majority is financed by state and federal governments through the Medicaid program. As of the 2011 fiscal year, 62.3 percent of all LTSS expenses were being paid by Medicaid at a cost of $131.4 billion.[6] In that year, states were already spending an average of 16.7 percent of general revenues on Medicaid and were seeking ways to reduce these costs.[7] Yet, the confluence of the factors listed above – limited penetration of private long-term care insurance, demographic change,

[4]Long-term services and supports (LTSS) is another name for long-term care. These terms are used interchangeably in this paper.

[5]In 2010, there were 7 individuals aged 45-64 for every individual 80 years old and older. This number is projected to decline to 4 by 2030 (AARP Public Policy Institute (2013)).

[6]The other sources of long-term care financing were private out-of-pocket spending (22%), private insurance (12%), and other public (4.6%) (National Health Policy Forum (2014)).

[7]It should be noted that financing for long-term care represents only 30 percent of total Medicaid spending.

and concerns that individuals are not saving enough for retirement – has raised fears that the reliance on Medicaid financing is likely to increase.

For this reason, policy analysts were hopeful that the Community Living Assistance Services and Supports (CLASS) Act, originally Title VIII of the Patient Protection and Affordable Care Act of 2010, would provide an alternative source of financing for LTSS. The CLASS Act would have established a voluntary and public long-term care insurance option for employees. However, the voluntary nature of the program led to doubts about its fiscal viability, leading to its repeal on January 1, 2013.[8]

Against the backdrop of the CLASS Act's repeal, the President and Congress appointed the Commission on Long-Term Care to address the crisis. The Commission issued its Report to the Congress on September 30, 2013, in which it articulated a vision of "a more responsive, integrated, person-centered, and fiscally sustainable LTSS delivery system that ensures people can access quality services in settings they choose" (Commission on Long-Term Care (2013), p. 35). The report's focus on an LTSS system that is "person- and family-centered" and in which needs are met in the "least restrictive setting" is part of an on-going trend away from institutional care toward home- and community-based care, a shift commonly referred to as "re-balancing." Integral to this vision is "the active involvement of individuals and family caregivers in making care decisions" and "the strengthening of mechanisms to support family caregivers" who, the report acknowledges, "will remain a mainstay support for many, if not most, of those with LTSS needs" (Commission on Long-Term Care (2013), pp. 36, 76).

This paper contributes to the knowledge base needed to reform the U.S. long-term care system in line with the Commission's vision in two ways. The first contribution of this paper is the development of a model of family long-term care arrangements that extends the existing frameworks used to analyze these decisions. The second contribution of the paper is to use

[8]Broadening long-term care insurance coverage will certainly be a component of any comprehensive plan to address the nation's long-term care crisis, but it is not the focus of this paper. The debate over and repeal of the CLASS act, coupled with the decision by the Commission on Long-Term Care not to issue a recommendation on long-term care financing, suggest that consensus on the issue of long-term care insurance may be a long way off.

this model to simulate the effects of several long-term care policy options and assess their impact on the outcomes of interest: the well-being of the elderly and their families, shifting individuals from institution- to home- and community-based care, and reducing government expenditures.

The paper's first contribution synthesizes elements from two strands of the economics literature that have for the most part evolved distinctly from one another. The first of these literatures studies the life-cycle behavior of the elderly in the context of dynamic models that capture the evolution of these individuals' assets, health, and medical expenditures near the end of life. As this literature has developed, researchers have added increasing sophistication and realism into their modeling of the economic environment (Hubbard et al. (1995); Palumbo (1999); De Nardi et al. (2010)). These models have proven very useful in examining policy questions surrounding savings, the use of long-term care, and the role of Medicaid in insuring the elderly (Brown and Finkelstein (2008); Lockwood (2012); De Nardi et al. (2013)).

Yet, from the perspective of analyzing long-term care policy, this literature tends to abstract from two important considerations. First, life-cycle models typically either ignore living arrangements altogether or assume that transitions between living arrangements are exogenous. Yet, an analysis of the data (presented in Section 1.4.2.3), in conjunction with the results of other researchers (Hotz et al. (2010); Marshall et al. (2011)), provides evidence that the wealthiest elderly use their resources to remain independent as their health deteriorates while the less wealthy are more likely to live with family or in an institution. To the extent that care arrangements reflect choices by the elderly, a model that does not allow for these decisions may not be appropriate for studying the effect of long-term care policy on care utilization. Second, these models ignore flows of resources within a family, which represent an important support mechanism for the elderly. A significant fraction of the elderly co-reside with their children, and an even larger fraction rely primarily on family for their long-term care needs. If the availability of support from within the family affects long-term care decisions, these factors cannot be ignored.[9]

[9]While it is not the focus of this paper, the availability of support from the family may also influence

The second literature drawn on by this paper focuses specifically on the living and care arrangements of the elderly, typically using game-theoretic models to study these outcomes. This literature has evolved towards increasingly sophisticated games involving a greater number of family members as players (Pezzin and Schone (1999); Engers and Stern (2002); Pezzin et al. (2006); Byrne et al. (2009); Fontaine et al. (2009); Knoef and Kooreman (2011)). Though some dynamic models have appeared recently (Hiedemann et al. (2013)), the vast majority of these articles pose the caregiving decision in a static context.[10] However, there are important dynamic aspects to long-term care decisions. As stated above, the stock of assets is an important determinant of care arrangements, and spending on long-term care is a major reason that individuals deplete their assets in old age (De Nardi et al. (2010); Kelley et al. (2013)).[11]

In order to consider the dynamic aspects of this problem, the framework developed in this paper borrows from the caregiving literature but restricts the number of players in the game over living and care arrangements to two: an elderly parent and her adult child.[12] This long-term care game is embedded in a standard partial equilibrium life-cycle model framework, allowing for endogenous choices over living arrangements and caregiving. Within the model, elderly parents can receive informal care from their child, or they can purchase formal care while living in the community or in an institution. Children choose how to allocate time between working, caregiving, and leisure, while parents decide how to allocate their financial resources. The model features social insurance modeled after Supplemental Security Income (SSI) and Medicaid. It is estimated using data from a sample of single elderly mothers belonging to the Asset and Health Dynamics Among the Oldest Old (AHEAD) cohort of

the purchase of long-term care insurance (LTCI). The purchase of LTCI is studied in Brown and Finkelstein (2008) and Lockwood (2012) though the models in those papers abstract from informal caregiving. Though Mellor (2001) finds no evidence that the potential supply of child caregivers influences the decisions to purchase LTCI, Brown et al. (2012) reach the opposite conclusion.

[10] As Sovinsky and Stern (2012) point out, a reason for the focus on static models is that general methods for handling multiple equilibria in dynamic models do not yet exist.

[11] Furthermore, because Medicaid is a means-tested program, any modifications to the program will have implications for savings behavior. A dynamic model is necessary to capture the impact of the policy changes considered in this paper on the trajectory of savings in old age.

[12] This choice is based on computational tractability as well as patterns observed in the data, which suggest that, within a family, one child tends to shoulder the vast majority of the burden of providing informal care to an elderly parent (Section 1.3.4.1).

the Health and Retirement Study (HRS), a population at high risk of institutionalization.

The model developed in this paper is among the first to capture the long-term care arrangements of the elderly in a dynamic, structural life-cycle model. The only other paper to do so, to the best of the author's knowledge, is Barczyk and Kredler (2014). The model in this paper differs from their model in at least three respects. First, Barczyk and Kredler use a continuous time framework, which permits them to allow savings decisions by both parents and children in their model, while the model in this paper does not. Second, the model in this paper includes choices over both long-term care and living arrangements, as well as the choice of home care versus nursing home care, whereas Barczyk and Kredler restrict their attention to the choice between formal and informal. Finally, while Barczyk and Kredler include a binary representation of health and allow a binary choice over care arrangements, the model in this paper includes greater gradations of health and informal care.

Several other papers analyze closely related models. Gardner and Gilleskie (2012) estimate a discrete factor simultaneous equations model that jointly captures the evolution of health, assets, and care arrangements. The model in this paper can be viewed as the structural model underlying their reduced form approach. Skira (2012) models the supply of care and labor force participation of a child caregiver in a discrete choice dynamic model. In contrast to the model presented here, the elderly parent in Skira (2012) is not an active participant in the choice of care arrangement. In addition, neither the parent's living arrangements nor finances are explicitly modeled. Kaplan (2012) models a dynamic game between a parent and a young adult child over living arrangements and uses the model to examine how the option to co-reside with a parent affects a young adult's labor force outcomes.[13]

The second contribution of the paper is to inform long-term care policy by simulating the effects of several policy alternatives on the outcomes of the elderly and their children,

[13]The macroeconomics literature contains several related papers. Mattana (2013) studies intergenerational social mobility and co-residence of young adults in an overlapping generations (OLG) framework. Tabata (2005) and Mizushima (2009) construct OLG models where children's time is an input to their parent's health. Cardia and Ng (2003) and Cardia and Michel (2004) study OLG models in which elderly parents supply child care for their children.

the use of institutional care by the elderly, and government expenditures on the long-term care of the elderly. The policies studied, which are discussed in greater detail in the sections that follow, include (i) consumer-directed home care, (ii) wages paid to child caregivers, (iii) lump-sum allowances paid to full-time caregivers, (iv) respite and adult day care programs, and (v) variations in the financial eligibility threshold for Medicaid.[14] With respect to the recommendations of the Commission on Long-Term Care, policy (i), which provides LTSS recipients with more control over their care, is consistent with developing a more "person- and family-centered" LTSS system. Policies (ii)-(iv) are in line with the Commission's recommendation to "develop a national strategy to support family caregivers" (Commission on Long-Term Care (2013), p. 51).

These simulations contribute to a vast literature on the effects of Medicaid long-term care policy. While many of these studies use variation in Medicaid policies across states and over time (Cutler and Sheiner (1994); Hoerger et al. (1996); Aykan (2002); Gardner and Gilleskie (2012)), this paper addresses the same questions in the context of a model. The model is particularly useful when simulating policies which have not been implemented in the U.S., or that have only been implemented on a small scale, and for which data are not readily available. In addition, critics of the state variation (difference-in-differences) approach allege that variation in policy and the timing of its implementation may not be exogenous and may be correlated to other aspects of the long-term care environment that influence decisions.[15]

Several papers have established a precedent for studying long-term care policy with simulations. Pezzin and Schone (1999) simulate the effect of a non-means-tested home care subsidy in a static model where a mother and daughter endogenously choose living arrangements and find large decreases in the probabilities of co-residence and informal caregiving. In a game theoretic model of family long-term care decisions, Byrne et al. (2009) simulate

[14] In consumer-directed home care programs, Medicaid beneficiaries are given discretion over the resources that Medicaid would have paid a home care agency for their care. The beneficiaries use these resources to directly oversee their own care. These programs are described in greater detail in Section 1.2.

[15] Data availability was also a factor. This paper uses the Health and Retirement Study, which is the premier data source with which to study the behavior of the elderly, as it collects data on a vast array of outcomes, including income and assets, health, living arrangements, and health care utilization. However, access to the information needed to link individuals to their states of residence, and therefore their local policy environment, is restricted, and these data were not available to be incorporated into this paper.

the effects of formal and informal care subsidies, lump sum transfers to the elderly, and changing Medicaid income limits, observing minimal effects in all cases. Skira (2012) finds that a two-year extension of family leave policies has modest effects on informal caregiving but significantly increases the labor force attachment of middle-aged female caregivers while a caregiver's allowance has large effects on both caregiving and labor force participation. Barczyk and Kredler (2014) find large changes in care utilization and Medicaid enrollment when they simulate the introduction of subsidies for formal and informal care. Interestingly, the authors find that formal care subsidies are self-financing, for they reduce reliance on Medicaid by the old while simultaneously increasing income tax receipts from the young, who spend less time caregiving and more time working.

The simulation results in this paper build upon this literature by using a richer model of long-term care decisions and by studying a wider range of policies. The results of the simulation exercises show that expanding consumer-directed home care and compensating child caregivers with wages or a lump-sum allowance can reduce both the use of institution-based care and government long-term care expenditures. By contrast, policy experiments that simulated an expansion of respite care or which varied the generosity of Medicaid's Home- and Community-Based Care programs did not appreciably affect the outcomes of interest. The success of the consumer-directed and caregiver compensation experiments is a useful validation of the Commission's policy recommendations, in which strengthening government support for caregivers is an important pillar. By compensating adult child caregivers for their time, these policies facilitate an increase in the provision of informal care by adult children. The availability of more support from within the family enables individuals to shift from institutional care to home- and community-based care arrangements. This shift, in turn, reduces government long-term care expenditures.[16]

The paper proceeds as follows. Section 1.2 provides background on U.S. long-term care policy. It discusses the roles of Medicare and Medicaid in covering long-term care and offers some additional detail on the policies considered in the simulation experiments. The

[16]This paper does not assess the effect of the simulated policies on the welfare of parents or children, nor does it examine the consequences of the proposed policy changes for government tax revenue. The incorporation of welfare and tax considerations is left for future versions of this project.

theoretical model is presented in Section 1.3. The data, model parameterization, solution, identification, and the Method of Simulated Moments procedure for estimating the model parameters are described in Section 1.4. Section 1.5 displays the parameter estimates. Policy simulations are discussed in Section 1.6, and a final section concludes.

1.2 Policy Background

Both Medicare and Medicaid offer some coverage of long-term care. While Medicaid covers a wide range of long-term supports and services (LTSS), the benefit offered by Medicare is much more limited. Medicare provides partial coverage of care provided in a skilled nursing facility (SNF) following a prior hospitalization lasting at least three days. It covers the full cost of the SNF for the first 20 days and some portion of the cost up to 100 days. In some cases, Medicare also covers home health care, but crucially, Medicare will cover personal care services only if they are needed in conjunction with skilled nursing. It is important to distinguish between "home health care" on the one hand and "home care" (or "personal care") on the other. Home health care is medical care provided to individuals in their homes by trained medical staff. By contrast, personal care refers to non-medical services provided to individuals to help them with the activities of daily living (ADLs).[17] Personal care is the primary focus of this paper.

There are also many restrictions on Medicare's coverage of home health care. Medicare generally approves only four to ten hours of care per week though it can cover up to 35 hours under exceptional circumstances. Moreover, care must be supplied by a Medicare-certified home health agency. Eligibility requires that an individual be "home-bound," need intermittent skilled nursing care, and be under a physician's plan of care.[18,19]

[17] The activities of daily living (ADLs) are activities like bathing, dressing, and eating. Instrumental activities of daily living (IADLs) refer to such activities as meal preparation, medication management, and shopping.

[18] An individual is considered "home-bound" if he or she cannot leave home without "considerable and taxing effort." "Skilled nursing care" includes services that can only be performed by a licensed nurse.

[19] Good sources for this information include www.medicareinteractive.org, http://www.medicare.gov/Pubs/pdf/10969.pdf, and http://www.medicare.gov/coverage/home-health-services.html.

By contrast, for individuals who have exhausted nearly all of their income and assets, Medicaid offers very broad coverage of long-term services and supports. Medicaid, unlike Medicare, covers all institutional care expenses for eligible individuals. In addition, Medicaid offers a home care benefit that specifically covers personal care, and eligibility does not require that an individual need skilled nursing care.

Although Medicaid's coverage of long-term care initially included only institution-based care, beginning in the 1980s, the program began to cover home- and community-based services (HCBS).[20] The growth of Medicaid spending on HCBS as a share of total spending on LTSS has been rapid. In 1995, of the $54 billion spent by Medicaid on LTSS, 20% was spent on HCBS versus 80% that was spent on institutional care. By 2011, of the $123 billion that Medicaid spent on LTSS, the share spent on HCBS had grown to 45% (The Kaiser Commission on Medicaid and the Uninsured (2011)). The sharp increase in funding for HCBS owes to multiple factors. First, due to the high cost of institutional care, it is widely hoped that shifting from institution-based to home- and community-based care ("re-balancing") will reduce state expenditures on LTSS. Another important factor was the Supreme Court's 1999 Olmstead decision, which required states to make reasonable accommodation for a disabled individual's desire to live in the community rather than an institution.[21]

In spite of their quick growth, Medicaid's HCBS programs have not yet proven themselves to be a panacea for the crisis in the American LTSS system. In a seminal study of HCBS demonstration programs from the 1960s to the 1980s, Weissert et al. (1988) issued a grim pronouncement on the potential for HCBS to reduce institutionalization and costs. Comparing groups treated with access to home- and community-based services to control groups, they found higher costs and utilization in the treatment group, no improvement in health outcomes, and only small savings from reduced use of institution-based care.[22] The demonstrations did, however, identify gains in patient and caregiver satisfaction.

[20] The three main HCBS programs are the mandatory home health services state plan benefit, the optional personal care services state plan benefit, and the optional § 1915(c) HCBS waivers. The 1915(c) waivers represent two-thirds of total Medicaid LTSS spending on HCBS.

[21] *Olmstead v. L.C.*, 527 U.S. 581 (1999).

[22] The authors attributed this result to poorly targeted programs: despite being severely impaired, the individuals in the control group experienced relatively little institutionalization, leaving little scope for gains in the treatment group.

Since that study, results in the economics literature on whether expansions of home care can reduce the use of institutional care have remained inconclusive. In a study of Medicare home care subsidies, Ettner (1994) found that larger subsidies reduced the use of institutional care. Pezzin et al. (1996), using data from the Channeling Demonstration, observed similar results. That paper found that, relative to a control group, individuals treated with more access to home care were more likely to live independently and less likely to live in institutions or co-reside with their children. However, using data from the National Long-Term Care Survey, Hoerger et al. (1996) did not find that states with more accessible HCBS had lower rates of institutional care utilization. Instead, they found that individuals in these states shifted from co-residence with children to living independently, but the rate of institutionalization remained unchanged.

There are also concerns that increased coverage of home care induces individuals to substitute formal care where they previously used informal care. Ettner (1994) found exactly this pattern of substitution. Studying a decrease in the generosity of Medicare's home health benefit, Golberstein et al. (2011) observed that low-income individuals responded by using more informal care to replace the formal health services. Using data from Canada, Stabile et al. (2006) found that increased availability of publicly funded home care reduced the use of informal care. By contrast, with data from Scotland, Bell et al. (2007) did not see any such reduction in informal care following a similar expansion of formal home care.

Some also fear that an overly generous Medicaid program might incentivize individuals to deplete their resources to become eligible for these benefits. Recent work by Gardner and Gilleskie (2012) finds modest support for this notion. Using data from the AHEAD cohort from 1993-2000, the authors find that policy variables associated with the generosity of state Medicaid programs (HCBS spending per eligible elderly beneficiary, asset limits for HCBS eligibility) have a small but significant effect on the asset holdings of the elderly and the probability of Medicaid enrollment. Conversely, variables related to eligibility and generosity of nursing home coverage were found to have no effect on assets and Medicaid enrollment.

Another issue is that Medicaid coverage is uneven across states. There is wide variation in Medicaid eligibility, access, and limits on services. In addition, many states have implemented waiting lists for their § 1915(c) waiver programs in an effort to contain costs. According the Kaiser Family Foundation, in 2012, there were nearly 524,000 people on these waiting lists, which had a national average waiting time of 27 months.[23]

In order to further compliance with the law after Olmstead and to rein in LTSS expenses, states are expanding their arsenal of long-term care policies. Consumer- or participant-directed services are increasingly being offered under the HCBS waivers and offer one promising direction. As of 2010, at least 37 states offered a consumer-directed program as part of their HCBS waivers (O'Keeffe et al. (2010)).[24] These programs are an alternative to the traditional home care agency model of service delivery. By placing the funds that would have been paid to a home care agency under the discretion of a Medicaid beneficiary, the programs allow individuals to coordinate their own personal care services. In particular, beneficiaries are given the authority to hire, train, and dismiss their own workers, which may include friends and relatives. These policies are premised on the ideas that even severely impaired individuals are capable of articulating their care preferences and that the nature of the care required is non-medical or un-skilled and so can be performed by family members. In general, analyses of consumer-directed programs have found higher levels of patient satisfaction and comparable spending and health outcomes relative to individuals receiving care from home care agencies (Benjamin (2001); Dale and Brown (2005); Brown et al. (2007); Newcomer et al. (2011)).

Because of their central importance in the American LTSS system, strengthening state support for caregivers was an important principle of the Commission on Long-Term Care. While compensation of caregivers is possible under consumer-directed programs, another direction for long-term care policy is direct compensation of informal caregivers by the state. This approach is rare in the U.S. but is quite common in European countries. Austria, Germany, and Luxembourg all have "Cash Allowance for Care" programs. In the U.K., a

[23]See http://kff.org/medicaid/report/medicaid-home-and-community-based-service-programs/. These figures are for all groups are for all groups requiring LTSS not just the elderly. KFF reports that there were 129,758 "aged/disabled" and 35,463 "aged" individuals on these waiting lists.

[24]The most well-known pilot project evaluation of these services is the National Cash and Counseling Evaluation Demonstration, launched by the Robert Wood Johnson Foundation in 1995.

"Carer's Allowance" of £61.35 per week (approximately \$97 at November 2014 exchange rates) is provided to individuals who spent 35 or more hours a week caring for someone with long-term care needs.[25] Alternatively, respite care or adult day care programs could be used to reduce the hourly burden on a caregiver. The Commission on Long-Term Care reported that results from these policies have been "mixed" to date and that further research is needed (Commission on Long-Term Care (2013), pp. 53-54).

As is evident from this discussion, there is a diverse set of options available to policy makers. Many of these potential policies have not yet been implemented in the U.S., and even among the ones that have, the implementation has often been on a very small scale. Furthermore, many questions remain regarding how these policies will affect the decisions and well-being of LTSS recipients and what promise, if any, these policies might have for overcoming the problems of the current long-term care system. The next section develops a model with which these policies can be studied. The following section describes the data and the parameterization, solution, and estimation of the model. The policy discussion is picked up again in Section 1.6. That section describes how each policy is implemented in the context of the model and presents the results of the simulations.

1.3 Model

The model is populated by families, and each family contains two members: an elderly parent (the "old," with superscript o) and an adult child (the "young," with superscript y). The sources of uncertainty in the model are shocks to the parent's health h_t and mortality.[26] A parent's health determines the number of hours of long-term care Q_t that the parent requires. These needs can be met by a combination of formal and informal care. Formal care can be purchased at an hourly price p_t outside of a nursing home. Alternatively, for nursing home residents, formal care sufficient to cover long-term care needs is included in the price P_t

[25] See https://www.gov.uk/carers-allowance/overview.

[26] A previous version of the model included shocks to the child's wage w_t. To the extent that children use co-residence with their parents to insure themselves against wage risk, the omission of this source of risk in the current model will make children relatively less willing to co-reside with parents. This will understate the supply of informal care.

of the institution. Informal care hours q_t are provided by the parent's child at the child's discretion. The constraint that the hours of formal and informal care sum to total long-term care needs is always binding. Government-provided social insurance, denoted b_t, provides limited coverage of long-term care needs for those residing outside of institutions and full coverage for those residing within them.

In each period t while the parent is alive, the state of the parent-child pair is captured by five variables: parent's age t, parent's permanent income I, parent's assets a_t, parent's health h_t, and child's wage w_t. Taking these variables as given, parents choose their living arrangement r_t, consumption spending $\hat{c}_t^o$, the next period's assets a_{t+1}, and the financial transfer T_t they make to their children. Living arrangements may be chosen among living independently $r_t = 0$, co-residing with children $r_t = 1$, or living in an institution $r_t = 2$. The co-resident living arrangement is only available within the parent's choice set if it is preferred by the child to the arrangement the parent would otherwise choose if co-residence were not available. Therefore, children effectively have a veto over the formation of a joint household. Children choose their hours of market work L_t, their hours of informal care-giving q_t, and their hours of leisure l_t. The model assumes that children are not able to or would optimally choose not to save.[27] As a result, their consumption is fully determined by their choices of market work and their parent's financial transfer. A parent dies with certainty by period $T + 1$ and is survived by her child who receives her remaining assets upon her death.

1.3.1 Preferences

The model assumes two-sided altruism: both parent and child are altruistic toward each other, though the extent of their altruism may differ. The expected present discounted value

[27] The assumption that at least one of the two family members cannot save is needed because of the theoretical issues inherent in any model with imperfect altruism in which multiple savers interact strategically. A fuller discussion is contained below in Section 1.3.4.2.

of lifetime utility of the old from the perspective of time t is given by:

$$\begin{aligned} V_t^o = & \quad U_t^o + \eta U_t^y \\ & + \ \mathbb{E}_t \sum_{\tau=t+1}^{T+1} \beta^{\tau-t} \left[\left(\prod_{k=t+1}^{\tau-1} s_k \right) \left\{ s_\tau \left(U_\tau^o + \eta U_\tau^y \right) + (1 - s_\tau) \, \eta D_\tau^y \right\} \right] \end{aligned}$$

where U_t^i is the period t utility of family member i, the parameter η determines the extent of the old's altruism toward the young, s_t is the probability that the old survive from period $t-1$ to period t, and D_t^y is the terminal value function of the young. By assumption, the old are dead with certainty by $T+1$, so $s_{T+1} = 0$. Similarly, the expected present discounted value of lifetime utility for the young from the perspective of period t is given by:

$$\begin{aligned} V_t^y = & \quad U_t^y + \kappa U_t^o \\ & + \ \mathbb{E}_t \sum_{\tau=t+1}^{T+1} \beta^{\tau-t} \left[\left(\prod_{k=t+1}^{\tau-1} s_k \right) \left\{ s_\tau \left(U_\tau^y + \kappa U_\tau^o \right) + (1 - s_\tau) \, D_\tau^y \right\} \right] \end{aligned}$$

where the parameter κ determines the extent of altruism of the young toward the old. The period t utilities of old and young are defined as follows. The old have preferences only over their own consumption:

$$U_t^o = u\left(c_t^o\right)$$

The preferences of the young are given by:

$$U_t^y \quad = \quad \begin{cases} u(c_t^y) + \gamma v\left(l_t\right) + \alpha & \text{if living separately} \\ u(c_t^y) + \gamma v\left(l_t\right) & \text{if co-residing} \end{cases}$$

The three components represent preferences over consumption c_t^y, leisure l_t, and the living arrangement itself. The parameter α is the direct, non-pecuniary effect on the utility of the young of living independently from their parents. From this definition of preferences, it is implicit that, for both young and old, preferences over consumption and leisure are state-*independent*: that is, the marginal utilities of consumption and leisure are unaffected by the parent's health and living arrangements.[28]

1.3.2 Constraints

The model contains four constraints: budget constraints for young and old, a time constraint for the young, and the constraint on hours of long-term care needs Q_t for the old. The budget constraints vary somewhat with the choice of living arrangements. This section deals with all of the cases.

1.3.2.1 Budget constraint of non-co-resident parent

When not co-residing, the budget constraint of the parent is given by:

$$a_{t+1} = R_t \left(a_t + I + b_t - M_t - \hat{c}_t^o - T_t\right) \geq 0$$

Assets at the start of period t are represented by a_t. Assets, together with permanent income I and government transfers b_t, and net of out-of-pocket medical expenditures on long-term care M_t, yield the cash on hand that the parent can allocate between consumption spending $\hat{c}_t^o$, financial transfers T_t, and tomorrow's assets a_{t+1}. Unspent cash grows at the real interest rate R_t. Parents are assumed to be unable to borrow: $a_t \geq 0$. Medical expenditures depend on the choice of living arrangement r_t and the supply of informal care q_t from the young. They are given by:

$$M_t = \begin{cases} p_t \left(Q_t - q_t\right) & \text{if } r_t \neq 2 \text{ (non-institutional care)} \\ P_t & \text{if } r_t = 2 \text{ (institutional care)} \end{cases}$$

[28] There is limited evidence on how health affects the marginal utility of consumption. Finkelstein et al. (2013) estimate that a one standard deviation increase in the number of chronic conditions reduces the marginal utility of consumption by 11 percent. Brown et al. (2012) find their survey respondents to be "relatively evenly divided" in their preferences for allocating consumption to healthy versus sick states. Palumbo (1999) and De Nardi et al. (2010), in models similar to the one in this paper, allow health state to affect the marginal utility of consumption. Palumbo finds that allowing health-dependent utility does not affect the paper's results. De Nardi et al. find that being in the *healthy* state lowers the marginal utility of consumption relative to the sick state though this estimate is not statistically significant. In line with the results in these two papers, this paper ignores state-dependence.

If the parent lives outside of an institution $r_t \neq 2$, then any long-term care needs that remain after deducting the hours of informal care received from their child, $Q_t - q_t$, must be purchased at an hourly price p_t. Alternatively, if the parent lives in an institution $r_t = 2$, the cost of that arrangement P_t covers all long-term care needs.

1.3.2.2 Budget and time constraints of non-co-resident child

The child's time is constrained by the total number of hours in the period, $\bar{T}$, and the fact that hours of market work L_t, hours of informal care q_t, and hours of leisure l_t must all be non-negative:

$$\begin{aligned} L_t + q_t + l_t &= \bar{T} \\ L_t, q_t, l_t &\geq 0 \end{aligned}$$

When parent and child live apart, the child's budget constraint can be expressed as:

$$c_t^y = w_t L_t + w_{nl} + T_t \geq 0$$

The income the child receives depends on her wage w_t and hours of labor supplied to the market L_t, income earned from other sources w_{nl} (i.e. the income of the child's partner and household non-labor income), and the financial transfer from the parent T_t.[29]

1.3.2.3 Budget constraint for co-residing parent and child

When co-residing, parent and child are assumed to pool resources and maximize a weighted sum of their utilities. The budget constraint in the joint household is

$$a_{t+1} = R_t \left(a_t + I + w_t L_t + w_{nl} + b_t - M_t - \frac{c_t^o + c_t^y}{\phi} \right) \geq 0$$

[29]The child's unearned income w_{nl} was not mentioned in the description of the state variables in the model overview intentionally. The value for w_{nl} is assumed to be a constant proportion of the child's wage w_t, so no additional state variable is needed. This is discussed in more detail in the section on model parameterization.

The parameter ϕ determines the extent of economies of scale. All consumption in the joint household is assumed to be private.

1.3.2.4 Social insurance

The social insurance program in the model is based on the Medicaid and Supplemental Security Income programs. As in these programs, this insurance is available to two groups of individuals. The first group, known as the "categorically needy" meet certain income and asset eligibility thresholds, $\bar{I}$ and $\bar{a}$, respectively. The second group, the "medically needy" may have income that exceeds the threshold but is insufficient to meet their medical expenses M_t. For individuals living in the community $r_t \neq 2$, government benefits cover long-term care medical expenses up to a maximum reimbursement of $\bar{M}$ while providing a floor level of purchasing power $\bar{c}$. The maximum reimbursement captures the limitations of the Medicaid home care benefit, which is intended to cover care in the community only when it is less expensive than institutional care. For those living in the community, government benefits are given by:

$$b_t = max\left\{0, \bar{c} + min\left\{\bar{M}, M_t\right\} - max\left\{I - \bar{I}, 0\right\} - max\left\{a_t - \bar{a}, 0\right\}\right\}$$

For individuals living in an institution $r_t = 2$, government benefits are

$$b_t = max\left\{0, P_t - max\left\{I - \bar{I}, 0\right\} - max\left\{a_t - \bar{a}, 0\right\}\right\}$$

For those residing in an institution, medical expenses are equal to the cost of institutional care P_t. Government insurance covers the cost of all institutional care once the individual has exhausted all of their income and assets down the eligibility thresholds. As a consequence of the design of government benefits, for poor individuals with severe health needs, government benefits alone will not cover the cost of the care should they reside in the community. If their children are unwilling to cover their remaining needs, these individuals will be forced to enter a nursing home.

1.3.2.5 Consumption

The consumption of the old has two components: their consumption spending $\hat{c}_t^o$, and the consumption value of long-term care services they receive, $c_{m,t}$. Therefore, the total value of their consumption, which enters their utility function, is:

$$c_t^o = \hat{c}_t^o + c_{m,t}$$

It is assumed that $c_{m,t}$ is equal to zero for those residing outside of institutions. For those within institutions, $c_{m,t}$ may take on two values depending on whether the institutional care is privately financed, in which case $c_{m,t} = c_{priv}$, or publicly financed, $c_{m,t} = c_{pub}$. Moreover, it is assumed that individuals inside of institutions do not have further discretion over their consumption, so their consumption spending $\hat{c}_t^o$ is restricted to be zero.

1.3.3 Timing

Due to the potential existence of multiple equilibria in a simultaneous-move version of this game, it is necessary to specify the timing of the actions within each period t of the model. The basic intuition for the existence of multiple equilibria is that imperfect altruism $(\eta, \kappa < 1)$ can lead to situations in which young and old value living arrangements differently. Two examples should suffice to clarify this point.[30]

First, consider the case of a low-income child who prefers to live independently of his parent as long as the parent provides a financial transfer to finance the child's consumption. Suppose that the same child would prefer co-residence in the absence of the transfer. Assume that the parent prefers co-residence. In a simultaneous-move version of the game, two equilibria are possible: (i) child and parent live separately and the parent makes a transfer, or (ii) parent withholds the transfer and the two co-reside. In an extensive form game, the outcome would depend on the ordering of the decisions. If the parent could commit upfront to withholding the transfer, the outcome would be co-residence. Otherwise, knowing that

[30] The need for a timing protocol is also very clearly articulated in Appendix C of Kaplan (2012) for a similar model.

the parent's threat to withhold a transfer is not credible, the child would deny the option of co-residence to the parent, and so the outcome would be living separately.

As a second example, consider a parent with long-term care needs, who prefers to live in the community but would be forced to reside in a nursing home if her child did not provide informal care. Suppose that the child prefers that the parent enter the nursing home. In a simultaneous-move version of the game, two equilibria are possible: (i) child provides informal care and parent resides in the community, or (ii) child withholds informal care, and parent resides in a nursing home. Again, the timing matters: if the child can commit to not providing informal care, the parent will choose to live in a nursing home. If the parent can commit first to the living arrangement, then the parent will remain in the community, and the child will provide informal care.

The timing assumed by the model is depicted in Figure 1.1 and Table 1.1. Each period t of the model is divided into five phases, numbered $0, 1, ..., 4$. At the beginning of period t, the model enters phase 0. The state of the world at the beginning of phase 0 is given by the vector $S_{t,0} = (I, a_t, h_{t-1}, w_t)$. During this phase, the only action is taken by nature, which draws an updated value for the parent's health h_t. In phase 1, the parent takes the vector $S_{t,1} = (I, a_t, h_t, w_t)$ as given and chooses the living arrangement r_t, conditional on her choice set of living arrangements, which depends on the willingness of her child to co-reside. As the model enters phase 2, the state is given by $S_{t,2} = (S_{t,1}, r_t)$, which the child takes as given. In this phase, the child chooses her hours worked L_t, her hours of informal care q_t, and her hours of leisure l_t. In phase 3, taking the state $S_{t,3} = (S_{t,2}, L_t, q_t)$ as given, the parent chooses consumption spending $\hat{c}_t^o$, the financial transfer T_t, and the next period's assets a_{t+1}. Finally, in phase 4, nature draws the mortality shock of the parent, who survives with probability s_t.

There is a single exception to this timing protocol. When young and old co-reside $r_t = 1$, the phases 2 and 3 are combined into a single phase. In this phase, the state is given by $S_{t,2} = (S_{t,1}, 1)$. Parent and child pool their resources and jointly make all remaining decisions to solve a Pareto problem where λ is the weight given to the parent's preferences and $1 - \lambda$ is the weight given to the child's preferences. Appendix A.1 describes the decision problems in each phase of the stage game in greater detail.

1.3.4 Discussion of Model Assumptions

This section discusses some of the model's assumptions, why they were made, their effect on model outcomes, and how they can be justified.

1.3.4.1 Model includes only one child

While many families have multiple children, the analysis here is restricted to the interactions of a single parent-child pair. The restriction is necessary for the tractability of the model, but the choice is also validated by patterns of co-residence and informal care-giving in the data. While several papers have demonstrated that many families use multiple child care-givers (Checkovich and Stern (2002); Byrne et al. (2009)), the patterns in the Health and Retirement Study (HRS) show that this picture changes when one considers the intensive (number of hours) margin rather than the extensive (any contribution) margin.

Tables 1.2 and 1.3 analyze a sample of single, elderly, female HRS survey respondents who receive some fraction of their long-term care from their adult children. These data are described in much greater detail in Section 1.4.2. Table 1.2 confirms the extensive margin results found in the literature, which suggest that a sizable minority of families have multiple children contributing to a parent's care. The rows divide families by number of children, and the columns divide families by the number of those children who contribute to the parent's long-term care. The numbers appearing in the table are the percentages of families in a given row that belong in each column, so the entries in a given row sum to 100 percent. An observation in the table is a family at a particular interview. Among families with 2 children, 85 percent have a single child caregiver whereas in 15 percent of families, both children contribute to long-term care. Among families with 3 children, a single child provides all care in 76 percent of cases. Overall, for families with two or more children, multiple children contribute in just under 25 percent of cases.[31]

[31] In results not shown, the table was re-created using only a single observation from each family. Looking across all interviews, participation by multiple children increases. In families with two or more children, a single child contributes to parent's informal care in 54 percent of cases while multiple children contribute in 46 percent of cases.

Yet, while it is not uncommon for a family to use multiple caregivers, Table 1.3 shows that a single child caregiver provides the vast majority of those hours. The percentages in this table are the fraction of total child hours supplied by the child who supplied the most hours.[32] Across all families with two or more children, the child who supplies the most hours contributes on average 93 percent of all child hours (first row). When one restricts the analysis to families in which multiple children contribute, the primary child caregiver supplies on average 69 percent of all child hours (second row). Some researchers have suggested that children might take turns in the primary caregiver role over time to avoid caregiver "burnout." The results in the third and fourth rows do not provide evidence for this hypothesis. For these rows, hours were summed across all interviews for each child, and the percentage of total hours supplied by the primary caregiver was recomputed. Looking over time, the primary child caregiver supplies 89 percent of total child hours overall and 74 percent in families where two or more children contribute to their parent's care. The appearance that a single child caregiver supplies the majority of hours actually becomes stronger when hours are summed across time.

These results suggest that restricting the analysis to a single primary child caregiver captures the majority of the informal care supplied by children. Another question is whether other unobserved sibling behavior affects the supply of hours from the designated primary caregiver. In particular, siblings could make side payments to lessen the burden on the caregiver. Whether side payments are made between the other children and the primary caregiver is an interesting question, but it is one on which little if any data are currently available. In any case, due to the difficulty of modeling the strategic interaction of many siblings in the dynamic context, the model omits the possibility of this type of interaction.[33]

One additional consideration which arises from the focus on a single child per family is the practical question of how to select the primary child caregiver from each family. Such

[32] Three points should be kept in mind when interpreting the figures in Table 1.3. First, ties between children are broken arbitrarily. Second, rather than impute missing values, families with missing observations for any child's hours have been excluded from these tallies. Finally, hours provided by a child-in-law (i.e. a child's spouse) are counted as having been provided by the child herself.

[33] Future work will explore the effect of this omission by separately estimating the model for respondents with one child (461 respondents) and respondents with multiple children.

selection is necessary for generating the data inputs that are required for the estimation and simulation of the model. This issue is dealt with in Section 1.4.2.6.

1.3.4.2 Children cannot save

Though this restriction has important implications for the willingness of children to provide informal care, it was made out of necessity. As Kaplan (2012) points out in the case of a similar model, "the theoretical challenges to working with an imperfectly altruistic model without commitment in which both parties can save are overwhelming. Such models generally have a large set of Markov equilibria and to date are only understood in very stylized settings" (Kaplan (2012), p. 474).

Given that only one household member could be allowed to save, the decision to allow a savings decision for the parent instead of the child was an obvious one in this context for several reasons. First, data on the assets of children are not available in the HRS. Second, a preliminary reduced form analysis (Section 1.4.2.3) showed that a parent's wealth is a very important determinant of the choice of care arrangements, which are the focus of the model. Third, the important dynamics of long-term care decisions could not be captured without including assets: not only do assets affect the choice of care arrangements, but out-of-pocket medical spending is perhaps the primary cause of asset spend-down by the elderly. Finally, an important objective of this paper is to extend the life-cycle model literature, and modeling the savings behavior of the elderly makes this paper comparable to the papers in the life-cycle literature.

All of these points notwithstanding, the fact that the young cannot save does have implications for their behavior. The model assumes that the young inherit their parents' remaining assets upon their parents' death. Because the young have not accumulated assets of their own, this inheritance appears relatively more important. To the extent that the young can influence the size of the bequest by providing informal care that reduces their parent's out-of-pocket medical expenditures, the assumption that the young cannot save will increase their provision of care.

1.3.4.3 Children cannot make financial transfers

This restriction was made because very few children make financial transfers to their parents in the data. Pooling all of the children from the sample of respondents used in this paper, only 6.5% make a financial transfer to their parent in a given two year period. The median value of these transfers, conditional on the transfer being greater than zero, was $1,100. By contrast, in a given two-year period, 23% of respondents reported making a transfer with a median amount of $2,700. These results are consistent with the literature, which has found that the magnitude of financial transfers from children is modest relative to the value of the informal care that they supply (McGarry and Schoeni (1995); McGarry and Schoeni (1997)). Because relatively few children make financial transfers, these are excluded from the model.[34]

1.3.4.4 Parent and child can anticipate the parent's long-term care needs

While it is reasonable to doubt whether people are aware of the likelihood that they will need long-term care in the future, there is some evidence that individuals can anticipate their long-term care needs. For example, Finkelstein and McGarry (2006) find that individuals' subjective assessments of their own risk of nursing home use do predict future nursing home use. In addition, these beliefs contain residual private information beyond what is captured in the data that insurance companies use to assess an individual's risk. The literature contains similar findings for individuals' assessments of their mortality risk (Hurd and McGarry (1995), Hurd and McGarry (2002); Smith et al. (2001)). The assumption is also made for comparability with recent models in this literature, which make use of this assumption (De Nardi et al. (2010); De Nardi et al. (2013); Lockwood (2012)).

[34]It is worth noting that, while ignoring transfers from children is a useful simplification, being able to include these transfers would provide a helpful angle for the identification of a child's altruism. Because financial transfers only arise as a result of altruism within the model, variation in financial transfers can be used to recover the degree of altruism.

1.3.4.5 Parent's health is not affected by living or care arrangement

The assumption that a parent's health is not affected by her choices is an important one in the model. This question can be linked to a much broader literature on whether investments in health at older ages can affect health or mortality. The general consensus appears to be that an individual's health in old age is largely predetermined by investments made much earlier in life and therefore not affected much by utilization at older ages. The evidence for this view comes primarily from research on how health insurance affects health. The reference point in this literature is the RAND Health Insurance Experiment, which found an insignificant effect of health insurance on health outcomes (Newhouse and RAND Corporation: Insurance Experiment Group (1993)). More recently, the Oregon Experiment generated no significant improvement in physical health outcomes over two years for the individuals randomly assigned to health insurance coverage (Baicker et al. (2013)). Consistent with this evidence, Finkelstein and McKnight (2008) find that the introduction of Medicare in 1965 did not impact the mortality of the elderly over its first 10 years though it did dramatically reduce the exposure of the elderly to out-of-pocket medical expenditure risk.[35]

It remains difficult to assess whether care arrangements can affect an individual's health. Assignment to home care versus institutional care is generally non-random. However, home care demonstration programs that utilized a treatment-control framework offer some evidence on this question. Weissert et al. (1988) review home care demonstration programs from the 1960s through the 1980s. The authors found that individuals treated with more accessible home care, who were more likely to receive care in the community, did not have better mortality or physical functioning outcomes than members of the control groups.[36]

Another question is whether the receipt of formal versus informal care affects an individual's health outcomes. Related to this issue is the extent to which informal care can

[35]Khwaja (2010) reaches the same conclusion, that the primary benefit of Medicare is insurance against spending risk rather than improved health and longevity. However, comparing the mortality outcomes of individuals with "non-deferrable" hospital admissions around Medicare eligibility at age 65, Card et al. (2009) found that Medicare coverage was associated with a 20% decline in 7-day mortality.

[36]In principle, state variation in Medicaid laws that generates variation in the accessibility of home care could potentially be used as an instrument to get quasi-exogenous variation in assignment to home- and institution-based care, which could be used to examine the effect of care arrangements on health outcomes. This could be an interesting avenue to address this question in the future.

substitute for formal care. The model assumes that informal care is a perfect substitute for formal care: an hour of informal care replaces exactly one hour of formal care in meeting an individual's long-term care needs. The assumption is premised on the fact that long-term care, the type of care modeled in this paper, is generally non-medical in nature, and workers in that sector are considered low-skilled. Indeed, part of the rationale behind consumer-direction is that the services provided are sufficiently non-technical that individuals can hire and train their own caregivers. And even though child caregivers may not receive any formal training, policy experts are dubious about the quality of the training currently given to formal care workers (Commission on Long-Term Care (2013)).

The evidence in the literature appears to support substitutability, at least as far as health outcomes are concerned. One study of the Cash and Counseling Demonstration and Evaluation, a large pilot study of consumer-directed home care, concluded that individuals treated with consumer-direction, relative to a control group who used home care agencies, were "no more likely to suffer care-related health problems" (Brown et al. (2007), p. 51).[37] Consistent with this evidence, Newcomer et al. (2011) find that among individuals in a consumer-directed care program, those receiving help from relatives did not have different health outcomes (injuries, bedsores, contractures) than individuals receiving paid care.

1.3.4.6 Parent and child play a cooperative game when co-residing

The assumption that parents and children play a cooperative game when living together seems more plausible than the alternative. Furthermore, there is a precedent for this assumption in the literature. For example, Pezzin and Schone (1999) assumes that equilibrium decisions inside of co-residence are the solution to a Nash bargaining problem with equal weights on mother and daughter. The paper models decisions outside of co-residence as part of a Cournot-Nash equilibrium in which parent and child separately maximize their own utilities.

[37] In all of the demonstration program studies, even though health outcomes did not differ clearly between groups, individuals treated in the community and individuals in consumer-directed programs reported much greater satisfaction with their care than individuals in the control groups.

A further difficulty, however, lies in determining how resources are allocated within the co-resident household. The model assumes that parent and child solve a Pareto problem, but it is not clear that there is sufficient information to identify the Pareto weight. To proceed, the baseline results use $\lambda = 0.5$, assigning equal weight to each member's preferences. Future work will examine the sensitivity of the results to alternative values of the Pareto weight and compare these results to an extension of the model in which parent and child play a non-cooperative game in co-residence.

1.3.4.7 No commitment

The assumption of no commitment imposes strong restrictions on the ability of parent and child to contract on the child's provision of informal care. In particular, parent and child cannot commit to an arrangement where the child provides informal care (phase 2) for a fixed wage to be paid out in the next phase (phase 3). Clearly, this assumption is an impediment to the success of consumer-directed home care policies in the model. However, this assumption is a useful starting point because it provides a lower bound on the effectiveness of these policies because of the inefficiencies generated by the lack of commitment and non-cooperation outside of co-residence. Future work will explore the effects of relaxing this assumption.

1.3.4.8 No moral hazard in use of home care

One consequence of expressing a parent's long-term care needs as a constraint is that parents do not over-consume home health services when these are provided free of charge by Medicaid.[38] To the extent that this moral hazard problem is an issue, the results of this paper's simulations will provide a lower bound on government expenditures. As the government's ability to screen patients for home care eligibility improves and the long-term care system becomes more integrated with the acute care system, better targeting of home care benefits may reduce the threat of this form of moral hazard. In any case, the choice of families to

[38] There is, however, a concern that public home care entails a moral hazard problem. As Norton (2000) puts it: "Who would not want some paid help at no out-of-pocket cost with household chores?"

substitute toward formal care and away from informal care due to the availability of home care benefits is probably a much greater issue. This type of substitution is captured in the model. Indeed, the model assumes that a child's time is perfectly substitutable with a formal care worker's time, perhaps exaggerating the magnitude of this effect.

1.4 Estimation

1.4.1 Method of Simulated Moments

The estimation of the model has two phases. In the first stage, the majority of the model's parameters are either calibrated or estimated external to the model. Let the estimated values of these parameters be denoted by $\hat{\chi}$. The parameterization of χ is described in detail in section 1.4.2. Let $\theta \equiv (\eta, \kappa, \alpha, \gamma)$ denote all of the remaining model parameters to be estimated within the model using the Method of Simulated Moments (MSM). The MSM works by choosing θ such that particular patterns ("moments") in the simulated data match as closely as possible the same patterns found in the real data. Let $g_s(\theta, \hat{\chi})$ be a vector of simulated moments generated from the model simulated data when the model is parameterized by $(\theta, \hat{\chi})$. The dimension of $g_s()$ must be at least as great as the dimension of θ. Let $\hat{\pi}$ be the analogous vector of moments computed from the real data. The MSM estimate $\hat{\theta}$ is defined as:

$$\hat{\theta} \equiv \underset{\theta \in \Theta}{argmin} \left(\hat{\pi} - g_s(\theta, \hat{\chi})\right)' W \left(\hat{\pi} - g_s(\theta, \hat{\chi})\right)$$

where W is a positive definite weighting matrix.[39]

1.4.2 Data and Model Parameterization

The majority of the model parameters are taken from the literature or estimated external to the model. A complete listing of these parameters can be found in Table 1.11. The following

[39]The matrix W used in the current estimation is a diagonal matrix where the entries are the inverses of the variances of the sample moments.

subsections describe these choices.

1.4.2.1 Data

The data used in this paper are drawn from the Asset and Health Dynamics Among the Oldest Old (AHEAD) cohort of the Health and Retirement Study (HRS). The AHEAD study began in 1993 as a sample of the non-institutionalized American population aged 70 and older. Though none of the survey respondents were institutionalized at the time of the 1993 survey, since then follow-up interviews have followed these individuals as many of them entered institutional care. The survey includes detailed information on assets and income, living arrangements, health and health services utilization, and the receipt of informal care. The data also include information on the survey respondent's children, including their gender, age, education, labor force participation, the number of children they have, and a range for their income. The AHEAD survey was repeated in 1995 and 1998 when the survey was incorporated into the HRS, after which re-interviews were conducted every two years beginning in 2000. The most recent data used in this paper are from 2010.

1.4.2.2 Sample Selection

From the AHEAD cohort, the sample for this paper selected females who were 72 years of age or older in 1995, were unmarried from 1995 onward, and who reported having one or more children in each core interview from 1995.[40] Summary statistics for this population are presented in Table 1.4. An observation is a respondent interview, so each respondent appears multiple times. The median age in the sample is 84 years old, and much of the sample is receiving help with long-term care needs. Over 40% need help with the activities of daily living (ADLs), which include activities like bathing and dressing. Over 30% need help with instrumental ADLs, such as shopping and preparing meals. In addition, 5% are cognitively impaired on the basis of scoring an 8 or below on a 35 point total cognition score

[40] AHEAD interviews conducted while the survey respondent is alive are referred to as "core interviews." After a respondent has died, follow-up interviews are conducted with a proxy (generally a surviving child or spouse) who is most knowledgeable about the respondent's final years. These follow-up interviews are known as "exit interviews."

(Herzog and Wallace (1997)). Almost 50% receive help with ADL or IADL limitations, and 80% of these receive some help from their children.

The choice to restrict the sample to single females was made for two reasons. First, unmarried individuals, and in particular unmarried women, are much more likely to be at risk of institutionalization. Married individuals have access to informal care provided by their spouse and are less likely to experience prolonged stays in a nursing home or receive care from their children. Because women have a longer life expectancy than men, they tend to outlive their husbands and find themselves without a spouse to care for them.[41] As a result, the AHEAD data contain a much larger share of a single women than single men at advanced ages. Second, the decisions of a married couple are more complicated than those of an individual, so the restriction simplifies the model.

The model uses data from core and exit interviews from 1995 through 2010. The decision to exclude the 1993 data is based on known mis-measurement of assets in that year (Juster and Smith (1997); Juster et al. (2007)). It is also known that second home equity is not measured for some individuals in the 1995 data.[42] This paper uses the imputed values of second home equity in Cao and Juster (2004), which are available on the HRS website. Note that the measure of assets used throughout this paper is net wealth, including the net value of a second home.[43]

1.4.2.3 Living Arrangements

The model allows for a choice among three living arrangements: living independently, co-residing with an adult child, or living in an institution. This variable is derived from the data in the following way. Individuals are classified as living in an institution if any of the

[41]The life expectancy of a 65 year old male in the U.S. was 15 years in 1990. The life expectancy of a female was 19 years. (Social Security Administration Pub. No. 11-11536, August 2005.).

[42]Specifically, due to a skip-pattern error, individuals who did not live in their second homes for at least two months of the year were not asked about their second home equity.

[43]The use of net wealth is consistent with the literature. However, from a policy perspective, there is an important distinction between housing and non-housing assets. Indeed, while the Medicaid eligibility threshold for non-housing assets is around $2,000, the maximum Medicaid threshold for housing assets is considerably higher, around $800,000. Future work will take the distinction between housing and non-housing assets into account.

following are true: (i) the individual was reported to be living in an institution at the time of the interview (core interviews) or at the time of their death (exit interviews); (ii) for a core interview, the individual was reported to have spent 120 or more days in a nursing home since the previous core interview; or (iii) for an exit interview, the individual was reported to have spent 60 or more days in a nursing home since the previous core interview.[44] Individuals are classified as co-residing with children if they are not classified as residing in an institution and are reported be living with a child at the time of the interview for a core interview or at the time of their death for an exit interview.[45] Finally, individuals who are not classified as living in an institution or with their children are classified as living independently.

Figures 1.2 and 1.3 illustrate several patterns of interest in the data with respect to living arrangements. Figure 1.2 shows the patterns of living arrangements by age. The main features of the figure are the secular decline in the share of elderly females living independently from over 70 percent in their mid-seventies to less than 20 percent by age 100 and the simultaneous rise in institutionalization from roughly zero to 60 percent between ages 70 and 100.[46] Another striking feature of the data is that the share of the elderly female population co-residing with their children is always above 20 percent of the sample and is very constant with age.

The three panels in Figure 1.3 show the gradients of living arrangements with respect to parent and child income groups. Within each panel, the data have been divided into 4 quartiles for parent's permanent (non-asset) income and 3 categories of child "potential" household income.[47] The top panel shows that the rate of living independently increases as child and parent incomes increase, moving from the left to right of the panel. The opposite pattern is revealed in the second panel: the rate of co-residence decreases in both child and

[44] The median time elapsed between core interviews is two years. The median time elapsed between the final core interview and the exit interview is 15 months. De Nardi et al. (2013) use the same criteria to classify individuals as living in a nursing home.

[45] Note that this definition of co-residence does not take into account who is living with whom. A parent who moves in with her child is treated the same as a parent whose child moves in with her.

[46] Recall that the AHEAD sample was drawn from the non-institutionalized population in 1993, so these changes may be somewhat exaggerated.

[47] Child "potential" income is more fully discussed in Section 1.4.2.5. It is imputed for a given child's household using the income of similar child households with full-time child workers. By using these measures of child and parent income, the endogeneity of these variables in the figure is reduced.

parent incomes. The bottom panel displays the pattern of nursing home utilization. The patterns are less clear in this case though nursing home utilization is mostly decreasing with parent income and increasing in child income.

Tables 1.5 and 1.6 present the results of a preliminary reduced form analysis of the determinants of living arrangements. The reported estimates are the marginal effects from a multinomial logit model of living arrangements. Due to negative values of assets in a small fraction ($<$ 3 percent) of the sample, the inverse hyperbolic sine transformation was used for assets, child income, and parent income.[48] The results in Table 1.5 indicate that age and functional limitations exert a strong influence on living arrangements. Independence decreases with age and impairment, and these factors increase nursing home utilization. Interestingly, an increase in difficulties with instrumental activities of daily living (e.g. shopping, managing medications) increases the likelihood of co-residence, but an increase in ADLs does not.[49] Higher income and assets are associated with a higher probability of living independently and lower probabilities of co-residence or nursing home usage. While the number of children has no visible effect, an increase in the number of daughters decreases nursing home utilization while increasing independence. All measures of child characteristics are important. Older children and those with their own children are less likely to co-reside while having more unmarried children increases the chances of co-residence. Finally, higher child income significantly reduces co-residence while increasing both independence and nursing home utilization.

Table 1.5 does not attempt to address the endogeneity of incomes and assets. In particular, child income is affected by a child's caregiving decision, and parent's (asset) income and assets are affected by the costliness of different living arrangements. In addition, because only two measures of health, the numbers of ADLs and IADLs, are included, it is possible that assets and income are proxying for unobservable differences in health. Table 1.6 attempts to mitigate these issues in three ways. First, several additional measures of health

[48]The inverse hyperbolic sine transformation is given by: $f(x) = log\left(x + \sqrt{x^2+1}\right)$. It is an alternative to the standard log transformation often used when a variable takes on negative values.

[49]It is also conceivable that the causality flows in the other direction, and individuals co-residing with their children are more likely to report needing help with these activities because their children are there to provide that help.

are added as controls: body mass index and indicators for certain health conditions: heart disease, stroke, cancer, lung disease, arthritis, diabetes, and high blood pressure. Second, contemporaneous assets are replaced with assets from the 1995 interview, and income is replaced by permanent income, which is average non-asset income over the sample period. Third, contemporaneous child income is replaced by then mean of child income from the 1995 interview, which eliminates any contemporaneous effect of child's labor force participation and caregiving decisions on child income.

The results in Table 1.6 change only slightly. The biggest change is that income is insignificant in the second specification. It is likely that the importance of income in the first model was due either to reverse causality or an association between income and omitted components of health. Relative to the first model, the importance of assets is somewhat attenuated, but the fact remains that greater assets are associated with less nursing home utilization and more independence. This result suggests that wealthier individuals may be able to use their assets to purchase independence.[50] The effect of child income using the alternative measure is even stronger in the second specification. Parents with high-income children are less likely to co-reside and more likely to either live independently or in a nursing home. This finding suggests that a child's opportunity cost of time affects the availability of support that they provide to their parent through co-residence and informal caregiving.

1.4.2.4 Health states and required long-term care

Table 1.7 describes the 8 health states $h_t = 0, 1, ..., 7$ used in the model. These states are based on the actuarial model in Robinson (1996), which is the standard both within the industry as well as in the economics literature (Brown and Finkelstein (2008); Lockwood (2012)). Increasing numbers generally reflect increasing severity of impairment, with $h_t = 0$ representing good health with no functional limitations and $h_t = 7$ representing death. With each health status is associated a required number of hours of long-term care Q_t and a price of institutional care P_t. The price of institutional care takes on two values depending on health

[50] This idea has been suggested elsewhere: see Hotz et al. (2010) and Marshall et al. (2011).

status. For individuals with no cognitive impairment and fewer than two ADL limitations, $P_t = \$34,850$, the average annual price of an assisted living facility over this period in 2010 dollars. For individuals in worse health, $P_t = \$69,500$, the average annual price of a nursing home. This choice was made because cognitive impairment or two functional limitations are commonly used as the level of care criteria for nursing home care. The price of formal home care is assumed to be $p_t = p = \$23$ per hour. The values for p_t and P_t are from Lockwood (2012).

Long-term care needs Q_t are not observed in HRS data. Instead care needs must be inferred from data on the hours of long-term care *received* by the sub-sample of respondents who receive help with functional limitations. For these individuals, the HRS includes a list of all individuals who were reported to have assisted the survey respondent since the prior interview with a functional limitation and the number of hours helped by each in a typical month. Questions are asked about helpers if the respondent or proxy answers affirmatively to a sequence of questions like the following example for bathing:

> "Because of a health or memory problem do you have any difficulty with bathing or showering?"
>
> "Does anyone ever help you bathe?"

To compute values for Q_t, the hours of help received in each interview were summed for each respondent across all of their helpers. In order to be consistent with the time allocation parameters (next section), which limit the numbers of hours to be allocated in a day to 14, the monthly hours for each respondent are capped at 420, or 14 hours per days for 30 days. For each health state h_t, the mean number of hours is calculated over all respondents with fully non-missing hours data. Because not all individuals with a functional disability are receiving help, these means are scaled by the fraction of individuals in the health state who report receiving help.[51]

[51] To be more specific, suppose that in the data, among individuals in health state h, the fraction p_h report receiving help with their functional limitations, and among those receiving help, the mean number of hours received is H_h. Then, the number of hours of long-term care needs of individuals in health state h, Q_h, is calculated as $Q_h = p_h \times H_h$. The rationale underyling the calculation is that the fraction $1 - p_h$ do not need help with functional limitations. An alternative interpretation (which would suggest a different calculation)

The one-year transition probabilities between each state are computed from a multinomial logit model. The probability of transitioning from state i to state j for an individual of gender $s \in \{0 \text{ (male)}, 1 \text{ (female)}\}$ and age x is given by:

$$\frac{exp\left\{a_{ij} + b_j s + c_j \left(x - 73\right)\right\}}{\sum_{k=0}^{7} exp\left\{a_{ik} + b_k s + c_k \left(x - 73\right)\right\}}$$

The age 73 corresponds to period $t = 0$ in the model and so is used for convenience. Nine parameters $a_{i0}\ \forall i, b_0, c_0$ are normalized to zero. The remaining 54 parameters are estimated with maximum likelihood over a sample including all observations for both male and female respondents who are at least 65 years old and have non-missing health state data for the current and previous interview. The estimation utilizes data from all HRS core interviews from 1995-2010 to ensure that all cells of the transition matrix are populated. As the median time elapsed between interviews is 2 years, all transitions observed in the data are assumed to have taken place over 2 years. The survival probabilities s_t are computed from the estimated transitions probabilities.

1.4.2.5 Child Income Imputation

In the HRS, the only measure of child's income is total household income for the calendar year preceding the interview. There are three problems with this variable. First, income is reported as a categorical variable within five possible ranges.[52] Second, the necessary model inputs are not the child's total household income but measures of the child's wage w_t and "non-labor" income (including spouse's or partner's income) w_{nl}. Third, these reported income categories may be affected by selection bias. For example, a child who exits the labor force to care for a parent may have done so because he had limited economic opportunities, but he will also have a lower income as a consequence of the choice to provide care. The reported income bracket is contaminated by this latter possibility.

is that these individuals have unmet long-term care needs.

[52]These ranges are $< \$10,000$, $\$10,000 - \$35,000$, $> \$35,000$, and $> \$70,000$. In the 1995 AHEAD data, though the income question allowed for continuous values of income, many parents reported that they did not know the dollar amount of their child's income.

The procedure used to extract measures of child's wage w_t and non-labor income w_{nl} from the available data is done in three steps. First, using the reported categorical incomes, continuous values of child "actual" income are imputed using data from the March Current Population Survey from the calendar year for which incomes were reported. Individuals in the CPS are assigned to income brackets matching those in the HRS data. The imputed values are the means of household income for individuals in the CPS whose income falls in the same bracket with similar characteristics as the HRS children: by interview year, age, sex, whether married, education, whether working. Income brackets are imputed for HRS children with partial or missing bracket information. The "actual" income measure imputed from this step of the process still contains the selection bias.

Second, from the imputed data on "actual" child incomes, a least squares model of household income is estimated over a sample of children who are full-time workers regardless of whether their spouse or partner, if any, works. The least squares model is estimated separately by child gender and marital status, and the child characteristics included in the model are quadratics in age and education, the interaction of age and education, the number of children the child has, and dummies for whether any of these values are missing.[53] From this model, fitted values of child household "potential" income are predicted for the entire sample. This measure of a child's household income should be free of selection bias due to the care-giving and labor force participation decisions of the child.

The third and final step of the process extracts values for w_t and w_{nl} from the imputed potential household income. Let $\hat{w}_t$ denote the "potential" total income of the child's household were the child to be employed full-time. Let ψ equal the fraction of potential income earned by "non-child" sources, including non-labor income and income from the child's spouse or partner, if any. Then, the child's income in period t is equal to:

$$w_t L_t + w_{nl} = \underbrace{(1-\psi)\,\hat{w}_t\left(\frac{L_t}{2,000}\right)}_{w_t L_t} + \underbrace{\psi \hat{w}_t}_{w_{nl}}$$

[53]Missing values of age, education, and the number of children are replaced with zeros.

The child's implied hourly "wage" in this equation is given by $\frac{(1-\psi)\hat{w}_t}{2{,}000}$. If the child elects not to work $L_t = 0$, then the child's household income is w_{nl}. At the other extreme, if the child works full-time $L_t = 2,000$, then the child's household income is $\hat{w}_t$. The parameter ψ is estimated separately by child gender and marital status using the CPS data. For example, for married women this is done as follows. First, a sample of all full-time married female workers is taken from the March CPS over the years 1994-2010. For each woman, non-labor income is calculated as total household income minus her earned income. The parameter ψ is calculated as the median fraction of this non-labor income to total household income across all full-time women workers in the CPS sample. The resulting values, by child type, are 0.03 for single males, 0.30 for married males, 0.11 for single females, and 0.55 for married females. To use the example of married females again, the value of 0.55 means that a household in which a married child is not working has an income equal to 55 percent of the income it would receive were she working full-time.

1.4.2.6 Child Selection

Much of the recent work on models of family long-term care choices has extended the original models to include more players.[54] Several of these models determine family caregiving arrangements using a game played in two stages. In a first stage, a primary caregiver is chosen from amongst the children, and in the second stage, the remainder of the choices over informal care and other transfers are made. This model uses the simplification, based on the data patterns described above, that the second stage game is played out primarily between a parent and the primary caregiver. The first stage of the game is assumed to have already taken place and is used as an initial condition to the model. The way that the model selects a child primary caregiver in families where there are multiple children is described in the following paragraphs and is meant to capture, in a reduced form way, the first stage of the family game.

The general strategy is to select the child within each family who provided, or would have

[54]See, for example, Engers and Stern (2002); Pezzin et al. (2006); Byrne et al. (2009); Fontaine et al. (2009); Knoef and Kooreman (2011); Hiedemann et al. (2013).

provided, the most informal care to the parent. In families where some care was provided by a child, the child who provided the most hours, summed across all interviews, is selected. Since not all parents receive long-term care from their children, the selection is done for some of the sample using estimated probabilities of being the primary child caregiver. These estimates are obtained with a probit model in which the dependent variable is equal to 1 if the child is the primary caregiver in the family and 0 otherwise. The model is estimated using the sample of families in which one or more children provide some care. As many variables are missing over time for any given child due to skip patterns in the interviews, the model is estimated after collapsing the sample to a single observation per child.

The estimates for the model that predicts primary caregiver status are presented in Table 1.8. The results are for the $9,663$ children in families that provided some care to an elderly mother (over 64 percent of families in the sample). Own (as opposed to step-) daughters are the most likely among children to be primary caregivers. In addition, older children, more educated children, and, perhaps surprisingly, married children are also more likely to be selected. Co-residence is also very strongly associated with being the primary child caregiver.

Among the 64 percent of families in which children provide some care, one child provides the most hours in over 97 percent of cases. Among families in which children tie over the number of hours, ties are broken arbitrarily. For the remaining 36 percent of families, the child most likely to be the primary child caregiver is selected using the model described above, with ties broken arbitrarily. The characteristics of the full sample of AHEAD children are reported in Table 1.9. In addition, Table 1.10 compares the selected and non-selected children. The selected children are more likely to be own children, daughters, unmarried, and more highly educated. They have fewer children and are less likely to work full-time. They are nearly 10 times more likely to have ever co-resided with their parent and not quite 7 times more likely to provide informal care if their parent is receiving some help with I/ADLs. Conditional on providing some help, they contribute twice as many hours. Surprisingly, the selected children have slightly higher income, both actual and potential, than the other children.

1.4.2.7 Child Types

The model is estimated with four observable types of children on the basis of child's gender and marital status (single, married). For children who change types due to a change in marital status over the sample period, their modal type is used. The types are allowed to differ in their preferences (κ, α, γ) and their incomes $(\hat{w}_t, \psi)$. This heterogeneity captures many of the facets of the child's decision problem from which the model abstracts.

1.4.2.8 Preferences

Preferences over consumption and leisure are assumed to be $log\,()$. The period t utilities of old and young, respectively, are:

$$U_t^o = log\,(c_t^o)$$

$$U_t^y = \begin{cases} log\,(c_t^y) + \gamma log\,(l_t) + \alpha & \text{if living separately} \\ log\,(c_t^y) + \gamma log\,(l_t) & \text{if co-residing with parent} \end{cases}$$

The discount factor is taken to be $\beta = \frac{1}{1.03}$.

1.4.2.9 Time allocation

The model assumes that the available time for a child to allocate in one year, $\bar{T}$, is equal to 5,110 hours. This is equivalent to 14 hours per day for 365 days. The child can divide this time between three activities: market work, the provision of informal care to her parent, and leisure. The child's labor force decision is discretized to three points. Annual hours worked can be chosen as follows:

$$L_t \in \{0 \text{ (not working)},\ 1,000 \text{ (part-time)},\ 2,000 \text{ (full-time)}\}$$

This choice is made partly on the basis of available data: child labor supply is reported on the basis of not-working, part-, and full-time in the HRS data. However, given that most individuals don't have the ability to freely vary their work hours, such a discretization is reasonable.[55] The choice of informal care hours is also discretized:

$$q_t \in \{0 \text{ (no care)}, 0.5 \times Q_t \text{ (half of required hours)}, 1 \times Q_t \text{ (all of required hours)}\}$$

The child can supply zero hours, hours equal to half of the parent's long-term care needs, or all of the parent's required hours of long-term care.[56] The values for $\bar{T}$ and part- and full-time hours are from Skira (2012).

1.4.2.10 Social insurance and the consumption value of institutional care

Medicaid laws vary enormously by state. States differ in financial eligibility criteria, services offered, service limits, reimbursement policies, and home- and community-based services (HCBS) waiver waiting lists, among other dimensions. Because respondents in the HRS cannot be linked to their states of residence without access to a restricted version of the data, the model uses social insurance parameters based on state medians.[57]

The income and asset thresholds are $\bar{I} = \$450$ per year and $\bar{a} = \$2,650$. The value of the purchasing power floor $\bar{c}$ is equal to $\$7,800$.[58,59] These three values are taken from

[55] In fact, even by allowing children to choose freely between full- and part-time work (and with no wage penalty for choosing the latter), the model may already be considerably overstating their flexibility in allocating their time.

[56] This choice was made in order to simplify the model solution. Given the timing of the model, allowing a fully continuous choice of hours in this phase 2 decision would add a second continuous state variable to the phase 3 state vector. Computation of q_t^* would then necessitate the interpolation of the parent's decision rules for T_t^*, a_{t+1}^*, and $\hat{c}_t^o$. Instead, the approach taken here is to approximate the continuous choice with a discrete one over fractions of the parent's care needs. The approximation can be improved by adding additional points to the child's choice set. Future work will explore the robustness of the results to increasing the range of possible informal care choices.

[57] This approach is also preferable on the grounds that, if parents are able to move to where their children live, then the parent's state of residence is endogenous. If such moves are possible, it is also unclear whether to assign a parent the social insurance parameters of their state of residence or those of the states where their children live.

[58] Medicaid allows institutionalized individuals to retain a small amount of income each month. Across states in 2000, the modal monthly amount was \$30. On an annual basis, inflated to 2010 dollars, this yields the income threshold $\bar{I} = \$450$.

[59] Recall that the measures of assets used in this paper is net wealth including housing rather than just

Lockwood (2012). A critical social insurance parameter in the model is $\bar{M}$, the maximum reimbursement by Medicaid of home health care. Recall that individuals with long-term care needs who reside in the community and receive government benefits have coverage of their long-term care spending up to a maximum of $\bar{M}$. This parameter is therefore an important mechanism causing individuals in the model to enter institutions. At the same time, it is difficult to establish a value for this parameter. As a result of state differences, the availability of Medicaid home and community-based services is very uneven across states. Using the Kaiser Family Foundation State Health Facts from 2006, the limits on service days range from a minimum of 208 hours per year in Maine to 3,396 hours per year in California.[60] Across the seventeen states for which the limits were available in the 2006 data, the median (mean) cap was 1,040 (1,374) hours per year.

Waiting lists for HCBS waivers also restrict access to these services. From the KFF State Health Facts 2010 data, there were 129,758 aged/disabled and 35,463 aged individuals on waiting lists for Medicaid Section 1915(c) HCBS Waivers. Using data from the 47 states who had non-missing waiting list data for at least one of these groups, the size of the combined waiting lists for these two groups ranged from 0 in many states to 40,897 in Louisiana. The nationwide mean was 3,344, and the median was zero.

The value of $\bar{M}$ is obtained by using the median hours limit and assuming that home care workers are reimbursed at a rate of \$23 per hour, which together imply a value of $\bar{M}$ equal to \$23,920 per year. Because the median waiting list length is zero, the model abstracts from the possibility that an individual would be placed on a waiting list.

The consumption value of institutional care is taken from Lockwood (2012). As in that paper, the value is allowed to depend on whether the care is privately financed with out-of-pocket expenditures or publicly financed through social insurance. When privately financed,

non-housing wealth. Strictly speaking, this value of $\bar{a}$ applies to non-housing assets and is not appropriate for net wealth. However, this paper follows the literature in applying the non-housing asset eligibility threshold to net wealth. An example of a paper that does distinguish between these two types of assets is Nakajima and Telyukova (2012).

[60] These annual hours figures were re-scaled by the author from weekly and monthly limits. In Maine, the actual limit on service days in 2006 was 2-4 hours per week. In California, the limit on service days was 283 hours per month. See http://kff.org/medicaid/state-indicator/personal-care-services/ for further details.

the consumption value is $c_{priv} = \$7,800$. When publicly financed, this value is $c_{pub} = \$7,400$, which is the estimated value from Lockwood (2012). The extent to which $c_{pub} < c_{priv}$ captures the degree by which stays in publicly financed nursing homes are considered to be of a lower quality than privately financed stays. This is known as public care aversion.

1.4.2.11 Pareto weight in co-resident household

As discussed above, the model assumes that parent and child play a cooperative game when they co-reside. The weight placed on the parent's preferences is λ, and the child's preferences are weighted by $1 - \lambda$. That is, the period t utility of the household is given by:

$$\lambda \left(U_t^o + \eta U_t^y\right) + (1 - \lambda) \left(U_t^y + \kappa U_t^o\right)$$

It is not clear that these weights are well-identified in the model, however. Rather than attempting to estimate λ, the baseline model assumes that the preferences of parent and child are assigned equal weight, $\lambda = 0.5$. Future work will access the robustness of the results to alternative parameters values.

1.4.2.12 Permanent income, assets, and other budget parameters

The model is solved with four points for parent's permanent income I in the state space. For each individual, permanent income is calculated as the mean of non-asset income, taken across all core interviews in which the individual's income was available. The distribution was discretized into four points, which are the medians within each of four quartiles. The model is solved with 21 points for assets (net wealth, including housing assets). It is assumed that the elderly are unable to borrow, so the initial conditions to the model exclude individuals with negative assets. The net real interest rate is assumed to be four percent over the sample period, implying that $R_t = R = 1.04$. In the joint household, though all consumption is assumed to be private, the household benefits from economies of scale in consumption. The extent of these economies is governed by the parameter ϕ. By the construction of the budget constraint for the joint household, a 1 unit increase in household consumption only increases total spending by $\frac{1}{\phi}$. If $\phi = 1$, there are no economies of scale, and if $\phi = 2$ there are perfect economies of scale. The model sets $\phi = 1.4$ based on the OECD (square root) equivalence scales.

1.4.3 Initial and Terminal Conditions

The first decisions in the model are made at time $t = 0$. The initial state vector, including child type, is therefore $S_{0,0} = (Type, I, a_0, h_{-1}, w_{-1})$. Time $t = -1$ which corresponds to age 72, the youngest age of any individuals from the AHEAD cohort in the 1995 data. The youngest individuals first decisions in the simulation are recorded at time $t = 0$, or equivalently age 73. The old die with certainty at time $T = 32$, corresponding to age 105.

The final component of the model is a terminal value function for the young that describes their utility when their parent dies. In order to obtain a closed form solution for the value function in terms of state variables, the model assumes that once the old die, the young inherit all of their parents' remaining wealth and continue to receive 60% of their final potential income $\hat{w}_t$ until their own death at time $2T$. In the remainder of their lives, the young face no uncertainty.[61]

1.4.4 Model Solution

Beginning at time T and working backwards to time 0, at each phase of each time period, the decision problems (described in Appendix A.1) are solved at each point on a grid of the state space. The grid contains 4 points for child $Type$, 4 points for permanent income I, 21 points for assets a_t, 7 points for health h_t, and 3 points for child's wage w_t. Problems involving continuous choice variables are solved using a golden section search over parent's consumption spending $\hat{c}_t^o$ after substituting for the other continuous variables in terms of $\hat{c}_t^o$ using the budget constraint (for a_t) and intra-temporal first order conditions (for T_t or c_t^y). With log preferences over consumption for both parent and child, using the first-order

[61] Alternatively, terminal value function could be parameterized as a flexible function of the final state variables, and these parameters could be estimated within the MSM estimation.

conditions from the independent parent's problem, financial transfer T_t can be expressed as:

$$T_t = \begin{cases} \tilde{T}_t & \text{if } \tilde{T}_t > 0 \\ 0 & \text{if } \tilde{T}_t \leq 0 \end{cases}$$

$$\tilde{T}_t = \hat{c}_t^o \eta - w_t L_t - w_{nl}$$

Similarly, with log preferences, using the first-order conditions from the co-residing parent's and child's problem, the child's consumption c_t^y can be expressed as:

$$c_t^y = \left(\frac{1 - \lambda + \eta\lambda}{\lambda + \kappa (1 - \lambda)} \right) \hat{c}_t^o$$

When computing the optimal level of parent's consumption spending, $\hat{c}_t^o$, the value functions $W_{t+1,0}^o(S_{t+1,0})$ and $W_{t+1,0}^y(S_{t+1,0})$ are interpolated along the a_t dimension using linear interpolation. This is the only dimension of the state space in which off-node values are possible.

1.4.5 Identification

The parameters $(\eta, \alpha, \gamma, \kappa)$ are estimated within the model using the Method of Simulated Moments, so the discussion in this section focuses on these parameters. Table 1.12 summarizes the moments used for identification.

1.4.5.1 Parent's altruism: η

The intra-temporal first order condition on financial transfers from parent to child (T_t) in the independent parent's problem pins down altruism. Under log preferences, when $T_t^* > 0$, the first order condition is:

$$u'\left(c_t^{o*}\right) = \frac{1}{c_t^{o*}} = \eta \frac{1}{wL_t - w_{nl} + T_t^*} = \eta u'\left(c_t^{y*}\right)$$

The variation in the data used to estimate η is the mean financial transfer from parent to child in the data.[62,63]

1.4.5.2 Child preferences over leisure: γ

Identification of γ is facilitated by the time allocation decision of non-co-resident children. Under log preferences over consumption and leisure, the first-order conditions governing this choice are:

$$\gamma v'\left(l_t^*\right) = \frac{\gamma}{\bar{T} - L_t^* - q_t^*} = \frac{1}{w_t L_t^* + w_{nl} + T_t^*(S_{t,1}, L_t^*, q_t^*)} = u'\left(c_t^{y*}\right)$$

Consider a scenario in which a parent is in good health $h_t = 0$ and the child's unearned income w_{nl}, parent's permanent income I, parent's assets a_t, and the other state variable components of $S_{t,1}$ are such that the parent would make no financial transfers, $T_t^* = 0$, for all feasible values of hours worked, L_t. In this case, since $r_t^* \neq 1$, $q_t^* = 0$, and $T_t^* = 0$, the parent and child problems are effectively de-linked, for the choice of child's labor supply and leisure only affect the child's utility.[64] Variation in the proportions of children living separately from healthy parents who work full- and part-time is used to identify γ.[65]

[62] The choice of living arrangements also contains information on η. This is due in part to the particular timing assumed by the model. Because parents commit to living arrangements before children choose their supply of informal care, an impoverished parent with extremely poor health could choose to live independently even if social insurance would be insufficient to cover her long-term care needs and leave her with non-negative consumption. Parents could do so secure in the knowledge that an altruistic child would provide informal care sufficient to guarantee them non-negative consumption when social insurance fell short. As parental altruism increases and parents value their children's utility more, they will be less inclined to "be a burden" to their children by forcing them to provide informal care and will instead choose to use institutional care.

[63] Of course, this argument, and the others that follow, rely on the assumption that the value of these parameters is constant within the population or sub-population being studied. In the case of η, it must be that parents who live independently of their children, on whose data the estimation relies, are altruistic to the same degree as those who reside with their children or in nursing homes. Otherwise, one could not extrapolate from one sub-population to another. This assumption is therefore indispensable.

[64] Under the model's assumptions that no informal care or financial transfers are made when a parent is institutionalized, a similar statement can also be made when the parent is living in an institution, $r_t = 2$.

[65] The use of the conditional moment may lead one to question the strength of identification of γ since, when informal care is not supplied, there are only three values of leisure used to identify γ. These correspond to working full- and part-time and not working. From a mathematical standpoint, these three points should be sufficient to identify the curvature of preferences.

1.4.5.3 Child's altruism: κ

Variation in the supply of informal care from non-co-resident children to parents with long-term care needs can be used to identify the extent of child altruism κ. Consider the first order condition governing the child's choice of informal care hours:

$$\begin{aligned} \gamma v'(l_t) &= \gamma \quad \frac{1}{\bar{T} - L_t^* - q_t^*} = \kappa u'(c_t^{o*}) = \beta\kappa \frac{\partial W_{t+1,0}^o \left(Type, I, a_{t+1}^*, h_t, w\right)}{\partial a_{t+1}} \\ a_{t+1}^* &= \quad R\left(a_t + I + b_t - p\left(Q - q_t^*\right) - c_t^{o*} - T_t^*\right) \end{aligned}$$

Suppose that the parent's resources $I + a_t$ are sufficiently low that current and future financial transfers and bequests are also projected to be zero, yet the parent's resources exceed the threshold for SSI and Medicaid eligibility. In this case, the decision to supply informal care reflects a simple tradeoff captured in the first order condition. The child can sacrifice her own leisure today to increase the parent's consumption today and assets tomorrow. As children become more altruistic, an increase in κ, the proportion of non-co-resident children providing informal care will increase.

1.4.5.4 Child preferences over living arrangements: α

The pattern in the data that pins down α is the gradient of co-residence with respect to the child's income. The data in Figure 1.3 indicate that co-residence declines sharply as the income of the child increases. In order to fit this pattern, a positive value of α is necessary. If it were the case that $\alpha \leq 0$, an increase in children's income may actually increase co-residence. To see why, consider that co-residence entails gains from economies of scale, and so an increase in the child's income makes co-residence more attractive to the parent. Therefore, the children may co-reside as a way to support their parents. While parents are assumed to have two mechanisms to transfer resources to their children, economies of scale when the two co-reside and financial transfers when living separately, children are assumed not to make financial transfers.[66] Therefore, co-residence is appealing as a way to transfer

[66] Informal care represents a transfer of resources from child to parent. This type of transfer differs from a financial transfer because it is only possible when a parent is in poor health and requires long-term care.

resources from child to parent.[67] With $\alpha > 0$, while the gains from economies of scale will be important for the young when their resources are limited, these gains will be dominated by the non-pecuniary gain from living independently as resources increase.[68]

1.4.6 Model Simulations

The simulations use most of the individuals with non-missing values for all initial conditions variables in the 1995 AHEAD data. Individuals with negative assets at the initial condition are dropped, as the model's no-borrowing constraint is not designed to accommodate these values. In addition, the top 5 percent of assets are trimmed to exclude extreme outliers.[69] With the remaining individuals, the remainder of each individual's life is simulated from these starting points, five times per individual. Because HRS interviews take place every other year, simulated moments are constructed using every second observation from the simulated data. If the final observation, corresponding to the exit interview, occurs in an off-year, it is also used.

1.4.7 Technical Details

All of the programs used to solve and simulate the model and compute the GMM criterion (objective) function were written in C. Parameter estimation is done using HOPSPACK (Hybrid Optimization Parallel Search PACKage), which is open source software available from Sandia National Laboratories for solving derivative-free optimization problems.[70] Each guess of a parameter vector is fed from the HOPSPACK into the C program, which solves for the value functions of young and old and simulates the life histories of these families

[67] A necessary qualification is that the decision of the young to co-reside also depends on how resources are allocated within the joint household, which depends on the altruism parameters (η, κ) and the Pareto weight (λ).

[68] It is worth noting that, although the model is specified without parents' non-pecuniary preferences over living arrangements, the data are sufficient to identify a parameter analogous to α for parents. An earlier version of the model allowed for such an effect, but the fit was not much improved relative to the current model.

[69] More precisely, all observations are dropped for individuals whose assets ever exceed the 95th percentile of assets during the sample period.

[70] For details, see https://software.sandia.gov/trac/hopspack/ and Plantenga (2009).

from the initial conditions. The GMM criterion function is compiled simultaneously with the simulations and returned to the HOPSPACK at the end of the model run. This process was repeated to convergence from 100 random starting points within a range of reasonable parameter values. The estimates derived from this procedure were then used as the initial guess to compute the distribution of the estimates by bootstrap.[71] The mean and standard errors of the parameters (reported in Table 1.13) are from the bootstrapped distributions.

1.5 Estimation Results

This section describes the estimation results, which are a work in progress. The baseline model sets the value of the Pareto weight λ, which determines the weight of parent's preferences relative to child's preference in the co-resident household, equal to 0.5. In addition, the parameter governing child altruism κ is restricted to be the same within each gender, so married and single women are equally altruistic toward their parents, for example. The other child parameters (α, γ) are allowed to vary freely by child type.

1.5.1 Parameter Estimates

The parameters estimated by the MSM procedure are reported in Table 1.13. The estimated value of η, reflecting parental altruism, is 0.49. This result suggests that parents value their children's utilities roughly half as much as they value their own. Relative to the literature, this value is neither high nor low. For example, using data on financial transfers from parents to children in the National Longitudinal Survey of Young Men, Kaplan (2012) estimates a value of parental altruism of only 0.04. In contrast, Nishiyama (2002), using in an overlapping generations model fit to match the distribution of intergenerational transfers from the Survey of Consumer Finances, shows a value of 0.626 in that paper's benchmark calibration. In the middle of this range, Barczyk and Kredler (2014) estimate the value of parental altruism to be 0.391.

[71] Specifically, the model was re-estimated from this initial guess 25 times using initial conditions and moments computed based on 90% random samples with replacement from the data.

Turning next to the estimated values of κ, the model finds very low levels of child altruism, estimating a value of 0.011 for males and just 0.025 for females. This parameter is estimated under the assumption of altruism, but the estimate may reflect other motives (e.g. exchange for parental transfers made earlier in life) for the supply of informal care beyond altruism. In order to fit the distribution of child caregiving, neither altruism nor these other motives seem necessary. These low estimates are also consistent with the low percentage of children making financial transfers to parents.[72]

The estimated values of α, corresponding to the child's preference for living apart from a parent suggest a not unreasonable pattern that married individuals have a higher preference for living independently than single individuals. These differences reflect the different opportunity costs of married and single individuals that are abstracted from by the model and which heterogeneity in α is intended to capture. To convert these estimates into a more readily interpretable form, for various values of child income w, the consumption increment $\Delta c(w)$ needed to make a child indifferent between co-residing and living independently can be computed as follows:

$$log\left(w + \Delta c\left(w\right)\right) = log\left(w\right) + \alpha$$

Using the mean income by child type for w, these calculations yield consumption equivalents of approximately \$27,600 for single men, \$102,000 for married men, \$27,500 for single women, and \$78,500 for married women.

The estimated values of γ, which measure the leisure preferences of children, suggest that single children value leisure more than married children. While perhaps unrealistic, the estimates make sense within the context of the model estimation procedure. These estimates likely reflect the model's effort to match the fact that, given their low non-labor incomes (reflected in the estimated type-specific values of ψ), single children supply much less labor to the market relative to married children than would be expected.

[72] In footnote 2 of Nishiyama (2002), the author notes that the original version of the model contained two-sided altruism but that the estimated value of child altruism was "negligible." By contrast, Barczyk and Kredler (2014) estimate the value of child altruism to be 0.256, considerably higher than other estimates in the literature.

1.5.2 Model Fit

Table 1.14 shows the fit of the model relative to the moments that it was calibrated to match. The model fits well in many respects. It matches fairly closely the unconditional mean of financial transfers, and it matches well the fractions of children co-residing by type. The simulated percentages of individuals providing informal care are reasonably close to the data, but for single females and for co-resident children, the model significantly overstates the willingness of children to supply informal care.

The model fit is poorer for labor supply, especially for married females, where it misses badly. Given the complexity of the labor supply decision and the highly stylized way in which it is captured in the model, this result may be unsurprising. In particular, the bad fit for married female labor supply is likely owing to the fact that a married woman's household receives a large share of income from other sources, namely her spouse's earnings. From the data, the estimated average fraction of income from other sources for a married women was 55 percent, meaning that if a married daughter does not work, her household still earns 55 percent of what it would have earned had she worked full-time. Compared to the values for married men (30 percent) and single sons (3 percent) and daughters (11 percent), this value is massive, and it is a huge deterrent to labor force participation in the model. Moreover, by treating income from other sources as a constant fraction of household income, the model misses important heterogeneity across the population that affects labor supply decisions.

Figures 1.4 and 1.5, respectively, show the profiles of living arrangements and median assets by age. Neither the distribution of living arrangements between living independently and living in an institution nor the age patterns of living arrangements were targets of the model. Yet, the model captures these patterns in Figure 1.4 quite closely, especially at younger ages. It does, however, over-predict independence and under-predict nursing home usage at older ages.[73] Median assets were also not a target of the model, but as Figure 1.5

[73] One reason that the model understates nursing home use relative to the data is that the threshold for classifying an individual as living in a nursing home differs between the two. In the model, an institutionalized individual spends a full year in a nursing home. The classification described in Section 1.4.2.3 is much more broad: in core interviews, for example, individuals reported to have spent more than 120 days in an institution are classified as institutionalized.

demonstrates, the fit of the simulated age profile of assets is very close to the pattern in the data.

Figure 1.6 displays the gradients of each living arrangement by child and parent income categories. In each of the three panels, each corresponding to a different living arrangement, the bars are computed from the model simulations and the whiskers are 95 percent confidence intervals computed from the data. In the top panel, the general pattern in the data, that the proportion of individuals living independently increases in both child income and parent permanent income, is reflected in the simulated data for the bottom three quartiles of parent income. In the top parental income quartile, the model fails to match the pattern in the data. The same can be said of the middle panel in which the model captures the overall pattern in the decline in co-residence with parent and child income for the bottom three quartiles of parent income but not in the top quartile. However, the fit tends to be somewhat worse for co-residence with the models predictions frequently falling outside the 95 percent confidence intervals. In the bottom panel, the model is shown to overstate the decline in nursing home utilization as a parent's income increases, especially for the highest quartile of parent income. In the upper quartiles of parent's income, however, the model does tend to capture the increase in nursing home usage with child income, holding parent's income constant.

1.6 Policy Simulations

This section describes the policy experiments undertaken with the model. The next sub-section describes each policy and how it is implemented within the model. The following sub-section discusses the results.

1.6.1 Policy Descriptions

The model simulates the effects of five different types of policies. The experiments are described in the following bullets. The quoted words in parentheses are abbreviations for the policies that are used in the accompanying tables and figures.

- *Consumer-Directed home care ("Lump-sum").* Parents are approved for a certain number of hours according to their needs, and they may hire their own personal care aides to provide these services paid for by Medicaid. This policy is effected in the model through an annual lump-sum government transfer to an individual with long-term care needs of the maximum amount that Medicaid would pay for formal care for that individual given their care needs, irrespective of whether informal care is being provided. That is, an individual with care needs Q_t will receive a transfer for their long-term care needs of $min\left\{pQ_t, \bar{M}\right\}$.[74]

- *Caregiver wage ("Wage").* A wage paid directly from the government to a child caregiver, up to a health-contingent maximum payment that is no larger than what would be reimbursed under the baseline model. In this experiment, a caregiver's hours are reimbursed at the same rate p that Medicaid would pay for formal care up to a maximum that depends on health status and cannot exceed $\bar{M}$. The payment does not depend on or vary with co-residence. In this policy, in contrast to the consumer-direction policy, the transfer goes directly to the child caregiver rather than to the Medicaid beneficiary.

- *Caregiver allowance ("Allowance").* A lump-sum transfer paid by the government to child caregivers who fully meet their parent's long-term care needs. The difference between this policy and the caregiver's wage described above is that the allowance is only given to caregivers who meet all of their parent's long-term care needs. In this experiment, the reimbursements to the child for the informal care are the same as what the beneficiary would have received had all care been purchased from a home agency, up to a maximum of $\bar{M}$.

- *Respite care, adult day care ("Respite").* A reduction in the number of hours that a caregiver needs to supply to meet a parent's long-term care needs. The policy is

[74]In the event that care needs are met by informal care, the model allows for any remaining funds from these transfers to be saved or spent on consumption. This implementation is much more flexible than most real-world implementations of these programs. In a typical program, most consumers use fiscal intermediary services to disburse their program allowances, and these fiscal agents only write checks to cover care-related goods and services authorized under a spending plan approved by a program counselor. See, for example, the discussion of the Cash and Counseling Demonstration in Brown et al. (2007).

actualized in the model as a transfer of leisure to a caregiving child at the hourly cost of p to the government. This experiment uses a 25% reduction in hours. That is, if a child offers to provide q_t hours, under this policy, the child covers $.75q_t$ hours and the government provides $.25q_t$ hours.

- *Variations in Medicaid asset eligibility thresholds for home and institutional care ("Eligibility").* This is the parameter $\bar{a}$ in the model. There is a long-running debate (e.g. see Gardner and Gilleskie (2012)) on the extent to which Medicaid financial eligibility thresholds affect an individual's willingness to spend down assets to qualify for the program. The concern is that making the thresholds too generous incentivizes spend-down. The experiment with this policy allows the asset thresholds to differ by whether the individual uses home- and community-based care ($\bar{a}_{HCBS}$) or institution-based care ($\bar{a}_{NH}$). The experiment allows for a 25% increase in $\bar{a}_{HCBS}$ relative to $\bar{a}_{NH}$.

Note in all cases the implicit assumption that the government administering these policies is able to perfectly observe not only the parent's health status and long-term needs but also all of the actions taken by the parent and child. With this assumption, the paper sidesteps important issues regarding the monitoring and enforceability of these policies. While critical to the practical viability of these policies, such concerns are beyond the scope of this paper.

1.6.2 Results of Simulations

Table 1.15 contains an overview of all five simulation results. The remaining figures and tables offer more visually accessible displays of the results. The effect of each experiment on living arrangements is analyzed more closely in Table 1.16 and Figures 1.7 and 1.8. Figure 1.9 shows the effect of each policy on the age profiles of assets. Table 1.10 and Figure 1.17 illustrate the effects on caregiving, and Table 1.11 and Figure 1.18 depict the effects on labor supply. The following discussion summarizes the results by experiment.

Consumer-Directed home care ("Lump-sum"). Relative to baseline, the expansion of consumer-directed home care reduces institutionalization by about 6 percentage points, from 14% to 8% of the population. These individuals are shifted in roughly equal parts to living independently and co-residing with children. This experiment results in the largest increase in co-residence relative to baseline (Figure 1.8, co-residence panel). As alluded to above in the discussion of model assumptions (see Section 1.3.4.7), the increase in co-residence in this experiment is largely driven by the assumption that parents and children cannot commit to care contracts. In order to capture their fair share of the gains of the consumer-directed programs, children choose to co-reside with their parents to increase their bargaining power over the allocation of government transfers.[75]

The shift in living arrangements is facilitated by an increase in caregiving by adult children, and most of the increase is in care provision that fully covers a parent's needs. The percentage of children providing for all of their parents' long-term care needs increases from 15.6% at baseline to 20.4% in the simulation. As children re-allocate their time toward caregiving, the percentage of children working full-time declines from 45% to 40%. There is some evidence that individuals run down their assets more quickly in the experiment relative to baseline (Figure 1.9). However, in spite of the accelerated spend down, the policy results in a 23.6% reduction of annual per capita government expenditures from $8,900 to $6,800. This finding is the result not of a reduction in the recipiency rate, which is slightly increased, but a reduction in the magnitude of transfers from over $30,000 per individual per year to $23,000. This difference is due to the reduction in the use of institutional care by the Medicaid-eligible.

Caregiver wage ("Wage"). Relative to baseline, paying the children of the Medicaid-eligible elderly to provide informal care has the largest effect of all policies considered on the rate of institutionalization. The percentage of nursing home residents in this simulation falls dramatically from 14% to 3%. Unlike in the case of the expansion of consumer-directed home

[75]In some real-world implementations of consumer-directed programs, parents are allowed to pay their children to provide care. Because of the timing protocol assumed in the model, a parent cannot commit to paying a child (in phase 3) in return for care received (in phase 2). Strictly speaking, this means that the model does not allow parents to pay children for care. However, a parent will still make a transfer to a child caregiver (in phase 3) if doing so increases the parent's utility (through their altruism toward their child). In addition, co-resident children benefit from program funds that are spent on shared consumption. In some sense, these benefits can be regarded as payments to the child for caregiving.

care, all of these individuals are shifted into living independently rather than co-residing. Again, it is an increase in informal caregiving by adult children that makes this shift possible. However, the biggest increase in this case is from those supplying for just some, but not all, of their parents long-term care needs. The fraction of individuals providing some care increases from 2.7% at baseline to 16% while the fraction providing all of their parents' care increases only from 15.6% to 18.7%. As a result of this re-allocation of time, children work fewer hours: the fraction working full-time decreases substantially from 45% at baseline to 35% in the simulation. Part-time work increases somewhat in response, rising from 14% to 20%, and the fraction not working rises from 41% to 46%. As can be seen in Figure 1.9, this experiment appears to create incentives for the elderly to more rapidly deplete their assets, resulting in a slight increase in the recipiency rate for government transfers from 29% to 31%. Yet, in terms of cost-effectiveness, this policy is comparable to the expansion of consumer-directed home care. Annual government expenditures per capita decline from $8,900 to $6,800.

Caregiver allowance ("Allowance"). The difference between this experiment and the caregiver wage is that the wage is paid to any caregiver of a Medicaid-eligible parent while the allowance is paid only to caregivers who meet all of their parents' long-term care needs. Conditional on providing all of their parent's long-term care, a child would receive the same transfer under either policy. This difference turns out to be important. Relative to baseline, this experiment reduces the use of institution-based care from 14.2% to 11%, less than either of the two preceding experiments. Informal caregiving does increase: as expected, the percentage of children meeting all care needs of their parent increases from 15.6% to 21.8% while the fraction of children meeting only some of their parent's care needs is unchanged. The decrease in labor force participation is the same as in the consumer-directed home care simulation: approximately 4% of children shift from full-time to not working, with no increase in part-time work. Because this experiment delivers a smaller reduction in institution-based care, the savings to the government are smaller: annual per capita government expenditures decline to only $7,800, a 12.4% decrease.

Respite care, adult day care ("Respite"). A 25% reduction in the hours burden of a child caregiver of a Medicaid-eligible parent has a minuscule effect on model outcomes. There is a very modest increase in the share of children who provide some informal care to their parents, but the change is not enough to shift many nursing home residents to the community. As a result, this policy is not able to achieve the high savings of the three preceding policies.

Variations in Medicaid asset eligibility thresholds for home and institutional care ("Eligibility"). This experiment simulates the effect of making Medicaid HCBS more generous by increasing the threshold for financial eligibility. Specifically, the asset threshold $\bar{a}$ is raised by 25% while holding the threshold fixed for institution-based care. This policy has very modest effects. The share of the elderly population living in institutions falls by less than one percent, and the provision of informal care decreases by the same magnitude. Perhaps surprisingly, the increase in this threshold does not even appear to increase incentives for the spend-down of assets by the elderly. This result is in contrast to the findings of Gardner and Gilleskie (2012), which finds that loosening of eligibility criteria and increasing generosity of Medicaid HCBS programs encourage more spend down.

Discussion. In terms of cost-effectiveness and reduced use of institution-based care, the expansion of consumer-directed home care, the implementation of a caregiver wage, and the implementation of caregiver allowance had the largest impacts. In comparison, a respite care program for caregivers and an increase in the asset threshold for Medicaid HCBS eligibility did not significantly affect these outcomes.

The first three policies succeeded in these two dimensions by increasing the supply of informal care from adult children. In the case of expanding consumer-directed home care, the increase in informal care was largely from co-resident caregivers who met all of their parents' long-term care needs, and this simulation significantly increased co-residence, unlike the other policies. The caregiver's allowance also significantly increased caregiving, but it did not increase co-residence. By contrast, the caregiver's wage substantially increased the fraction of children who met some, but not all, of their parents care needs. By the metrics of cost-effectiveness and the reduction in institutionalization, the implementation of a caregiver wage was by far the most successful. The key to its success appears to be that it was directed to all child caregivers of Medicaid-eligible parents, instead of just those caregivers who met all of their parents' needs. The results suggest that part-time support from children is a critical ingredient that enables the elderly to remain in the community.

From the perspective of the Commission on Long-Term Care's vision elucidated in the opening sections of this paper, these results are in line with the view that informal caregiving is and will remain an integral component of the U.S. long-term care system. Each of the three successful policies promotes a key policy recommendation of the Commission, which is "the strengthening of mechanisms to support family caregivers" (Commission on Long-Term Care (2013), p. 36). As the exploratory reduced from analysis in Tables 1.5 and 1.6 suggested, a child's opportunity cost, as measured by their income, is an important determinant of parent living and care arrangements. By allowing parents to purchase care from their children (consumer-direction) or directly paying children to provide care through a wage or allowance, these policies facilitate caregiving from adult children and thereby promote the agreed upon policy objectives of re-balancing care from institutions to the community while controlling costs and strengthening caregiver support.

Though the results in this paper are indicative of a promising direction for policy, the results are not conclusive. The most important qualification of these results is that they are derived from a model which abstracts from the revenue side of the government's budget. A particular concern is that these policies significantly reduced full-time labor force participation by adult children. If the reduction in work significantly reduced government income tax revenue, it could reverse the paper's conclusions about cost-effectiveness. Moreover, this reduction in labor supply could impact the human capital accumulation and retirement savings of the next generation. Additional work will be needed to address these issues.

1.7 Conclusion

This paper contributes both to the study of long-term care policy in the U.S. and the analysis of family long-term care and living arrangements. The model developed in this paper builds upon models from two strands of the economics literature, one on caregiving arrangements and the other on the dynamic life-cycle behavior of the elderly, which have in many respects evolved distinctly from each other. This synthesis can be viewed as part of a broader research agenda that seeks to introduce more intra-family dynamics into the standard models used to perform policy analysis. The results in the paper indicate that the model captures several important aspects of the distribution of living and care arrangements observed in the data.

The simulation analysis provides insights into the relative effectiveness of certain Medicaid long-term care policy alternatives in meeting three important policy objectives: a re-balancing of long-term care from institution-based to home- and community-based care, increased support of family caregivers, and a reduction in government long-term care expenditures. Three of the policies analyzed in the paper appear to hit these objectives: an expansion of consumer-directed home care, the implementation of a wage paid to child caregivers, and the implementation of an allowance paid to full-time child caregivers. Because these policies reduce child labor force participation, future work is needed to assess whether this reduction would decrease income tax revenue sufficiently to alter the paper's conclusions about each policy's cost-effectiveness. A planned extension of the model will incorporate both revenue and cost sides of the government budget through a budget constraint and taxation on the young.

Future work is also necessary to explore the model's robustness to a relaxation of some of its assumptions. For example, the assumptions of no commitment and no re-negotiation of the household Pareto weight are strong, and these assumptions undermine the effectiveness of a policy like consumer-directed long-term care, which relies on contracting between parent and child. Future work will experiment with alternative decision structures within the co-resident household, including variations in Pareto weights and a non-cooperative framework. Another interesting, if complicated, direction in which to extend the model could consider the role of housing in long-term care arrangements. There is evidence, for example, that the participants in consumer-directed home care programs use the funds to purchase home modifications that are not generally covered by Medicaid and which help enable them to remain in the community (Benjamin (2001)). These issues, and many more, are left for future work. Although no single paper can offer a conclusive solution to the varied and complex issues involved in reforming the long-term care system in the U.S., the present paper represents a useful starting point for future analysis.

Appendix A

Appendix to Chapter 1

A.1 Decision Problems

A.1.1 Problem of an independent parent

Given the state vector $S_{t,3} = (Type, I, a_t, h_t, w_t, r_t, L_t, q_t)$ where $r_t = 0$, an independent parent chooses consumption spending $\hat{c}_t^o$, financial transfers T_t, and the next period's assets a_{t+1} to solve:

$$\begin{aligned}
\max_{\hat{c}_t^o, T_t, a_{t+1}} \quad & U_t^o + \eta U_t^y + s_t \beta W_{t+1,0}^o \left(Type, I, a_{t+1}, r_t, h_t, w_t\right) \\
\text{subject to:} & \\
a_{t+1} &= R\left(a_t + I + b_t - M_t - c_t^o - T_t\right) \\
M_t &= p\left(Q_t - q_t\right) \\
b_t &= max\left\{0, \bar{c} + min\left\{\bar{M}, M_t\right\} - max\left\{I - \bar{I}, 0\right\} - max\left\{a_t - \bar{a}, 0\right\}\right\} \\
U_t^o &= u(c_t^o) \\
U_t^y &= u(c_t^y) + \gamma_t v(l_t) + \alpha_t \\
l_t &= \bar{T} - L_t - q_t \\
c_t^o &= \hat{c}_t^o + c_{m,t} \\
c_t^y &= w_t L_t + w_{nl} + T_t
\end{aligned}$$

Denote the maximized value of this problem by $W_{t,3}^o(S_{t,3})$. Denote the solutions by $\hat{c}_t^{o*}, T_t^*, a_{t+1}^*$.

A.1.2 Problem of a co-resident parent and child

Given state vector $S_{t,2} = (Type, I, a_t, h_t, w_t, r_t)$ where $r_t = 1$ and Pareto weight λ, the co-residing parent and child choose parent's consumption $\hat{c}_t^o$, child's consumption c_t^y, child's hours of market work L_t, the child's hours of informal care q_t, the child's hours of leisure l_t, and the next period's assets a_{t+1} to solve:

$$\begin{aligned}
\max_{\hat{c}_t^o, c_t^y, L_t, q_t, l_t, a_{t+1}} \quad & \lambda \left(U_t^o + \eta U_t^y\right) \\
+ \quad & (1-\lambda)\left(U_t^y + \kappa U_t^o\right) \\
+ \quad & s_t \beta \lambda W_{t+1,0}^o \left(Type, I, a_{t+1}, r_t, h_t, w_t\right) \\
+ \quad & s_t \beta (1-\lambda) W_{t+1,0}^y \left(Type, I, a_{t+1}, r_t, h_t, w_t\right)
\end{aligned}$$

subject to:

$$\begin{aligned}
a_{t+1} &= R_t \left(a_t + I + w_t L_t + w_{nl} + b_t - M_t - \frac{c_t^o + c_t^y}{\phi}\right) \\
M_t &= p\left(Q_t - q_t\right) \\
b_t &= max\left\{0, \bar{c} + min\left\{\bar{M}, M_t\right\} - max\left\{I - \bar{I}, 0\right\} - max\left\{a_t - \bar{a}, 0\right\}\right\} \\
U_t^o &= u(c_t^o) \\
U_t^y &= u(c_t^y) + \gamma_t v(l_t) + \alpha_t \\
l_t &= \bar{T} - L_t - q_t \\
c_t^o &= \hat{c}_t^o + c_{m,t}
\end{aligned}$$

Denote the solutions to this problem by $\hat{c}_t^{o*}, c_t^{y*}, L_t^*, q_t^*, l_t^*, a_{t+1}^*$. Denote the maximized value of this problem to the old and young, respectively, by $W_{t,3}^o(\check{S}_{t,3})$ and $W_{t,2}^y(S_{t,2})$:

$$\begin{aligned}
W_{t,3}^o(\check{S}_{t,3}) &= U_t^{o*} + \eta U_t^{y*} + \beta W_{t+1,0}^o \left(Type, I, a_{t+1}^*, r_t, h_t, w_t\right) \\
\check{S}_{t,3} &= \left(S_{t,2}, L_t^*, q_t^*\right) \\
W_{t,2}^y(S_{t,2}) &= U_t^{y*} + \kappa U_t^{o*} + \beta W_{t+1,0}^y \left(Type, I, a_{t+1}^*, r_t, h_t, w_t\right) \\
U_t^{o*} &= u(\hat{c}_t^{o*}) \\
U_t^{y*} &= u(\hat{c}_t^{y*}) + \gamma_t v\left(l_t^*\right) + \alpha_t
\end{aligned}$$

A.1.3 Problem of a parent living in an institution

Given state vector $S_{t,3} = (Type, I, a_t, h_t, w_t, r_t, L_t, q_t)$ where $r_t = 2$, the model assumes that a parent living in an institution has zero consumption spending, $\hat{c}_t^o = 0$, and zero financial transfers, $T_t = 0$. As a result, these parents make no decisions. Assets evolve according to:

$$\begin{aligned} a_{t+1} &= R\left(a_t + I + b_t - M_t - c_t^o - T_t\right) \\ M_t &= P_t \\ b_t &= max\left\{0, P_t - max\left\{I - \bar{I}, 0\right\} - max\left\{a_t - \bar{a}, 0\right\}\right\} \end{aligned}$$

Denote the value of this problem to the parent as $W_{t,3}^o(S_{t,3})$.

A.1.4 Problem of a non-co-resident child with an independent parent

Given state vector $S_{t,2} = (Type, I, a_t, h_t, w_t, r_t)$ where $r_t = 0$ and beliefs over the parent's decision rules $\hat{c}_t^{o*}, T_t^*, a_{t+1}^*$ given the child's choices, the child chooses hours of labor L_t, hours of informal care q_t, and hours of leisure l_t to solve:

$$\max_{L_t, q_t, l_t} \quad U_t^y + \kappa U_t^o + \beta W_{t+1,0}^y\left(Type, I, a_{t+1}^*, r_t h_t, w_t\right)$$

subject to:

$$\begin{aligned} c_t^y &= w_t L_t + w_{nl} + T_t^* \\ l_t &= \bar{T} - L_t - q_t \\ c_t^o &= \hat{c}_t^{o*} + c_{m,t} \\ U_t^o &= u(c_t^o) \\ U_t^y &= u(c_t^y) + \gamma_t v(l_t) + \alpha_t \end{aligned}$$

Denote the solutions to this problem by L_t^*, q_t^*, l_t^*. Denote the maximized value of the problem as $W_{t,2}^y(S_{t,2})$.

A.1.5 Problem of a non-co-resident child with an institutionalized parent

Given state vector $S_{t,2} = (Type, I, a_t, h_t, w_t, r_t)$ where $r_t = 2$, the child chooses hours of labor L_t, hours of informal care q_t, and hours of leisure l_t to solve:

$$\max_{L_t,q_t,l_t} \quad U_t^y + \kappa U_t^o + \beta W_{t+1,0}^y (Type, I, a_{t+1}, r_t h_t, w_t)$$

subject to:

$$\begin{aligned}
c_t^y &= w_t L_t + w_{nl} \\
l_t &= \bar{T} - L_t - q_t \\
c_t^o &= c_{m,t} \\
a_{t+1} &= R (a_t + I + b_t - P_t - c_t^o - T_t) \\
b_t &= max \left\{0, P_t - max\left\{I - \bar{I}, 0\right\} - max\left\{a_t - \bar{a}, 0\right\}\right\} \\
U_t^o &= u(c_t^o) \\
U_t^y &= u(c_t^y) + \gamma_t v(l_t) + \alpha_t
\end{aligned}$$

Denote the solutions to this problem by L_t^*, q_t^*, l_t^*. Denote the maximized value of the problem as $W_{t,2}^y(S_{t,2})$. The model assumes that an institutionalized parent's long-term care needs are fully met by institutional care, so it is optimal for the child to supply no informal care, $q_t^* = 0$.

A.1.6 Problem of a parent choosing living arrangements

Given state vector $S_{t,1} = (Type, I, a_t, h_t, w_t)$, the Pareto weight λ, and beliefs over child's decision rules L_t^*, q_t^*, l_t^*, and conditional on the child's willingness to co-reside, a parent selects the living arrangement r_t to solve:

$$\max_{r_t} \left\{ \begin{array}{ll} W_{t,3}^o (Type, I, a_t, h_t, w_t, 0, L_t^*, q_t^*), & \text{(choose independent)} \\ W_{t,3}^o (Type, I, a_t, h_t, w_t, 1, L_t^*, q_t^*), & \text{(choose co-residence, if available)} \\ W_{t,3}^o (Type, I, a_t, h_t, w_t, 2, L_t^*, 0) & \text{(choose institution)} \end{array} \right\}$$

Co-residence will be in the parent's choice set if either (i) co-residence is the child's preferred living arrangement, or (ii) the child prefers co-residence to the parent's second most preferred choice. To be more concrete, it is possible that the parent's preferences are co-residence $\succ$ nursing home $\succ$ independent, and the child's ordering is independence $\succ$co-residence $\succ$ nursing home. Though the child does not prefer co-residence above all other options, she prefers it to the outcome that would arise if co-residence was not offered. In this case, the choice set will include co-residence, and the parent will choose co-residence. Denote the solution by r_t^* and the value of the problem by $W_{t,1}^o(S_{t,1})$.

A.1.7 Definition of $W_{t,0}^i(S_{t,0})$

Given a state vector $S_{t,0} = (Type, I, a_t, h_{t-1}, w_{t-1})$, before the realization of the uncertainty over h_t and w_t within period t, the parent's expected present discounted value of all future utility from the perspective of time t is given by $W_{t,0}^o(S_{t,0})$, which is defined as:

$$\begin{aligned} W_{t,0}^o(S_{t,0}) &= \sum_{h_t \neq \text{dead}, w_t} W_{t,1}^o\left(Type, I, a_t, h_t, w_t\right) P\left(h_t | h_{t-1}\right) P\left(w_t | w_{t-1}\right) \\ &\quad + \left(1 - s_t\right) \eta D_t^y\left(a_t, w_t\right) \end{aligned}$$

For the child, given the state vector $S_{t,0}$ and beliefs over the parent's decision rule r_t^* given the realizations of h_t and w_t, the analogous object is defined as:

$$\begin{aligned} W_{t,0}^y(S_{t,0}) &= \sum_{h_t \neq \text{dead}, w_t} W_{t,2}^y\left(Type, I, a_t, h_t, w_t, r_t^*\right) P\left(h_t | h_{t-1}\right) P\left(w_t | w_{t-1}\right) \\ &\quad + \left(1 - s_t\right) D_t^y\left(a_t, w_t\right) \end{aligned}$$

Note that $s_t \equiv \sum_{h_t \neq \text{dead}} P\left(h_t | h_{t-1}\right)$ and $\left(1 - s_t\right) \equiv P\left(h_t = \text{dead} | h_{t-1}\right)$.

Figure 1.1: Model Timing

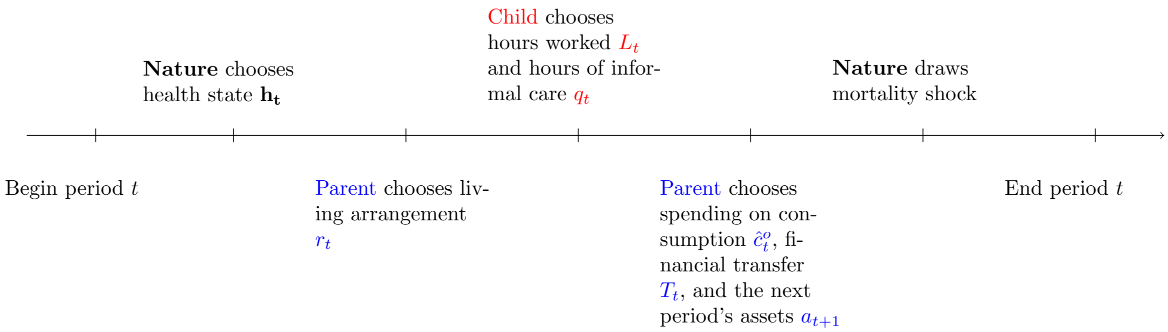

Table 1.1: Model Timing

Phase	Player	State	Choice(s)
0	Nature	$S_{t,0} = (I, a_t, h_{t-1}, w_{t-1})$	h_t
1	Parent	$S_{t,1} = (I, a_t, h_t, w_t)$	r_t
2	Child	$S_{t,2} = (I, a_t, h_t, w_t, r_t)$	L_t, q_t, l_t
3	Parent	$S_{t,3} = (I, a_t, h_t, w_t, r_t, L_t, q_t)$	$\hat{c}^o_t, T_t, a_{t+1}$
4	Nature	(I, a_{t+1}, h_t, w_t)	d_t

Notes: In the co-residential living arrangement $r_t = 1$, phases 2 and 3 are combined. See the text and Appendix A.1 for further details.

Table 1.2: Shared Caregiving: Extensive Margin

	Number of Children Helpers				
	1	2	3	4+	Total
	%	%	%	%	%
Number of Children					
1	100.0	0.0	0.0	0.0	100.0
2	85.4	14.6	0.0	0.0	100.0
3	75.7	20.7	3.6	0.0	100.0
4+	68.5	22.5	6.1	2.9	100.0
Total	79.0	16.7	3.1	1.1	100.0

Notes: Conditional on at least one child providing help.

Table 1.3: Shared Caregiving: Intensive Margin

Sample	Percentage of total child hours supplied by primary child caregiver*	Mean (median) hours supplied by primary child caregiver
One observation per child, per interview, all interviews with no missing child hours data	93%	130 (40)
...and two or more children provide care	69%	150 (60)
One observation per child, hours summed across interviews, families with any missing child hours data (across all interviews) excluded	89%	287 (100)
...and two or more children provide care	74%	324 (128)

*Ties between caregivers are broken arbitrarily. Ties occur in less than 4 percent of families in which a child supplies informal care. Hours supplied by a child's spouse are counted as if they were supplied by the child.

Table 1.4: Descriptive Statistics: Respondents (Parents)

	Mean	SD	Obs.*
Living Arrangement			
Independent	.58	.49	10,735
Co-resident	.23	.42	10,735
Nursing Home	.19	.39	10,735
Permanent Income	15,931	10,580	10,735
Assets (Net Wealth including Housing)	232,866	1,144,415	8,742
Had Negative Assets	.026	.16	8,742
Non-Housing Assets	155,582	1,095,131	8,746
Had Any ADL Limitation	.42	.49	8,733
Number ADLs (ADLs $>$ 0)	2.5	1.5	3,655
Had Any IADL Limitation	.31	.46	8,959
Number IADLs (IADLs $>$ 0)	1.9	.84	2,765
Cognitively Impaired	.05	.22	7,097
Received any help for I/ADLs	.49	.5	10,735
Received help from Child	.4	.49	10,735
Made Financial Transfer to Child	.23	.42	8,295
Received Transfer from Child	.13	.33	8,302
Age	85	6.3	10,534
Education (years)	11	3.7	10,735
Black	.16	.37	10,735
Hispanic	.069	.25	10,735
Number of Children	3.1	2	8,884

*The decrease in the number of observations from around 10,500 to approximately 8,700 is due to the fact that not all variables are available in exit interviews. The difference between these two figures is the number of exit interviews in the sample.

Figure 1.2: Living Arrangements by Age

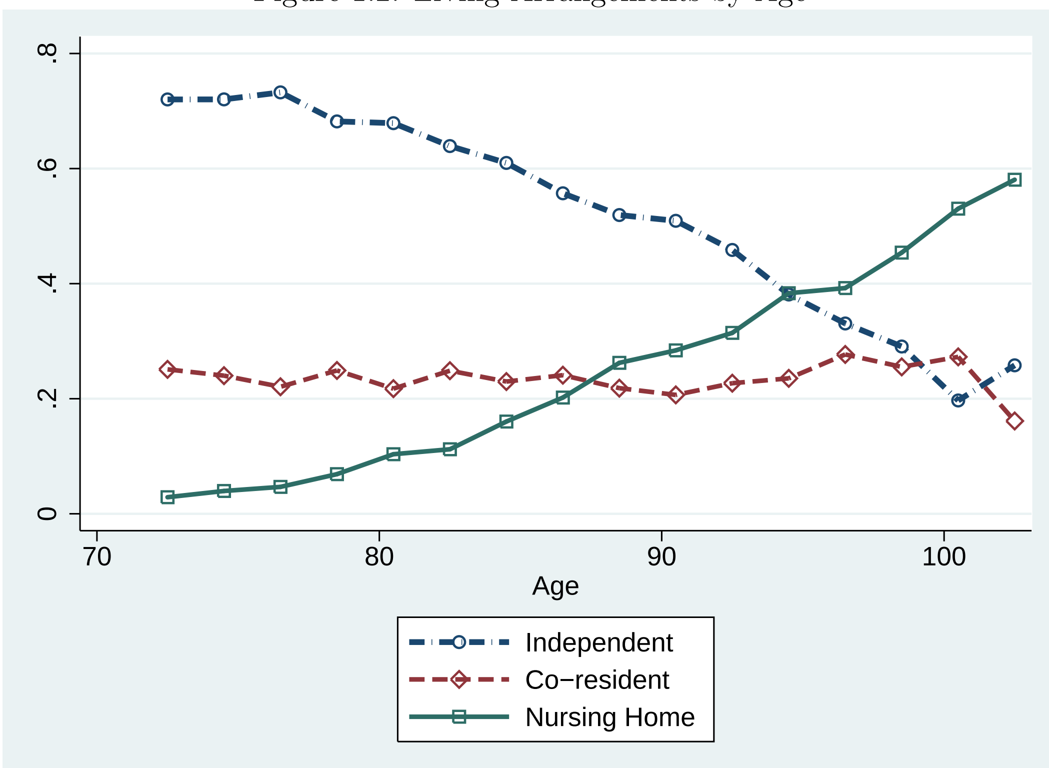

Figure 1.3: Living Arrangements by Child and Parent Income

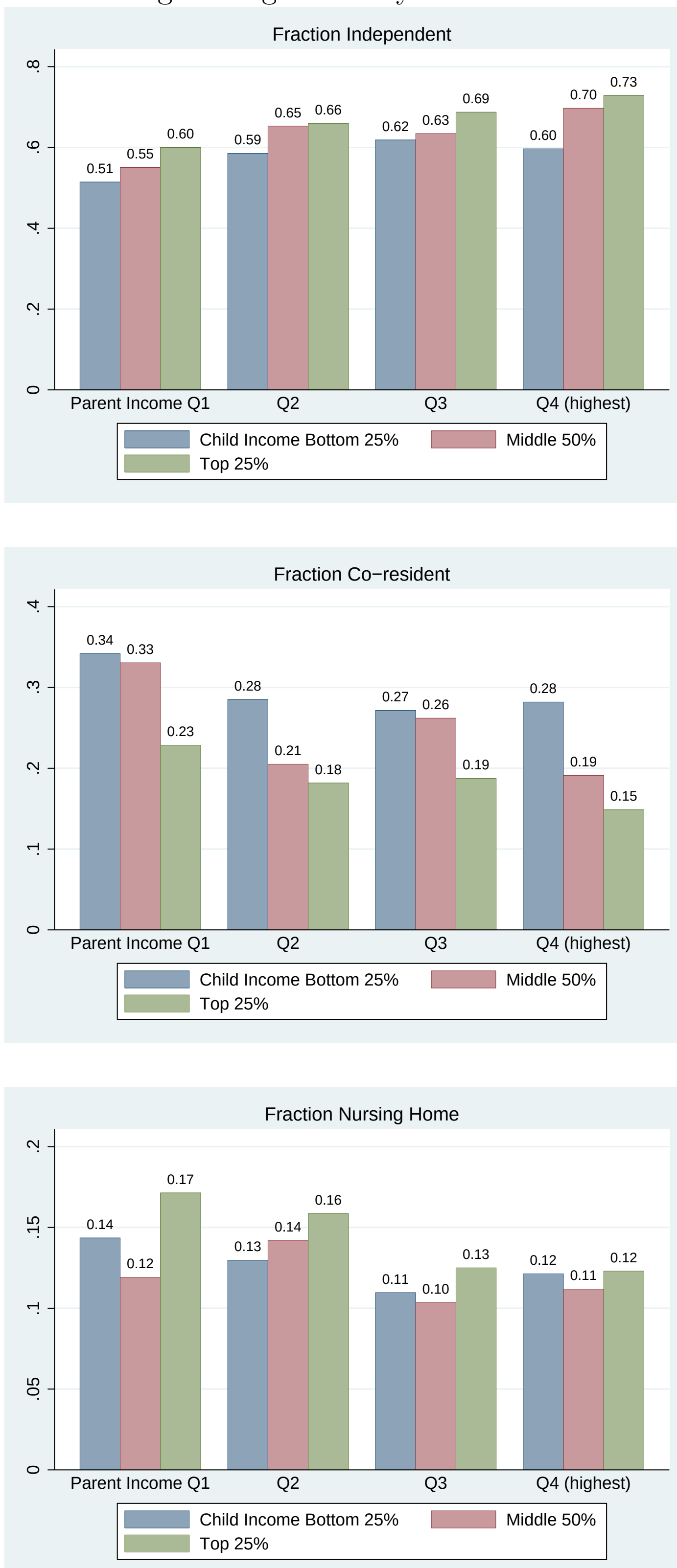

Table 1.5: Determinants of Living Arrangements: Multinomial Logit

	(1) Independent	(2) Co-resident	(3) Nursing Home
Age	-0.00919***	0.00517**	0.00402***
	(0.00205)	(0.00202)	(0.00105)
Black	-0.0470*	0.100***	-0.0534***
	(0.0243)	(0.0227)	(0.0128)
Hispanic	0.0308	0.0724**	-0.103***
	(0.0372)	(0.0362)	(0.0221)
Number of ADLs	-0.0251***	-0.00159	0.0267***
	(0.00524)	(0.00519)	(0.00243)
Number of IADLs	-0.0905***	0.0474***	0.0431***
	(0.00822)	(0.00826)	(0.00374)
Income	0.0276***	-0.0179***	-0.00975***
	(0.00684)	(0.00633)	(0.00231)
Assets	0.00748***	-0.00181	-0.00566***
	(0.00159)	(0.00159)	(0.000660)
Number of Children	-0.00649	0.00964	-0.00315
	(0.00668)	(0.00658)	(0.00319)
Number of Daughters	0.0177*	-0.00619	-0.0115**
	(0.00935)	(0.00916)	(0.00452)
Mean Child Age	0.00389**	-0.00431***	0.000415
	(0.00152)	(0.00143)	(0.000780)
Number of Unmarried Children	-0.0476***	0.0500***	-0.00233
	(0.00962)	(0.00927)	(0.00519)
Mean Number of Grandchildren	0.0298***	-0.0286***	-0.00119
	(0.00618)	(0.00620)	(0.00275)
Mean Child Income	0.0525***	-0.0664***	0.0139*
	(0.0143)	(0.0144)	(0.00829)
N	6026	6026	6026

Multinomial logit marginal effects. Standard errors in parentheses.

* $p<0.1$, ** $p<0.05$, *** $p<0.01$

Notes: In addition to the variables presented in the table, the controls also include parent's years of education and dummies for the interview waves. For parent's income and assets and mean child income, the inverse hyperbolic sine transformation is used.

Table 1.6: Determinants of Living Arrangements: Multinomial Logit (Endogeneity Mitigated)

	(1) Independent	(2) Co-resident	(3) Nursing Home
Age	-0.00891***	0.00556**	0.00335***
	(0.00218)	(0.00218)	(0.00110)
Black	-0.0574**	0.113***	-0.0560***
	(0.0270)	(0.0250)	(0.0136)
Hispanic	0.0361	0.0624	-0.0985***
	(0.0400)	(0.0390)	(0.0224)
Number of ADLs	-0.0260***	-0.00435	0.0304***
	(0.00532)	(0.00521)	(0.00247)
Number of IADLs	-0.0957***	0.0503***	0.0454***
	(0.00802)	(0.00807)	(0.00392)
Permanent Income	0.0174	-0.0130	-0.00441
	(0.0112)	(0.0101)	(0.00433)
Assets (1995)	0.00458**	-0.00130	-0.00328***
	(0.00214)	(0.00210)	(0.000952)
Number of Children	-0.00430	0.00826	-0.00397
	(0.00715)	(0.00687)	(0.00315)
Number of Daughters	0.0200**	-0.00769	-0.0123**
	(0.00973)	(0.00954)	(0.00489)
Mean Child Age	0.00389**	-0.00465***	0.000758
	(0.00161)	(0.00153)	(0.000780)
Number of Unmarried Children	-0.0511***	0.0515***	-0.000418
	(0.0110)	(0.0104)	(0.00513)
Mean Number of Grandchildren	0.0219***	-0.0223***	0.000346
	(0.00627)	(0.00638)	(0.00289)
Mean Child Income (1995)	0.0539*	-0.0663**	0.0124
	(0.0309)	(0.0300)	(0.00813)
N	6601	6601	6601

Multinomial logit marginal effects. Standard errors in parentheses.

* p<0.1, ** p<0.05, *** p<0.01

Notes: In addition to the variables presented in the table, the controls also include parent's year of education, dummies for the interview waves, indicators for the presence of certain health conditions (see text) and body mass index. For parent's income and assets and mean child income, the inverse hyperbolic sine transformation is used.

Table 1.7: Health States

Health State h_t	Description	LTC Hourly Needs Q_t	Cost of Institutional Care P_t
0	Healthy, no impairment	0	\$34,850
1	1+ IADL	400	\$34,850
2	1 ADL	500	\$34,850
3	2 ADLs	1100	\$69,500
4	3+ ADLs	2000	\$69,500
5	Cognitive impairment, $<$ 2 ADLs	1300	\$69,500
6	Cognitive impairment, 2+ ADLs	3000	\$69,500
7	Dead	–	–

Notes: ADL stands for Activities of Daily Living, which include activities like dressing and eating. IADL stands for Instrumental Activities of Daily Living, which include activities like shopping and preparing meals. Cognitive impairment is assessed on the basis of a total cognition score available from the RAND version of the Health and Retirement Study data (R*COGTOT) which is the sum of the total word and mental status summary score for an individual, which is the sum of scores for serial 7's, backwards counting from 20, and object, date, and President/Vice-President naming tasks. Scores range from 0 to 35. As in Herzog and Wallace (1997), scores of 8 or lower are considered to reflect cognitive impairment.

Table 1.8: Child Selection Model (Predicts Primary Caregiver Status)

	(1) Primary Caregiver
Child is Parent's Own Child	0.290*** (0.0195)
Child Female	0.127*** (0.00818)
Child Age (mean)	0.00392*** (0.000476)
Child Education (years)	0.0218*** (0.00158)
Child Married	0.0418*** (0.00945)
Child Ever Coresident	0.330*** (0.0105)
N	9685

Controls include dummies for missing values of each variable.
* p<0.1, ** p<0.05, *** p<0.01

Table 1.9: Summary Statistics: Children: Full Sample

	Mean	Median	SD	Obs.
Child is Parent's Own Child	.9	1	.3	35,940
Female	.51	1	.5	35,727
Married	.65	1	.48	27,841
Age	56	56	9.2	27,582
Education	13	12	2.8	33,705
Number of Child's Children	2.4	2	1.8	21,022
Works Full-time	.57	1	.5	25,414
Works Part-time	.087	0	.28	25,414
Co-resident	.095	0	.29	27,068
Provides Informal Care (a)	.28	0	.45	18,253
Informal Care Hours (b)	113	30	197	4,704
Child Actual Household Income	68,766	60,654	47,848	18,873
Child Potential Household Income	82,751	80,325	36,237	27,841

(a) Conditional, Parent Receives I/ADL help. (b) Conditional, Hours > 0.

Table 1.10: Summary Statistics: Children: Selected -vs- Non-Selected

	Un-selected	**Selected**
Child is Parent's Own Child	.88	.97
	(.0021)	(.0018)
Female	.46	.62
	(.0031)	(.0048)
Married	.67	.59
	(.0034)	(.0053)
Age	55	56
	(.068)	(.094)
Education	13	14
	(.018)	(.025)
Number of Child's Children	2.5	2.2
	(.015)	(.021)
Works Full-time	.58	.53
	(.0038)	(.0055)
Works Part-time	.081	.098
	(.0021)	(.0033)
Co-resident	.026	.24
	(.0012)	(.0047)
Provides Informal Care (a)	.11	.72
	(.0027)	(.0064)
Informal Care Hours (b)	66	131
	(3.7)	(3.7)
Child Actual Household Income	68,509	69,337
	(413)	(645)
Child Potential Household Income	81,777	84,944
	(260)	(393)

(a) Conditional, Parent Receives I/ADL help. (b) Conditional, Hours > 0.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 1.11: Model Parameters and Sources

Parameter	Description	Value	Source
$u()$, $v()$	preferences over consumption and leisure, resp.	$log()$	
β	discount factor	$\frac{1}{1.03}$	Brown and Finkelstein (2008), Lockwood (2012)
h_t	health states	$0, ..., 7$	Robinson (1996)
p_t, P_t	price of formal care, price of institutional care	$p = \$23$, assisted living facility: $P_t = \$34,850$ ($h_t < 3$), nursing home: $P_t = \$69,500$ ($h_t \geq 3$)	Lockwood (2012); U.S. averages from 2002 MetLife Mature Market Institute in 2010 dollars
$\bar{T}$	total time to be allocated in one year	$5,110$ hours	Skira (2012), 14 hours per day $\times$ 365 days per year
$\bar{I}$,$\bar{a}$	income and asset thresholds for SSI/Medicaid	\$450, $\$2,650$	Lockwood (2012), mode of 1999 state thresholds inflated to 2010 dollars
$\bar{c}$	purchasing power floor provided by social insurance	$\$7,800$	Lockwood (2012), SSI income floor for single elderly in 2000, inflated to 2010 dollars
$\bar{M}$	Medicaid maximum reimbursement of home health care	$\$23,920$	Kaiser Family Foundation State Health Facts 2006, state median annual hourly service limit $\times$ \$23/hour
c_{priv}, c_{pub}	consumption value of privately and publicly financed nursing home stays, resp.	$c_{priv} = \$7,400$, $c_{pub} = \$7,800$	Lockwood (2012): c_{priv} is a normalization from Brown and Finkelstein (2008); c_{pub} is estimated
R	1 + net real interest rate	1.04	Lockwood (2012)
ϕ	economies of scale in co-resident household	1.4 ($\approx \sqrt{2}$)	OECD square root equivalence scales

Table 1.12: Moments Used for Identification

Parameter	Description	Moments
η	Parent altruism toward child	Mean transfer from parents living independently to primary child care-giver
κ	Child altruism toward parent	Proportion of children providing some informal care to parents living independently with LTC needs; same proportion for co-resident children
α	Child preference for living separately	Proportion of co-resident children
γ	Child preference for leisure	Proportions of children who live independently of their parents that work full-time; proportion of the same children who work part-time

Table 1.13: Parameter Estimates

Parameter	Description	Type	Mean	Standard Error
η	Parent "altruism"		0.4919	0.0141
κ	Child "altruism"	Male	0.0116	0.0032
		Female	0.0249	0.0085
α	Child living arrangement preferences	Single Male	0.5051	0.0050
		Married Male	0.7380	0.0061
		Single Female	0.5227	0.0045
		Married Female	0.6603	0.0061
γ	Child leisure preferences	Single Male	2.3059	0.0153
		Married Male	1.5335	0.0025
		Single Female	1.9811	0.0177
		Married Female	1.6267	0.0091

Table 1.14: Model Fit: Simulated and Sample Moments

	Type	Simulation	Data
Mean Financial Transfer		1258	1066
Fraction Full-time	Single Male	.777	.658
	Married Male	.993	.750
	Single Female	.834	.683
	Married Female	.000	.488
Fraction Part-time	Single Male	.177	.073
	Married Male	.004	.052
	Single Female	.079	.082
	Married Female	.000	.151
Fraction Co-resident	Single Male	.462	.458
	Married Male	.112	.092
	Single Female	.387	.355
	Married Female	.097	.125
Fraction Care-giving (Independent)	Single Male	.465	.408
	Married Male	.312	.403
	Single Female	.522	.331
	Married Female	.414	.461
Fraction Care-giving (Co-resident)	Single Male	.700	.629
	Married Male	.622	.559
	Single Female	.934	.719
	Married Female	.928	.797

Figure 1.4: Model Fit: Age Profiles of Living Arrangements

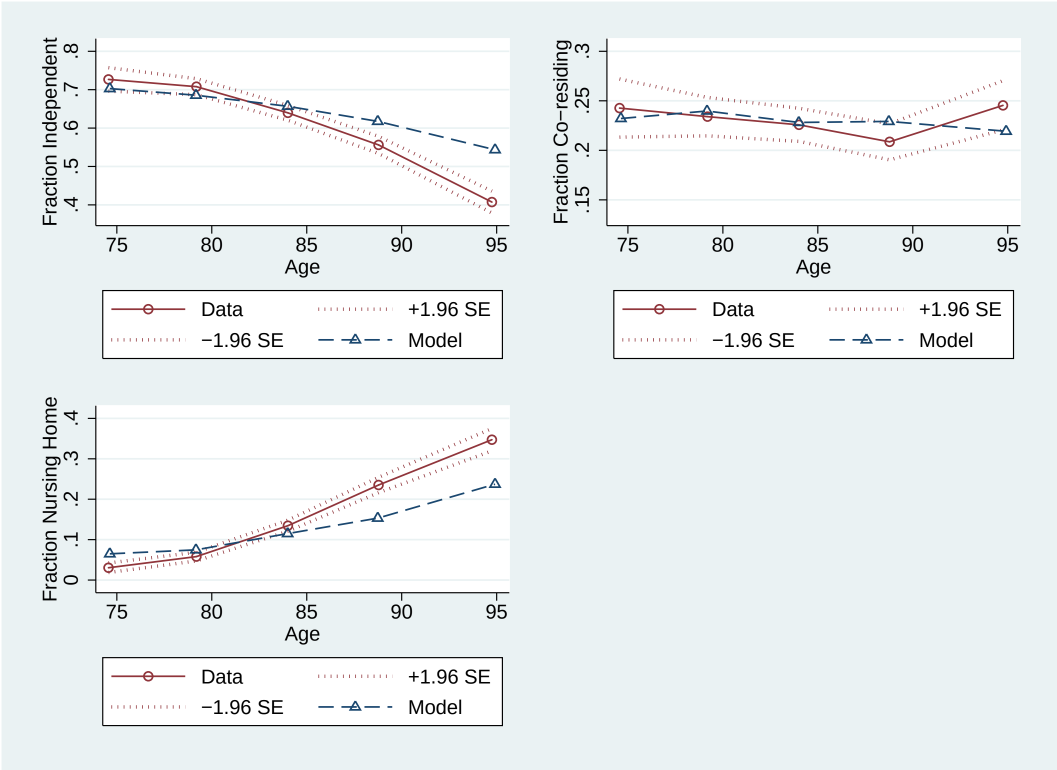

Figure 1.5: Model Fit: Age Profiles of Median Assets

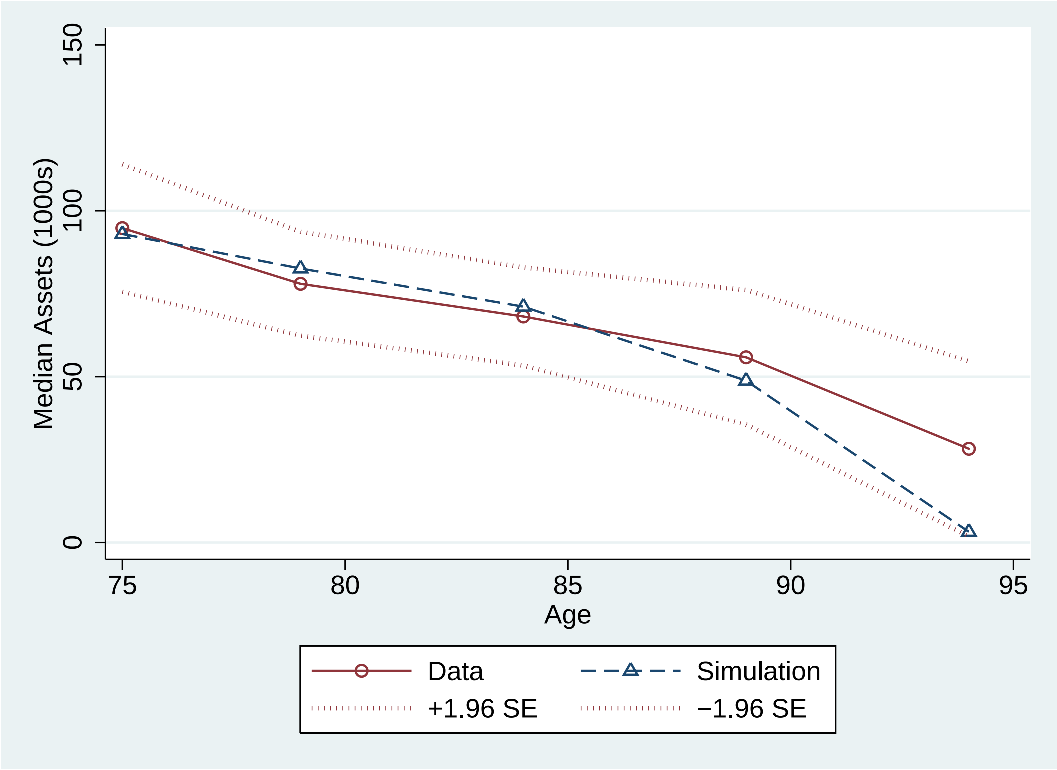

Figure 1.6: Model Fit: Living Arrangements by Parent and Child Incomes

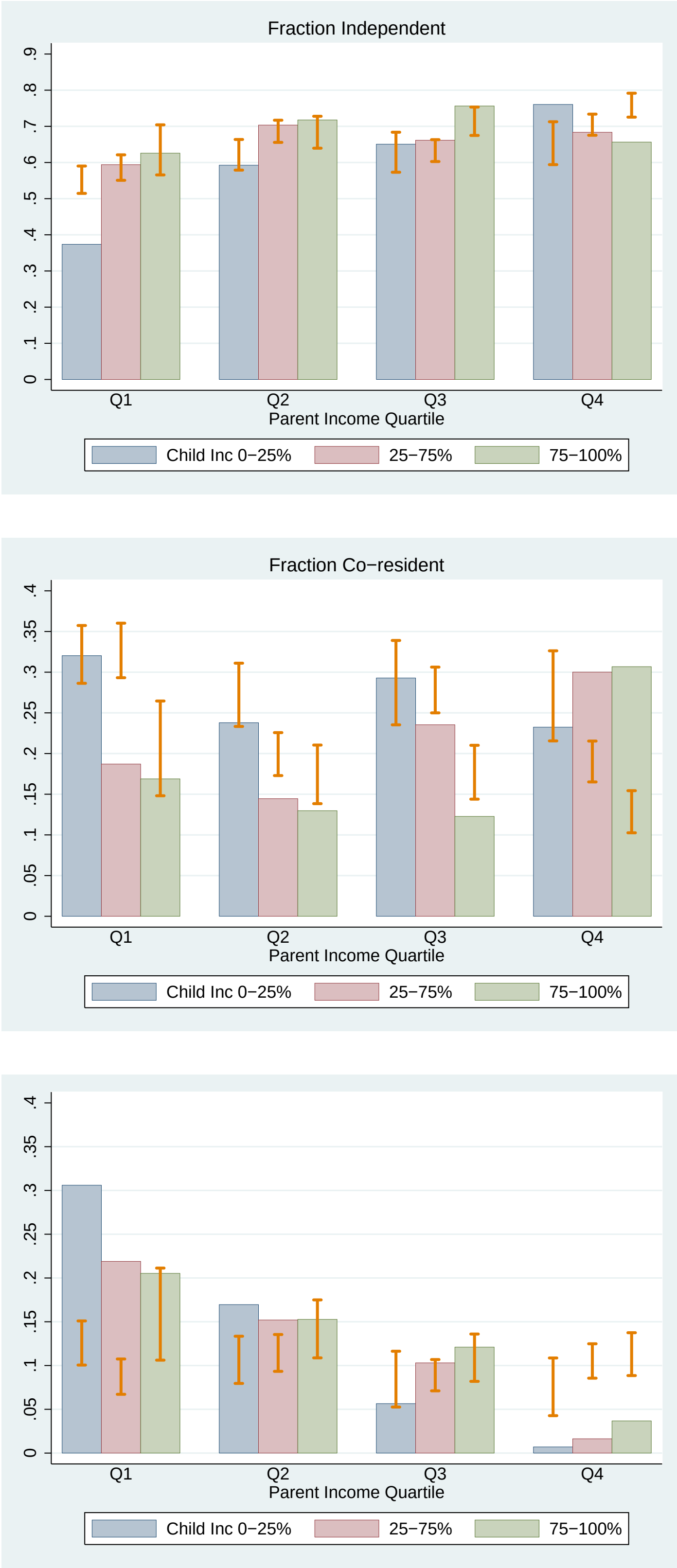

Table 1.15: Policy Simulations: Overview of Results

	Baseline	Lump-sum	Wage	Allowance	Respite	Eligibility
Living Arrangements						
Independent	0.63	0.65	0.74	0.67	0.63	0.64
	(0.0024)	(0.0024)	(0.0022)	(0.0023)	(0.0024)	(0.0024)
Co-resident	0.23	0.26	0.22	0.22	0.23	0.23
	(0.0021)	(0.0022)	(0.0021)	(0.0021)	(0.0021)	(0.0021)
Nursing Home	0.14	0.082	0.034	0.11	0.14	0.13
	(0.0017)	(0.0014)	(0.00090)	(0.0016)	(0.0017)	(0.0017)
Child Work Status						
Not Working	0.41	0.44	0.46	0.44	0.41	0.41
	(0.0024)	(0.0025)	(0.0025)	(0.0025)	(0.0024)	(0.0024)
Part-Time	0.14	0.16	0.20	0.16	0.15	0.14
	(0.0017)	(0.0018)	(0.0020)	(0.0018)	(0.0018)	(0.0017)
Full-Time	0.45	0.40	0.35	0.40	0.45	0.45
	(0.0025)	(0.0024)	(0.0024)	(0.0024)	(0.0025)	(0.0025)
Informal Caregiving						
No Care	0.82	0.75	0.65	0.76	0.81	0.82
	(0.0019)	(0.0022)	(0.0024)	(0.0021)	(0.0020)	(0.0019)
Some Care	0.027	0.050	0.16	0.026	0.036	0.028
	(0.00081)	(0.0011)	(0.0018)	(0.00080)	(0.00093)	(0.00082)
All Care	0.16	0.20	0.19	0.22	0.15	0.15
	(0.0018)	(0.0020)	(0.0019)	(0.0020)	(0.0018)	(0.0018)
Government Benefits						
Recipiency Rate	0.29	0.29	0.31	0.29	0.29	0.29
	(0.0022)	(0.0023)	(0.0023)	(0.0023)	(0.0022)	(0.0023)
Per Capita Exp.	8909.0	6786.3	6770.6	7796.5	8663.8	8711.5
	(98.3)	(79.4)	(72.6)	(88.3)	(96.6)	(97.8)
Per Recipient Exp.	31046.3	23058.1	22127.2	26885.1	30145.1	30058.2
	(241.1)	(203.1)	(170.2)	(221.4)	(239.4)	(243.4)

Standard Errors in Parentheses

Figure 1.7: Policy Simulations: Living Arrangements

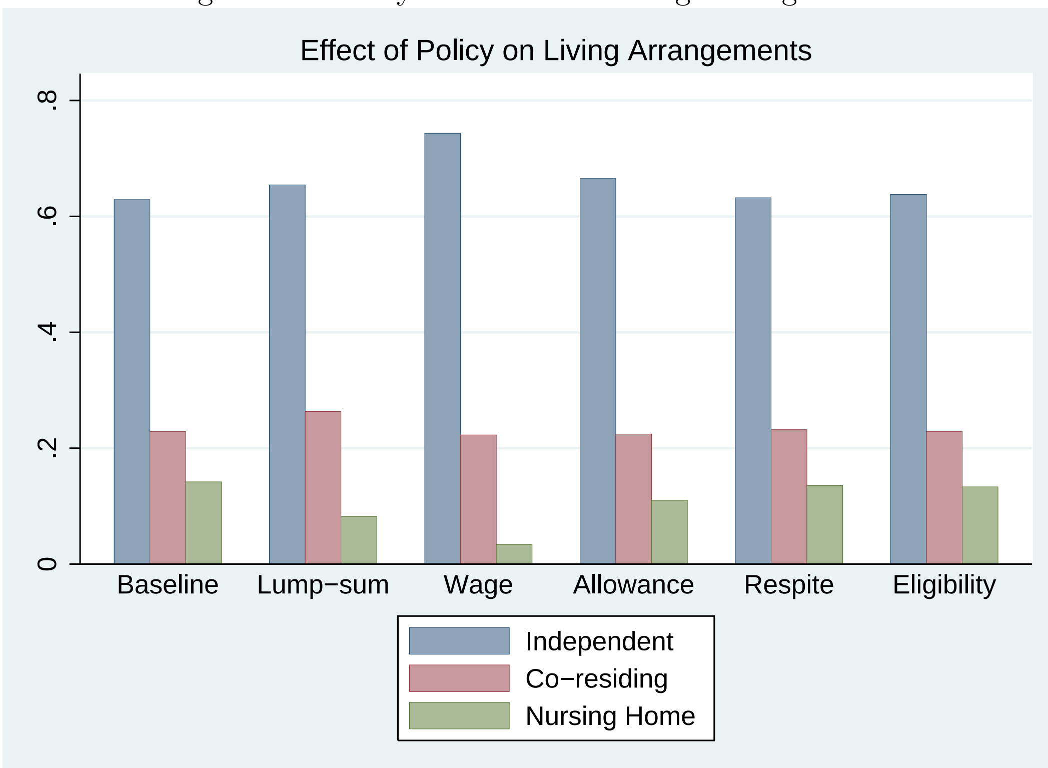

Table 1.16: Policy Simulations: Living Arrangements

	Baseline	Lump-sum	Wage	Allowance	Respite	Eligibility
Independent	0.63	0.65	0.74	0.67	0.63	0.64
	(0.0024)	(0.0024)	(0.0022)	(0.0023)	(0.0024)	(0.0024)
Co-resident	0.23	0.26	0.22	0.22	0.23	0.23
	(0.0021)	(0.0022)	(0.0021)	(0.0021)	(0.0021)	(0.0021)
Nursing Home	0.14	0.082	0.034	0.11	0.14	0.13
	(0.0017)	(0.0014)	(0.00090)	(0.0016)	(0.0017)	(0.0017)

Standard Errors in Parentheses

Figure 1.8: Policy Simulations: Age Profiles of Living Arrangements

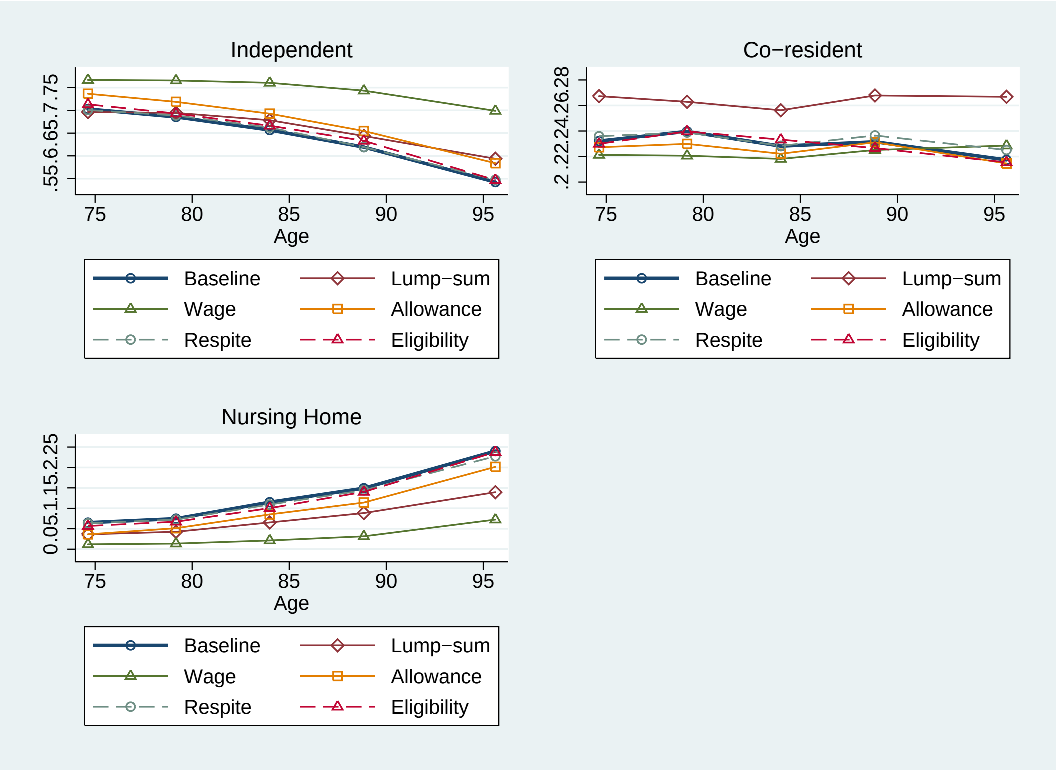

Figure 1.9: Policy Simulations: Age Profiles of Assets

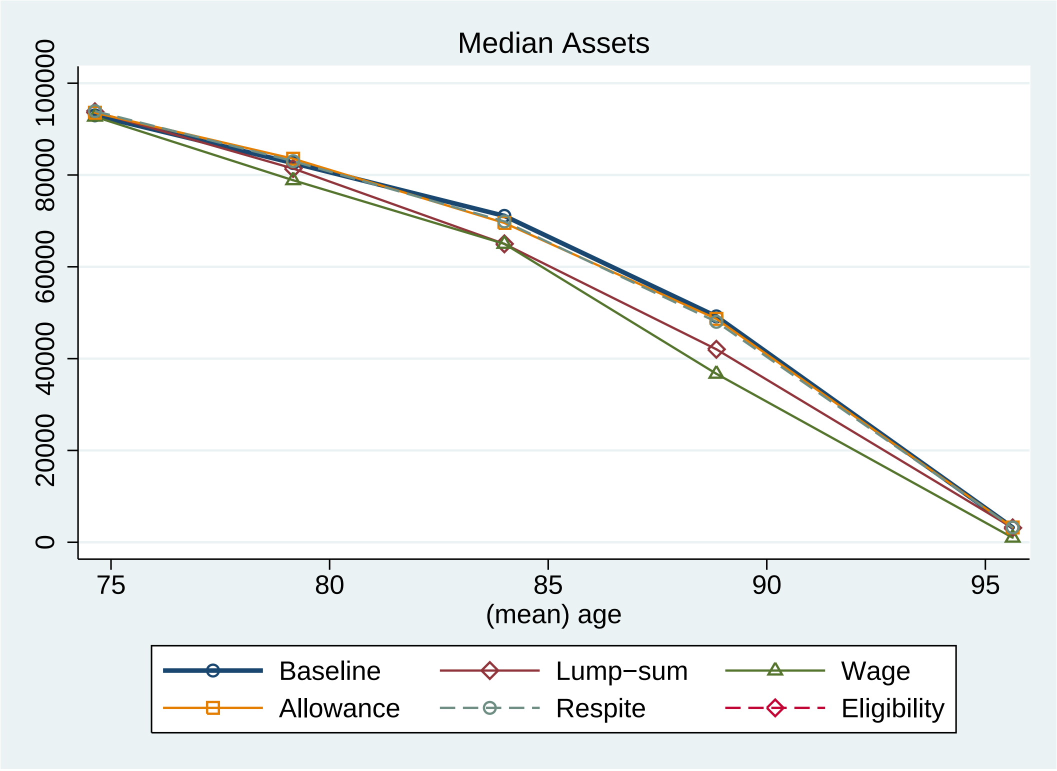

Figure 1.10: Policy Simulations: Effect of Policy on Informal Caregiving

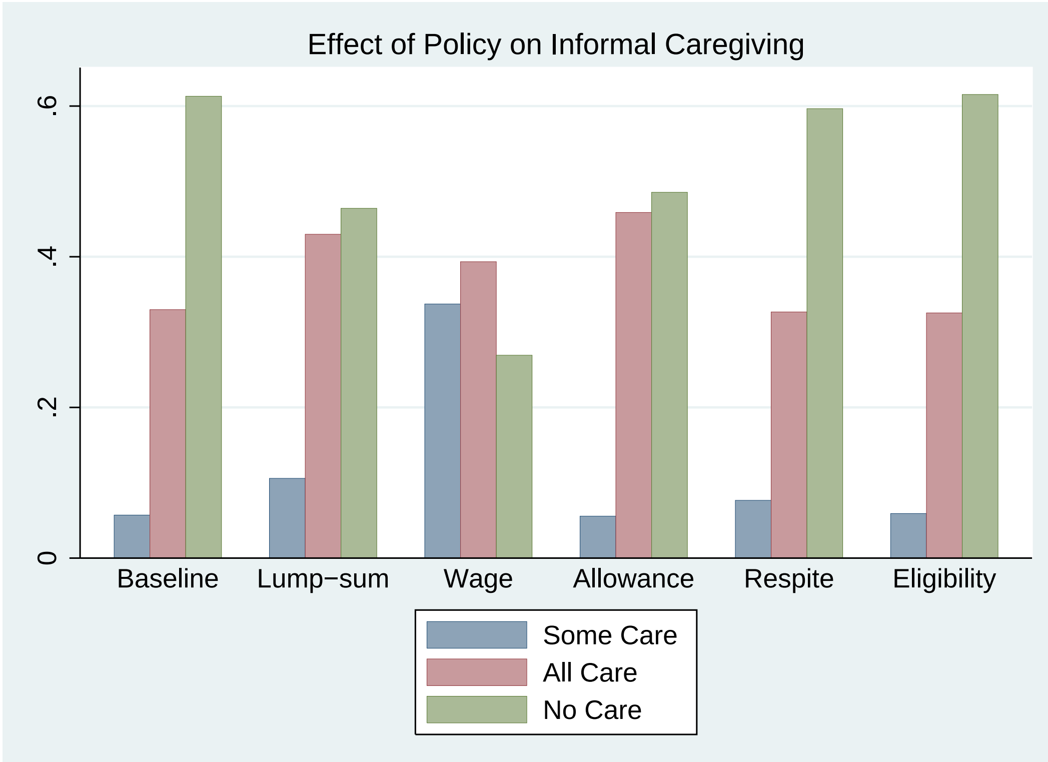

Table 1.17: Policy Simulations: Effect of Policy on Informal Caregiving

	Baseline	Lump-sum	Wage	Allowance	Respite	Eligibility
No Care	0.61	0.46	0.27	0.49	0.60	0.62
	(0.0035)	(0.0036)	(0.0032)	(0.0036)	(0.0035)	(0.0035)
Some Care	0.057	0.11	0.34	0.056	0.077	0.059
	(0.0017)	(0.0022)	(0.0034)	(0.0017)	(0.0019)	(0.0017)
All Care	0.33	0.43	0.39	0.46	0.33	0.33
	(0.0034)	(0.0036)	(0.0035)	(0.0036)	(0.0034)	(0.0034)

Standard Errors in Parentheses

Figure 1.11: Policy Simulations: Effect of Policy on Child Labor Force Participation

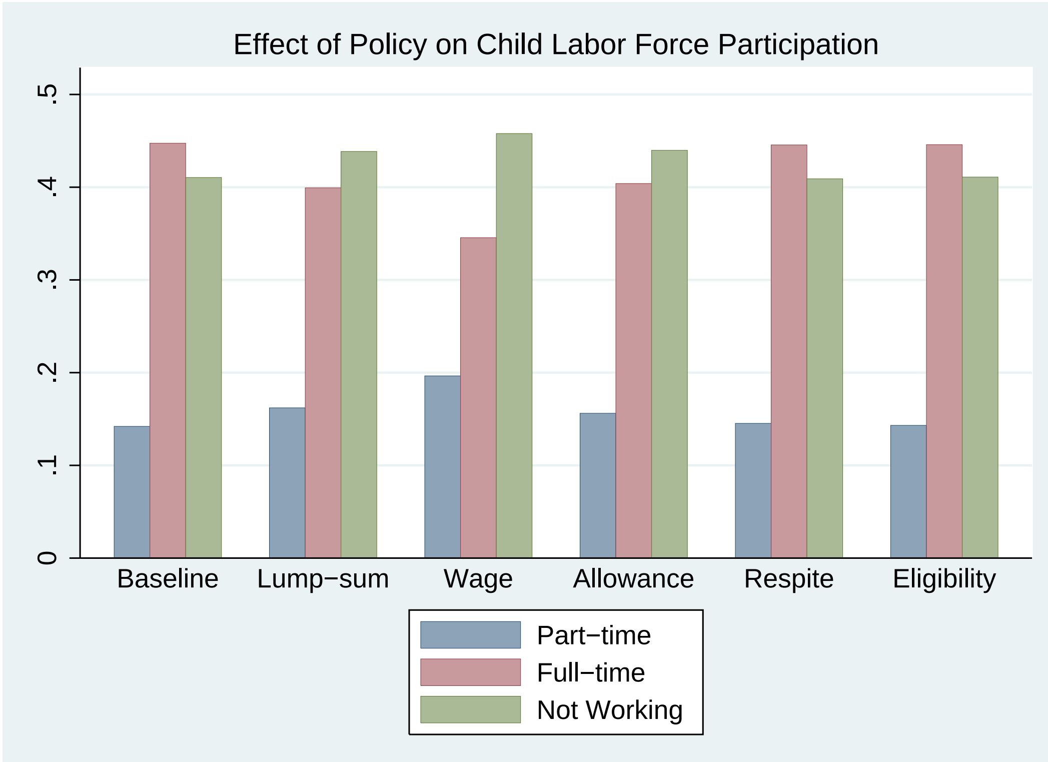

Table 1.18: Policy Simulations: Effect of Policy on Child Labor Force Participation

	Baseline	Lump-sum	Wage	Allowance	Respite	Eligibility
Not Working	0.41	0.44	0.46	0.44	0.41	0.41
	(0.0024)	(0.0025)	(0.0025)	(0.0025)	(0.0024)	(0.0024)
Part-Time	0.14	0.16	0.20	0.16	0.15	0.14
	(0.0017)	(0.0018)	(0.0020)	(0.0018)	(0.0018)	(0.0017)
Full-Time	0.45	0.40	0.35	0.40	0.45	0.45
	(0.0025)	(0.0024)	(0.0024)	(0.0024)	(0.0025)	(0.0025)

Standard Errors in Parentheses

CHAPTER 2

Informal Care, Actual Bequests, and Housing Assets

2.1 Introduction

While the provision of informal care from adult children to their elderly parents is a crucial component of the system of long-term care in the United States (Commission on Long-Term Care (2013)), the accumulated evidence indicates that caregivers are not well compensated for these vital services. Indeed, few children are explicitly paid for providing care (McGarry (1998)), and the receipt of cash gifts from parents is not strongly associated with whether a child provided informal care (McGarry and Schoeni (1997), Brown (2006), Leukhina and Santoro (2011)). Some evidence from survey data indicates that elderly recipients of informal care intend to bequeath more to the children who care for them (Brown (2006)) while other evidence is not consistent with this narrative (Norton and Van Houtven (2006)). Very little evidence from actual bequest data has been brought to bear on this question. Using probate records, Sussman et al. (1970) find that the receipt of informal care leads to unequal distribution of estates and the disinheritance of some children. However, Tomes (1981) and Norton and Taylor (2005), also using probate data, find no evidence for the so-called "exchange motive" of bequests, whereby caregivers receive larger shares of the estate relative to non-caregivers.

In spite of the ambiguity of the existing evidence, whether and how informal caregivers are being compensated for the services they provide is critically important for informing long-term care policy. Because of the centrality of this mode of care within the system of long-term care in the U.S., and particularly at a time when the cost of providing formal long-term care to the elderly through the Medicaid program is increasingly straining federal and state budgets, understanding the economic circumstances of the family caregiver is necessarily becoming a priority of policy makers.[1] Indeed, as the recent report of the Commission on Long-Term Care (2013) indicates, there is a consensus in the policy community on the need to improve support mechanisms for family caregivers to ensure the sustainability of this vital mode of care. In this context, understanding existing forms of support for caregivers in the form of bequests within the family is necessary.

Beyond the specific connection between caregiving and bequests, the division of assets among a decedent's children is an object of interest in itself. First, a sizable amount of wealth is transmitted between generations in the form of bequests, suggesting that bequests could play an important role in the distribution of wealth in the U.S. (Gale and Scholz (1994)). Second, the motives for leaving a bequest have significant implications for the effectiveness of redistributive fiscal policy as well as for the validity of the predictions from certain macroeconomics models (Barro (1974)).

The present paper is one of the few papers to study the determinants of bequest division, and the role of caregiving in particular, using data on actual bequests rather than bequest intentions. It is the only paper to do so using data from a large and approximately representative longitudinal survey of the American population over age 50, the Health and Retirement Study (HRS).[2] One advantage of the HRS for this purpose is that it includes data from all estates not just those in wills or those that went through probate or were subject to estate tax, making it more representative of the population. A second advantage of the data is that bequests can be partially disaggregated into their components, allowing for the study of different types of assets, such as housing and life insurance, separately. Of the earlier work in this literature, only Brown (2006) distinguishes between estates and life insurance. To the best of the author's knowledge, no existing studies examine bequests of housing assets separately. A second contribution of this article is, therefore, to study the division of assets, and the factors that determine asset division, across different categories

[1] In 2012, Medicaid spent $134.1 billion on long-term care, accounting for 61% of all formal long-term care expenditure in the U.S. (National Health Policy Forum (2014)).

[2] Hurd and Smith (1999) and Hurd and Smith (2002) also use the HRS data to examine bequests but do not focus on the division of assets among a decedent's children.

of assets: estates (excluding life insurance but including housing assets), housing assets, and life insurance.

The results of the paper, consistent with the literature, show that equal division is the norm for estates and life insurance settlements. At the same time, unequal division is not uncommon for estates or life insurance, and it is quite common for primary and secondary residences. The data provide little support for altruism in the division of estates, but there is evidence that the altruistic motive of bequests may apply to life insurance: bequests of life insurance tend to be less equal in families in which children are very different in terms of education and income (which may indicate differences in permanent income across children). By contrast, the results indicate a strong relationship between caregiving and the distribution of bequests among children. These results provide evidence consistent with the exchange motive: children who provide care receive larger bequests (specifically, they are much less likely to be disinherited). This connection is particularly salient for housing assets, suggesting that the exchange motive may be operating through this particular channel. Co-resident children are also more likely to receive housing assets though the interpretation of this finding is ambiguous and could reflect either exchange or altruism. These results concerning the division of housing assets are novel in the literature on estate division. Complementary with these results, the paper also gives evidence that parents who held housing assets and life insurance near the end-of-life were also more likely to receive informal care from their children. In contrast to previous work, the results in this paper are drawn from the period immediately preceding the end-of-life when care is most needed and when strategic considerations between parent and child or between siblings may be heightened.

The particular role of housing is interesting for many reasons. First, housing has a unique position among assets, for it typically comprises the majority of an individual's wealth and is also not easily divisible (Venti and Wise (2004), Nakajima and Telyukova (2011)). Second, retaining housing assets as one ages may be important for allowing an individual to retain independence in old age (Hotz et al. (2010)). Third, housing and long-term care arrangements are closely linked, and in particular caregiving and co-residence with children often go hand-in-hand. The results here suggest that housing may provide a venue for, as well as compensation of, informal caregiving from children.

The connection between caregiving and bequests of housing assets also has important policy implications. In particular, Medicaid treats housing assets quite differently from non-housing assets, allowing individuals to retain housing assets up to a threshold that is orders of magnitude above the threshold for non-housing assets.[3] As a result, Medicaid beneficiaries may die with considerable housing assets in their estates. Partly as a consequence of this provision of the Medicaid rules, since 1993, states have been required to recover assets from the estates of Medicaid beneficiaries to recoup Medicaid long-term care expenditures.[4] If housing assets are determinants of care receipt and are being used as compensation for caregivers, this has important implications for the effect of estate recovery on the provision of informal care and the well-being of informal caregivers.

The remainder of the paper proceeds as follows. Section 2.2 describes the data available in the Health and Retirement Study and the sample used for the analyses in the paper. Section 2.3 describes the division of assets within families both from the perspective of the parent and from the perspective of her children. Section 2.4 analyzes the factors that determine the division of assets using both the parent-level and child-level data. Section 2.5 considers the effect of assets on the receipt of informal care from children. While most of the paper focuses on single decedents, Section 2.6 discusses the role of marital status in the division of bequests. A final section concludes and offers directions for future research.

[3] In 2015, the limit on countable non-housing assets for a single individual for Medicaid eligibility is $2,000. Across states, the minimum eligibility limit on housing equity is $552,000, and the maximum limit is $828,000. In other words, states may allow individuals to retain up to $828,000 in housing assets and still quality for Medicaid. (http://medicaid.gov/medicaid-chip-program-information/by-topics/eligibility/downloads/2015-ssi-and-spousal-impoverishment-standards.pdf)

[4] States have been required by law to implement such estate recovery programs since the Omnibus Budget Reconciliation Act of 1993. States are required by OBRA 1993 to recoup Medicaid expenditures on long-term care and have the option of recovering the costs of other Medicaid services. In 2013-14, California recovered $61 million from 3,900 cases. To put that figure in perspective, including both state and federal contributions, the budget of Medi-Cal, the state Medicaid program, was $85.7 billion in 2014. (http://kaiserhealthnews.org/news/some-face-a-big-bill-from-medi-cal-after-they-die/)

2.2 Data

The data are drawn from the Health and Retirement Study (HRS). The HRS is a biennial, longitudinal survey of older Americans that is approximately representative of the American population ages 50 or older when properly weighted. Interviews were first conducted in 1992 with subsequent follow-up interviews conducted approximately every two years with the survey participants, and additional cohorts were added in 1998, 2004, and 2010. A novel feature of the HRS is that, following the death of a survey respondent, proxy interviews are conducted with the decedent's survivors about the decedent's end-of-life experience as well as the division of their estate. These interviews are known as "exit" interviews. The data for this paper include exit interviews over the period 1995-2012. Data for the decedents who appear in these interviews is combined with data from their live (or "core") interviews from the RAND versions of the HRS data, including the RAND HRS (version N), and RAND Family (version C) files, including both respondent and child files from the latter data set.

As discussed in the introduction, one very valuable feature of the HRS exit data is that it includes data not just on assets included in wills or which went through probate courts or were subject to estate taxes. Estate tax records only contain data on the largest estates: the basic exclusion amount is $5.43 million in 2015, for example. While many estates do go to probate, certain types of assets are exempt. For example, living trusts, jointly owned properties, and small estates are not probated.[5] In addition, any assets with a beneficiary designation, such as life insurance and retirement benefit accounts (e.g. IRAs, Keoghs, 401(k) accounts), are not probate assets.[6] As a result, the HRS exit interview data provide a unique view into the division of estates that may not be fully captured by either probate or estate tax records.

[5]California, for instance, has an affidavit procedure that allows inheritors to skip probate if the value of the estate is not more than $150,000, excluding joint tenancy property and life insurance.

[6]Other types of accounts not subject to probate include pay on death (POD) accounts and transfer on death (TOD) accounts.

2.2.1 Samples

The analysis that follows is conducted from two angles: from the perspective of the parent (i.e. the decedent, who was the original HRS survey respondent) and from the perspective of the respondent's children. In the respondent-level analysis, an observation is a parent, and there is one observation per parent. For the respondent-level analysis, the primary sample is limited to decedents (i) for whom an exit interview has been conducted, (ii) who appear in the RAND files (both HRS and Family files), (iii) who were single (neither married nor partnered) at the time of their death, and (iv) who have two or more step or own children (based on relationships to the children listed in the RAND Family child file). Respondents that do not meet criteria (i)-(iv) are excluded from the analysis with the exception of Sections 2.5 and 2.6 which enlarge the sample to include married decedents in addition to single decedents. The final sample includes 4,612 single decedents (and an additional 4,146 married decedents in the final two sections). Summary statistics for the sample of single decedents are presented in Table 2.1. In Table 2.1 and in the tables that follow, the notation "m.r." indicates that the value of the variable was taken from most recent core interview, which may be the interview immediately preceding the exit interview or an earlier interview if the data were not available in the final core interview or if that interview was skipped. In general, the only data taken from the exit interviews for the analyses in this paper are data on caregiving and bequests, and all remaining data are lagged values from the core interviews.

For the sample of single decedents, Table 2.2 shows the relationship between the proxy respondent, to whom the exit interview was administered, and the decedent. By far, daughters are the most common proxies, accounting for 50% of respondents. Sons are the second most common, at 25% of proxy respondents.[7]

In the child-level analysis, an observation is a child, and there can be several observations

[7]Balanced against the merits of working with the HRS exit interview data is the fact that these data are often reported by the decedent's children, who for obvious reasons cannot be regarded as neutral parties on matters of estate division. This fact suggests that caution may be warranted when analyzing some of the more subjective questions in the survey, such as whether bequests were "equally" divided. However, a similar caveat applies to bequest intentions data (subjectively reported by the parents some time before their death) which are commonly used in the literature. Interestingly, many of the findings in this paper are similar to the results from Brown (2006), which uses bequest intentions data from the HRS. See Table 2.5.

per parent. For the child-level analysis, all step and own children of this set of respondents are retained. Throughout the analysis, grandchildren, children-in-law, and children of unknown relation to the decedent are ignored. The final sample contains 18,821 children, an average of roughly 4 children per decedent on average (3 at the median). Summary statistics for the sample of children appear in Table 2.3. Child income is typically not reported using continuous values in the HRS, so continuous values were imputed using the Current Population Survey (CPS).

2.2.2 Assets

A second distinctive feature of the HRS data is information on multiple types of assets. The exit interviews contain data on four classes of assets: estate (*including* residences but *excluding* life insurance), life insurance, primary residence, and secondary residence.[8] The particular information available and the sequencing of the interview questions vary somewhat by the type of asset. The most important distinction is that information regarding whether the asset was divided equally among the decedent's children is available for the overall estate (including residences, excluding life insurance) and for life insurance but not available for either primary or secondary residences. For these latter two categories, proxy respondents are, however, given the opportunity to report whether all children received the asset. The remaining sections in this document offer considerable elaboration on the asset categories and modes of division.

2.3 Division of assets

The following two sub-sections provide a descriptive analysis of how an individual's assets are divided following her death, first from the parent's (decedent's) point of view and then from that of her children.

[8]Note that the exit interview survey questions make no distinction between term and whole life insurance.

2.3.1 Parent's perspective

Table 2.4 shows the division of assets by type for the sample of single decedents with exit interviews who have one or more step or own children. An observation is a decedent. The columns refer to the different types of assets. Recall that estate (column 1) includes primary and secondary residences (columns 3 and 4) but does not include life insurance (column 2). The first row describes the fraction of decedents owning each type of asset. Ownership of estates is inferred based on whether a question regarding how the estate was divided is asked. Note that proxy respondents are not asked this question if an estate has not yet been disposed, so the ownership figure likely understates the true extent of ownership for this category. Ownership of life insurance is inferred based on whether a life insurance settlement had been received, so this figure may also understate the true ownership figure. It is therefore best to think of "ownership" as depicted in this table as including both ownership *and* disposal of the asset.

The figures in Table 2.4 show that asset ownership (row 1) is common for estates (56%), life insurance (31%), and primary residences (41%), but second homes are not common (3%).[9] Among single decedents who owned these assets, the vast majority (84%-91%, varying by category) left some portion to their children (row 2). However, these figures imply that full disinheritance of all children is also not uncommon, ranging from 8% of cases for primary residences to 15% of cases for overall estates.[10]

The remaining three rows indicate how assets were distributed among children, conditional on ownership, disposal, and leaving some portion to children. The first of these, "Divided Equally," means that the proxy respondent reported that all children receive equal shares of the asset. This response is present in the data only for estates and life insurance

[9] A comparison of the ownership data from the exit interview with the information on ownership in the final core interview supports the notion that the definition of ownership in this paper (i.e. ownership plus disposal) understates the true extent of ownership. Ownership figures from the last core interview (not shown in the table) are: 86% for estate (measured as net wealth > 0), 56% for life insurance (including whole life and term), 63% for primary residence, and 7% for secondary residence.

[10] Although overall estates include primary residences, it is possible for a larger percentage children to be disinherited from estates than primary residences because the set of decedents with a primary residence is a subset of the set of decedents with any assets. In other words, the 15% figure is calculated over a larger sample, which contains the sample used to compute the 8% figure.

and not for primary or secondary residences. In the latter two cases, one can regard the fraction of cases where all children were reported to have received the residence as an upper bound on equal division. The exit interview data indicate that 76% of estates and 58% of life insurance settlements are divided equally among all children. The next row, "All Children, Not Equally," includes cases where the proxy respondent mentioned that all children received the asset but did not specify that the division was equal. It also includes cases where all own and stepchildren are mentioned individually by the proxy respondent as recipients of the asset.[11] This situation is just slightly more common for primary and secondary residences (35% and 30%, respectively) because equal division is not reported for these categories, but it is also not uncommon for estates (18%) or life insurance (29%).

The final row, "Other," includes all other cases: i.e. some, but not all, step and own children were recipients of the asset. This partial disinheritance is very common for primary and secondary residences (65% and 70%, respectively), but there are relatively few families in which one or more children are disinherited from the overall estate (5%) or life insurance (13%). Given these figures, it is natural to ask whether children who do not receive housing assets are being compensated with other assets, resulting in equal division when the overall estate is considered. Perhaps surprisingly, the overall estate is equally divided in only 53% of families in which one or more children are disinherited from the primary residence and 60% of cases with partial disinheritance of the secondary residence.[12]

Table 2.5 compares the results in this paper to the findings of earlier authors. To the author's knowledge, only one other article (Hurd and Smith (2002)) has examined the distribution of assets using exit interview data from the HRS. That paper finds that 20% of estates are divided unequally among children. The evidence from other studies that use actual bequest data from either federal estate tax or probate court records yield a wide array of estimates of the extent of unequal division, ranging from 49.6% of estates (Tomes (1981)) to 15.7% of estates (Menchik (1988)). The finding in this paper of unequal division in 24% of

[11] Practically speaking, this occurs when all own and stepchildren who appear in the RAND Family child file are listed (by Other Person Number, or OPN) in the exit interview data.

[12] Calculations do not appear in the table. Again, these numbers are not inconsistent with 5% partial disinheritance of overall estates because homeowners are a relatively small subset of the set of decedents who possess estates.

cases is near the mean of these estimates and is very close to the 23.4% reported by Wilhelm (1996).

Estimates of unequal division can also be obtained using data on intended bequests. While Light and McGarry (2004) find that only 7.9% of mothers intend to divide their estates unequally among their children, Brown (2006) finds intended unequal division in 24% of cases among single decedents with wills and two or more children.[13] Among this group, Brown (2006) finds that 6% of parents intend to disinherit all children and that 11% partially disinherit. The corresponding figures for overall estates from the 1995-2012 exit interview data used in this paper are that 16% of parents disinherit all children while just about 4% disinherit some children but include others.[14] Brown (2006), unlike the other articles, also examines the division of life insurance settlements. The results indicate that 63% of unmarried parents with two or more children and long-term care needs who have a term life insurance policy listing at least one child exclude one or more children from the life insurance policy. This percentage is considerably higher than the most closely corresponding figure reported here (not conditional on care needs), which is that just 13% of single decedents whose children receives a life insurance settlement listed fewer than all of their children.

2.3.2 Child's perspective

Table 2.6 repeats the analysis of the preceding section from the perspective of the decedent's children. An observation is a child of a decedent, so decedents may appear twice. All step and own children of the sample of single decedents are included. The second column ("Mean") records the fraction of children receiving each type of asset. These fractions are conditional on both ownership and disposal of the asset. A child is considered to have received an asset if either (i) the exit interview proxy respondent reports that "all children" (regardless of whether equally divided) receive the asset or (ii) the child was listed by name

[13]The very low 7.9% figure from Light and McGarry (2004) may be due to the fact that their sample includes relatively young mothers. The average age in their sample is around 60 while the youngest respondent in the AHEAD data (used by Brown (2006)) is 70 years old. For the sample in this paper, the mean age at the last core interview is 80.

[14]The calculation is: 4% = 84% ["left to children"]×5% ["other"].

(i.e. Other Person Number, or OPN) as having received the asset. The table is broken into three panels: the top panel includes all children, the middle panel includes only own children, and the bottom panel includes only stepchildren. Note that the disinheritance observed in this table reflects a combination of both partial (i.e. some children receive the asset while others do not) and full disinheritance (no children receive the asset).

This table highlights the relatively high frequency of disinheritance. In the case of overall estates (row 1), 21% of all children do not receive any portion of the estate (excluding life insurance). The figure for life insurance (row 2) is a comparable 23%. For housing assets (rows 3 and 4), the figures are much larger: 56% of children receive no portion of a primary residence while 59% receive no part of a secondary home. The fifth row indicates that 21% of all children receive no asset of any kind.

Turning to the comparison of own and stepchildren in the lower two panels of the table, it is apparent that stepchildren are more likely to be disinherited across all asset categories. The difference in the probability of disinheritance between own and stepchildren is small for overall estates (3 percentage points), a bit larger for life insurance (15 percentage points), and quite substantial for primary residence (30 percentage points).

2.4 Determinants of the division of assets

This section addresses the following question: What factors determine how a parent divides her assets, whether equally or otherwise, and which children receive which types of assets as a bequest? The first sub-section analyzes the question from the parent's perspective while the second addresses the question from the child's perspective.

2.4.1 Parent's perspective

In this sub-section, the decision over how to allocate assets is examined conditional on the decedent having already chosen to leave some portion of her assets to her children.[15]

[15]Conditioning the sample in this way retains approximately 90% of observations across asset types.

For estates and life insurance, the decedent faces three mutually exclusive and exhaustive alternatives: (1) divide assets equally among children, (2) leave assets to all children but not equally, or (3) disinherit some children ("other"). For primary residences, given that no information on the equality of the bequest is available, the decedent faces two choices: (1) leave the asset to all children, or (2) partial disinheritance.[16]

The results in this section are reported across four tables. Table 2.7 displays the estimates from probit models of the choice of whether to leave an equal bequest of the overall estate (column 1) and life insurance (column 2). The dependent variable is equal to 1 if the bequest was left equally to all children and 0 otherwise. Table 2.8 presents the results from probit models of the choice to leave assets to all children (including equal division) for the overall estate (column 1), life insurance (column 2), and the primary residence (column 3). Tables 2.9 and 2.10 show estimates from multinomial probit models of the discrete choice faced by a parent of how to divide her overall estate and life insurance, respectively. The columns each correspond to a different mode of division, as delineated above: equal (column 1), all children but not equal (column 2), or otherwise (column 3). In all tables, the rows correspond to covariates, broken into three blocks: parent characteristics (top), caregiving (middle), and summary child characteristics (bottom). The entries reported within the tables are marginal effects measuring the effect of a one unit change in each covariate at the mean of the data.

The results for overall estates indicate that parents without stepchildren, parents whose children are on average more educated, and parents whose children have higher average incomes tend leave more equal bequests. Though not significant in Table 2.7, the estimates in Table 2.9 show more equal division of estates in families where children assist their parent with her activities of daily living (ADL) limitations, suggesting a connection between caregiving and the division of bequests. Bequests become more equal when all children provide some assistance. From Tables 2.7 and 2.9, there is no clear evidence of parental altruism. Were parental altruism important, one would expect to see more unequal division in families with children who were more heterogeneous in terms of their permanent income (as measured

[16] Given that relatively few decedents own second homes, this asset category is excluded from the analysis in this section.

by education or current income, say), as a parent attempts to use bequests to even out differences in lifetime earnings between children. On the basis of the signs of the the coefficient estimates alone, it does appear that families with children who are more heterogeneous in age, education, and income do have less equal division, but the effects are not statistically significant. On the other hand, Table 2.8 shows that it is less likely that all children receive some portion of the estate in families where children have very different levels of education. Moreover, the results in Table 2.9 also indicate that partial disinheritance is more common in families where one or more children co-reside with the parent. If co-resident children are in greater need of parental help, this estimate could be picking up the effect of parental altruism. Families in which all children are homeowners also tend to have a higher frequency of partial disinheritance.

Turning to life insurance, the association between caregiving and the division of bequests is even stronger in this case than in the case of estates. Families in which some but not all children assist a parent with ADL limitations are much more likely to have unequal division of life insurance. Those in which all children provide some informal care are much more equal. Unlike in the case of the overall estate, the presence of stepchildren appears unimportant in this context. The results also indicate that white decedents leave more equal bequests though the other respondent characteristics do not appear to be important. Similar to the results for estates, the presence of co-resident children increases the likelihood of unequal bequests. In contrast to the estates results, Tables 2.7 and 2.10 show much clearer evidence of parental altruism: unequal bequests are more common in families with more heterogeneous children, as measured by differences in age, education, and income.

The last column of Table 2.8 presents estimates obtained from a probit model in which the dependent variable is equal to one if a parent leaves her primary residence to all of her children (regardless of whether divided equally) and zero otherwise. Consistent with the earlier results, families with no stepchildren tend to be more equal: all children are more likely to receive a share of the primary residence. In contrast with the findings for estates and life insurance, there is no strong relationship between bequests and caregiving or co-residence, nor does child heterogeneity appear to affect the division of the primary residence. It should be noted, however, that the results for primary residences are not strictly comparable to the findings for estates and life insurance due to the absence of a category for equal division.

The findings in this sub-section regarding the division of estates are comparable to what has been observed in the literature on intended bequests. On the question of whether bequest patterns are consistent with an altruistic model of bequests, McGarry (1999) finds that intended bequests, elicited using questions about respondents' wills in AHEAD 1993, are less equal when children's ages and levels of schooling are different and when not all children own homes. Using data from the National Longitudinal Survey of Young Women and Mature Women, Light and McGarry (2004) also obtain similar results. The authors find mothers with non-biological children, mothers in poor health, and mothers whose children's incomes vary widely are more likely to intend unequal bequests. While the results obtained here for estates do not show a strong relationship between child heterogeneity and the division of estates, the coefficient estimates point in the right direction, and insignificance may owe to the relatively small sample size. Moreover, the results for life insurance do show strong evidence of parental altruism in bequests consistent with the literature.

Relative to the exchange motive, the results in the existing literature are mixed. The results above indicate that the uneven receipt of informal care from children may be related to more unequal division of bequests. This result is in line with the findings in Sussman et al. (1970) who, using data from a sample of estates from Cleveland probate court records, observe strong evidence that unequal bequests and disinheritance were due to the child who provided the most service to their parent receiving the largest share of the inheritance (which, in cases of smaller estates, could mean the entire estate and therefore lead to disinheritance). By contrast, on the basis of a 5% random sample of estates probated in Cleveland, OH, in 1964-65, Tomes (1981) finds that frequency of contact with parents is not related to inheritance.[17] Most recently, Norton and Taylor (2005) link a longitudinal study of the elderly in North Carolina, the Piedmont Health Survey of the Elderly, to probate records. They found no association between four measures of exchange, including co-residence, help with cooking meals, shopping, and fixing things around the house, and whether bequests

[17]It should be mentioned that the results in that paper were later disputed by Menchik (1988).

were unequal. The authors also did not find that these measures of exchange were related to estate size in a test of the strategic bequest motive similar to that of Bernheim et al. (1985) and Perozek (1998). However, they caution that these results may be due to the small sample (265 probate records) used in their analysis.

The literature on the exchange motive also contains a few studies that examine this question using bequest intentions. On the one hand, the results in this paper are consistent with the findings in Brown (2006) (see the following sub-section) who finds that child caregivers are more likely to be listed as beneficiaries in wills and life insurance contracts. The finding in Light and McGarry (2004) that mothers in worse health are more likely to intend unequal bequests is also consistent with an exchange motive. On the other hand, these conclusions contrast with Norton and Van Houtven (2006), who find no evidence of a relationship between receipt of informal care from children and the probability of intending to leave an equal bequest in the first two waves of the AHEAD survey.

2.4.2 Child's perspective

This sub-section offers a similar analysis to that of the preceding sub-section but from a child's perspective. Table 2.11 presents the coefficient estimates from a linear probability model of whether each child was a recipient of each type of asset in the exit interview. Each column corresponds to a different type of asset, and the dependent variable in each case is an indicator equal to 1 if the child received the asset and 0 otherwise. Families are only included in each regression if the deceased parent owned the asset in question and it was disposed of by the time of the exit interview. The unit of observation is a child, and because parents can appear multiple times, standard errors are clustered by family (i.e. by decedent).

The covariates (rows) are broken into three blocks: caregiving and co-residence (top), child characteristics (middle), and parent characteristics (bottom). The first row shows a very strong relationship between the provision of informal care by the child and the receipt of assets, and the effect is strong across all four types of assets. The second row indicates that co-resident children are much more likely to inherit primary housing assets. Whether the child is a stepchild continues to exert a strong effect on asset receipt: non-stepchildren are much more likely to receive life insurance and both types of housing assets. Few other clear patterns are discernible. More educated and higher income children seem to receive more of each type of asset though the latter effect is significant only for estates (excluding life insurance, column 1). The effects of other covariates are mixed across assets. There is therefore no strong support for parental altruism playing a role by using bequests to even out differences among children.

Table 2.12 repeats this analysis with the inclusion of family fixed effects. The rationale for the inclusion of the fixed effects is to delve deeper into the relationship between caregiving and bequests. One concern is that this association is driven entirely by family "closeness:" parents in closer families include more of their children as beneficiaries of their estates, and children in these families provide more informal care for their parents.[18] The family fixed effects may mitigate the influence of family closeness as well as other family-specific factors that the previous OLS models failed to capture, providing cleaner identification of the effect of caregiving on bequest receipt.

The results in Table 2.12 continue to indicate a strong relationship between providing informal care to a parent (first row) and receipt of assets, conditional on ownership and disposal. This finding is strongly suggestive of the presence of an exchange motive whereby children who provide informal care to their parents are compensated through bequests. In particular, since the dependent variable in each column is an indicator for receipt of each asset type, the results indicate that children who provide informal care are less likely to be disinherited. Note, however, that the inclusion of fixed effects greatly attenuates the coefficient estimates for the effect of informal care on the receipt of estates (column 1) and life insurance (column 2) but much less so for primary and secondary residences. Therefore, the evidence suggests that the relationship between caregiving and bequest receipt may operating mainly through the channel of housing assets.

[18]If "closeness" is to be interpreted simply as stronger than average bi-directional altruism between parent and children, there need not be a relationship between caregiving and bequest receipt, for a child's household income and other measures of economic well-being (marital status, education, age, home ownership, and number of children) are already included in the model. Of course, closeness need not take this specific form.

Co-residence (second row) remains a strong predictor of the receipt of a primary residence though, consistent with Norton and Taylor (2005), co-residence does not appear to affect the division of the overall estate. On the one hand, co-residence could be capturing additional assistance provided from the child to the parent and therefore additional support for the notion of an exchange motive for bequests. On the other hand, co-residence could be measuring child need beyond what is being captured by the available child covariates and therefore providing evidence of parental altruism. From these results, it is not possible to distinguish which of the two motives is being captured. Overall, the evidence for parent altruism in bequests is mixed. A child's income has an insignificant effect on whether they receive each type of asset. The effects of child home ownership and education are positive, if generally not significant. As in the earlier results, own children are less likely to disinherited across all asset types than stepchildren.

The paper providing an analysis most similar to that included here is Brown (2006), which uses data from the 1993 wave of AHEAD on intended bequests through wills and term life insurance policies. Consistent with the findings reported above, Brown (2006) finds that children who supply informal care or who are projected to supply such care in the future are much more likely to be included in wills and life insurance policies. The results in that paper also indicate that unmarried children, children with fewer of their own children, and biological or adopted children are also more likely to be included. The findings in the present paper show an insignificant relationship between a child's marital status and bequest receipt (though the coefficient on "Married" is negative) and a positive relationship between bequest receipt and not being a stepchild.

2.5 Assets and the receipt of informal care

The results in the preceding sections provide evidence linking the receipt of care from children to the division of bequests, with child caregivers being relatively more likely to receive bequests than other children. If it is indeed the case that bequests reward children for providing informal care, a natural question to ask is: does the receipt of care from children depend on the parent's ability to use bequests to reward children for caregiving?

Table 2.13 provides some support for the notion that receipt of informal care is related to a parent's assets near the end-of-life. The results in the table are for an OLS model of whether a decedent receives any informal care from her children between her last core interview and the time of death, conditional on receiving some sort of assistance with her I/ADL limitations. The model was estimated on a pooled sample of married and single decedents. Coefficient estimates are in column 1, and standard errors are reported in column 2. The top and bottom blocks of rows contain, respectively, parent and child covariates, and the middle portion of the table contains six measures of the parent's bequeathable assets. All covariate data are taken from the preceding core interview.

The choice to condition on the receipt of care rather than the need for care is due to the phrasing of the questions in the exit interview which do not ask about whether help was needed only whether it was received. However, over 81% of decedents in this sample required some assistance with I/ADL limitations between their final core interview and their death. The focus on end-of-life caregiving differs from previous analyses in the literature and is motivated by two considerations: first, the need for caregiving is greatest at the end-of-life, and second, strategic incentives may be strongest when a parent is visibly near to death.

The results indicate that, while net wealth has an insignificant, negative effect on whether children provide informal care, the composition of wealth appears to be important. Home ownership itself does not appear to affect whether informal care is received from children, but the value of housing wealth is strongly positively related to the receipt of care. In addition, whether children are listed on the deed to the decedent's house is also important, with these decedents significantly more likely to receive care from children: 5.97 percentage points relative to the mean of 63.5%. These findings are consistent with the results linking bequests of housing assets to the provision of informal care. Parents with more housing wealth, and especially those who clearly intend to leave those assets to their children, receive more informal care. The finding that decedents whose children all own homes (roughly 76% of the sample) are more likely to receive care provides a challenge to this interpretation, however.

Life insurance is also related to the receipt of informal care. Decedents who held life insurance at the prior core interview but who did not list any children as beneficiaries are less likely to receive informal care from their children. By contrast, those who did list children as beneficiaries are 8.4 percentage points more likely to be cared for by the children relative to those without insurance.

These results are consistent with some of the findings in McGarry (1998), which reports that children listed on home deeds and children listed as beneficiaries of life insurance are more likely to provide informal care in the AHEAD 1993 data. That paper also finds that respondents whose children appear on home deeds are more likely to receive care from non-co-resident children. However, McGarry finds mixed results for numerous other proxies for exchange and concludes that there is little evidence for the exchange motive. Another interpretation of those results, consistent with the findings in this paper, is that an exchange motive is operable but only through particular channels, such as life insurance and housing assets. This notion is supported also by the results in Hoerger et al. (1996) who find a relationship between housing wealth and formation of intergenerational households, which are closely linked to informal care provision.

The results discussed to this point are consistent with models of exchange where children who provide more care receive larger bequests. Some of these models (see, e.g. Bernheim et al. (1985) for the original formulation and Perozek (1998) for a criticism) deliver this positive association between caregiving and assets by assuming that a parent is able to condition her bequest on the actions of her children. Other models (e.g. Brown (2006)) assume only that children regard the utility that their parents derive from caregiving as a normal good (in particular, they supply more of it as their income or wealth increases) and that parents can commit to particular bequest allocations in advance of their death.

The results in Table 2.14 take the analysis a step further by attempting to distinguish between these two types of models. To do so, the table draws on the insight from Sloan et al. (1997) that cognitively impaired parents will be unable to condition their bequest on the actions of their children. In particular, the model replicates the above analysis including interactions between cognitive impairment and the measures of bequeathable assets. On the basis of scoring an 8 or less on a 35 point cognition test, 8.4% of the sample is coded as cognitively impaired. Although many coefficient estimates for these interactions are of the expected sign (negative), none are significant. For example, the table shows that decedents whose children are listed as beneficiaries of life insurance at the prior core interview are almost 9 percentage points (mean 63.8%) more likely to receive informal care from their children. By contrast, cognitively impaired decedents whose children appear as beneficiaries of life insurance are only 5.5 percentage points more likely to receive care, but the difference between the two is not significant. Though insignificant, these results differ somewhat from Sloan et al. (1997), who found the cognitive impairment increased the effect of bequeathable wealth contrary to their expectations. Similarly, Hoerger et al. (1996) find that parents with more housing wealth are more likely to be residing with their children at the next interview but that the result holds only for cognitively aware parents. The authors suggest that children may do so strategically to cause parents to modify their wills, but they caution that cognitive impairment directly affects the marginal utility (and marginal cost) of caregiving, and this direct effect may dominate the effect, if any, due to strategic considerations. Further work will be needed to conclusively distinguish between these models.

2.6 Marital status

This section examines the role of marital status on the division of bequests. The unit of observation is a parent (decedent), and the sample is enlarged to include individuals who were single or married at the time of their death. Partnered individuals were excluded due to the small size of the sample of those individuals. The larger sample contains 8,758 decedents with two or more children, roughly equal parts married and single. Table 2.15 shows the breakdown of asset division by marital status. The columns correspond to marital status, and the rows are broken into four blocks by asset type. The first row of each block shows the fraction of decedents who left assets to children, conditional on ownership and disposal, by marital status.

A rather striking finding is that children tend to receive bequests even when their parent is survived by his or her spouse. For example, considering estates excluding life insurance (first row), 32% of married decedents leave a bequest for their children. The figures for the other asset categories are smaller but non-negligible: 10% for life insurance, 4.5% for primary residences, and 12% for secondary residences. But not only do the children receive a bequest, they receive a sizable fraction of the estate. For example, conditional on the children receiving some portion of the estate, the children of married decedents receive on average 44.1% of the total estate (fourth row). Conversely, another surprising result is that the children of single decedents, conditional on receiving some portion of the estate, receive on average only 60%, raising questions about where the remainder of the estate is going in these cases.

For comparison, Hurd and Smith (2002) provide a similar analysis using only the exit interviews from AHEAD 1995. Those authors find that the married decedents leave on average 22.6% of their estates to their children. By contrast, when not conditioning on receipt by children, the results in this paper suggest that only an average 5.14% of an estate is left to children of married decedents. While Hurd and Smith (2002) find that single decedents leave on average 91.7% of their estates to their children, this paper finds that children receive on average only 36.7% of an estate on average.

Interestingly, conditional on leaving assets to one's children, the division does not differ much by marital status. While 76% of single decedents divide assets equally among their children, 73% of married decedents do so. Similarly, for life insurance, among decedents whose heirs receive a life insurance settlement, the settlement is divided evenly in 58% of cases for single decedents and 54% of cases for married decedents.

These findings provide intriguing insights for the debate between accidental and intentional bequests. The fact that 32% of married decedents leave bequests that are on average 44.1% of their estate's value to their children suggests that many decedents do intend to leave bequests to their children. These assets are bequeathed to children even though the surviving spouse would benefit by retaining the additional wealth. This clear tradeoff between the marginal utility of the bequest to children and that of the surviving spouse retaining those assets provides a novel angle for the identification of the bequest motive (Hurd (1989), Hurd and Smith (2002), Kopczuk and Lupton (2007), Ameriks and Caplin (2011), and Lockwood (2012)).

2.7 Conclusion

The results in this paper show a division of assets very similar to what has been shown in earlier work using both bequest intentions from survey data and actual bequests from tax and probate records. Equal division among children is the norm, but a substantial fraction of decedents choose not to divide their estates equally or to disinherit some (or all) of their children. While the paper finds only limited support for the altruistic model of bequests, the results are strongly suggestive of an exchange motive, whereby children who provide more informal care to their parents receive larger bequests (are less likely to be disinherited, to be precise). The findings are strongest for bequests of housing assets, which tend to be divided most unequally and given to caregivers and co-resident children with high probability. The results also show that ownership of housing assets and life insurance near the end-of-life are predictive of whether informal care is received from children. These findings suggest that an exchange motive may be present but may operate through particular channels. The important role of housing as part of this mechanism is interesting both because housing comprises such a large share of most individual's wealth and because of the unique treatment of housing assets by the policy environment, particularly by Medicaid.

The results in this paper expose many potentially productive avenues for future work. First, the majority of the results in this study are conditional on ownership of particular assets (and disposal of these assets by the date of the exit interview). Many respondents do not own the assets in question and therefore are omitted from many of the analyses. Future research is needed to correct for the selection into asset ownership. Related to this point, future work could also use the "post-exit" interview data in the HRS to increase the sample size by including data on the division of estates that had not yet been disposed of at the time of the first exit interview. Second, the results in this paper primarily use data on the extensive margin of both bequests (whether a child disinherited or not) and caregiving (whether a child provides care or not). Future work could benefit greatly from exploiting data on the intensive margin, such as percentages of the estate received by different children and hours of informal care provided by children. Third, and related to this point, future research could better assess the compensation of caregivers (e.g. an effective wage, as in Brown (2006)) using the intensive margin data on bequests and caregiving. Given the importance of housing and the connection between caregiving and co-residence, it is clear that the value of shared housing and consumption, which has been absent from previous studies (and which is, of course, very difficult to measure) needs to be accounted for explicitly in the analysis. Fourth, along somewhat different lines, a future project could exploit data on the division of assets to the children of married decedents with surviving spouses to estimate the bequest motive in a structural life-cycle model.

Finally, future work should also look at the connection between bequests and earlier inter vivos transfers. Doing so would provide a better sense of intergenerational transfers over the life-cycle. Work along these lines has already been done by Haider and McGarry (2012) using inter vivos transfers and earlier investments in a child's education, but linking these to actual bequest data would be a valuable addition to this research effort. Exploration of these many avenues will help to address the limitations of the present study and contribute to a fuller understanding of the connection between savings decisions, bequests, and the choice of long-term care arrangements in old age.

Table 2.1: Parents Summary Statistics, Exit Interviews

	N	Mean	SD	Min	Median	Max
Male	4612	0.31	0.46	0	0	1
White	4608	0.79	0.41	0	1	1
Education (years)	4610	10.5	3.60	0	12	17
Age (m.r.)	4612	80.1	10.6	47	82	109
Number of children (m.r.)	4609	3.64	2.15	0	3	20
Fair/Poor health (m.r.)	4612	0.62	0.48	0	1	1
Number ADL limitations (m.r.)	4600	1.65	1.88	0	1	5
Number IADL limitations (m.r.)	4599	0.90	1.17	0	0	3
Income (m.r.)	4612	25.9	101.2	0	15.4	5529.4
Net Wealth (m.r, ex. 2nd res.)	4612	193.3	829.7	-191.5	40.5	42042.0
Received help with I/ADLs	4612	0.85	0.36	0	1	1
Any child helped with I/ADLs	4612	0.70	0.46	0	1	1
All children helped with I/ADLs	4612	0.069	0.25	0	0	1
No stepchildren	4612	0.84	0.37	0	1	1
All children own homes (m.r.)	4581	0.74	0.44	0	1	1
Any coresident child (m.r.)	4611	0.30	0.46	0	0	1
Child average educ. (years, m.r.)	4560	13.1	2.10	1	13	17
Child educ.: Max - Min (m.r.)	4560	2.61	2.30	0	2	16
Child average age (m.r.)	4586	52.0	10.9	9	53	87
Child age: Max - Min (m.r.)	4586	9.96	7.62	0	8	70
Child average income (m.r.)	4236	66.7	39.2	0	59.4	393.6
Child income: Max - Min (m.r.)	4236	56.0	46.7	0	47.0	969.2

Notes: Sample is restricted to deceased HRS respondents for whom an exit interview was given, who were single (not married or partnered) at the time of their death, who had one or more own or stepchildren (determined by relationships to children listed in RAND Family child file), and who could be matched to all RAND files (HRS version N and Family files version C). The notation "m.r." signifies that the information is taken from the most recent core interview: if the information is missing from the interview immediately preceding the exit interview, data from earlier waves are used. All dollar amounts are in 1,000s of 2010 dollars. "ADL" stands for "Activities of Daily Living" and includes activities such as eating and bathing. "IADL" stands for "Instrumental ADL" and includes activities such as preparing meals and managing medications. Child education is top-coded at 17 years. For child averages and max - min differences, children with missing values are ignored.

Table 2.2: Proxy Respondent Relationship to Decedent, Exit Interviews

	Percent
Spouse/partner	0.03
Son	0.25
Stepson	0.00
Son-in-law	0.01
Daughter	0.50
Stepdaughter	0.01
Daughter-in-law	0.03
Grandchild	0.03
Brother	0.01
Sister	0.04
Other relative	0.05
Other individual	0.04
Paid helper	0.00
Professional	0.00
Spouse/partner of grandchild	0.00

Notes: Sample is restricted to deceased HRS respondents for whom an exit interview was given, who were single (not married or partnered) at the time of their death, who had one or more own or stepchildren (determined by relationships to children listed in RAND Family child file), and who could be matched to all RAND files (HRS version N and Family files version C).

Table 2.3: Children Summary Statistics, Exit Interviews

	N	Mean	SD	Min	Median	Max
Helps parent with I/ADLs	18821	0.26	0.44	0	0	1
Co-resides with parent (m.r.)	18670	0.096	0.29	0	0	1
Not a stepchild	18821	0.89	0.31	0	1	1
Male	18749	0.50	0.50	0	1	1
Education (years)	17669	12.8	2.56	1	12	17
Age (m.r.)	18256	50.5	12.2	1	51	96
Married (m.r.)	18677	0.59	0.49	0	1	1
Number of own children (m.r.)	18256	2.15	1.78	0	2	20
Owns home (m.r.)	18148	0.53	0.50	0	1	1
Household Income (m.r.)	16749	61.7	47.0	0	53.6	1030.0

Notes: Sample is restricted to the own and stepchildren of the main sample of single, deceased HRS respondents. Only children listed in the RAND Family child file version C were retained. The notation "m.r." signifies that the information is taken from the most recent core interview: if the information is missing from the interview immediately preceding the exit interview, data from earlier waves are used. All dollar amounts are in 1,000s of 2010 dollars. "ADL" stands for "Activities of Daily Living" and includes activities such as eating and bathing. "IADL" stands for "Instrumental ADL" and includes activities such as preparing meals and managing medications. Child education is top-coded at 17 years.

Table 2.4: Division of Assets in Exit Interviews, Parent's Perspective, By Asset Type

	Estate	Life Insurance	Prim. Res.	Sec. Res.
Owned	0.56	0.31	0.41	0.03
Of those ...				
Left to Children	0.84	0.88	0.91	0.89
Of those ...				
Divided Equally	0.76	0.58	.	.
All Children, Not Equally	0.18	0.29	0.35	0.30
Other	0.05	0.13	0.65	0.70

Notes: Sample is restricted to deceased HRS respondents for whom an exit interview was given, who were single (not married or partnered) at the time of their death, who had one or more own or stepchildren (determined by relationships to children listed in RAND Family child file), and who could be matched to all RAND files (HRS version N and Family files version C). Note that the category "Estate" (column 1) excludes life insurance (column 2) but includes primary and secondary residences (columns 3 and 4). The "." entries in columns 3 and 4 reflect the fact that respondents were not given the opportunity to report whether primary and secondary residences were divided equally among their children.

Table 2.5: Comparison to the Literature

Article	Data Source	% Unequal Division of Estate (intended or actual)
This Paper	**HRS exit interview data 1995-2012**	**24%**
Menchik (1980)	Probate records from the Connecticut State Tax Department, 1930s-1940s.	29.5% (two-child families), 42% (three-child families)
Tomes (1981)	5% random sample of estates probated in Cleveland, OH, in 1964-65	49.6%
Menchik (1988)	Probate records.	15.7%
Wilhelm (1996)	Treasury estate tax data.	23.4%
McGarry (1999)	AHEAD 1993. Parents who name at least one child in will.	17%
Hurd and Smith (2002)	AHEAD 1995 exit interview data.	20%
Light and McGarry (2004)	NLS Young Women and Mature Women.	7.9%
Norton and Taylor (2005)	Piedmont Health Survey of the Elderly linked to probate records.	17-30%
Brown (2006)	AHEAD 1993. Unmarried parents with 2+ children, will naming 1+ child.	22% (without care needs), 28% (with care needs)

Table 2.6: Division of Assets in Exit Interviews, Children's Perspective, By Asset Type

	N	Mean	SD
All Children			
Child receives part of Estate	9548	0.79	0.41
Child receives part of Life Insurance Settlement	5213	0.77	0.42
Child receives part of Primary Residence	3286	0.44	0.50
Child receives part of Secondary Residence	168	0.41	0.49
Child receives part of Any Asset	12253	0.79	0.41
Own Children			
Child receives part of Estate	8583	0.79	0.41
Child receives part of Life Insurance Settlement	4657	0.79	0.41
Child receives part of Primary Residence	2953	0.47	0.50
Child receives part of Secondary Residence	156	0.44	0.50
Child receives part of Any Asset	10982	0.80	0.40
Stepchildren			
Child receives part of Estate	965	0.76	0.43
Child receives part of Life Insurance Settlement	556	0.64	0.48
Child receives part of Primary Residence	333	0.17	0.38
Child receives part of Secondary Residence	12	0	0
Child receives part of Any Asset	1271	0.72	0.45

Notes: Sample is restricted to the own and stepchildren of the main sample of single, deceased HRS respondents. Only children listed in the RAND Family child file version C were retained. Results in this table are conditional on asset ownership and disposal of the asset. That is, children are not included in this table if (i) the parent of the child was not known to possess the asset or (ii) the asset had not yet been disposed at the time of the exit interview. Note that the category "Estate" (row 1) excludes life insurance (row 2) but includes primary and secondary residences (rows 3 and 4).

Table 2.7: Predictors of Equal Division, Exit Interviews, Probits

	Estate: Equal	Life Ins: Equal
Male	-0.00175	0.0338
	(0.0217)	(0.0319)
White	0.0430	0.106***
	(0.0304)	(0.0406)
Education (years)	0.00521	0.00366
	(0.00336)	(0.00559)
Age (m.r.)	0.00371*	0.00235
	(0.00204)	(0.00311)
Number of children (m.r.)	-0.00155	-0.00674
	(0.00700)	(0.0102)
Fair/Poor health (m.r.)	0.0115	0.0394
	(0.0205)	(0.0304)
Number of ADL limitations (m.r.)	-0.00705	-0.00986
	(0.00726)	(0.0112)
Number of IADL limitations (m.r.)	0.00999	0.00220
	(0.0117)	(0.0179)
Income (m.r.)	0.0000357	0.000324
	(0.000164)	(0.000483)
Net Wealth (m.r, excl. 2nd residence)	-0.00000673	0.00000870
	(0.0000123)	(0.0000344)
Received help with I/ADLs	-0.0318	0.0522
	(0.0393)	(0.0641)
Any child helped with I/ADLs	0.0497	-0.0597
	(0.0318)	(0.0528)
All children helped with I/ADLs	0.0578	0.198***
	(0.0355)	(0.0539)
No stepchildren	0.0941***	0.0363
	(0.0256)	(0.0405)
All children own homes (m.r.)	0.0268	0.0300
	(0.0299)	(0.0456)
Any coresident child (m.r.)	-0.0296	-0.0852***
	(0.0221)	(0.0317)
Child average education (years, m.r.)	0.0117*	0.0447***
	(0.00662)	(0.0105)
Child education: Max - Min (m.r.)	-0.00113	-0.00441
	(0.00475)	(0.00750)
Child average age (m.r.)	-0.00300	-0.00349
	(0.00203)	(0.00311)
Child age: Max - Min (m.r.)	-0.00231	-0.00441*
	(0.00175)	(0.00262)
Child average income (m.r.)	0.000898***	0.000966*
	(0.000322)	(0.000525)
Child income: Max - Min (m.r.)	-0.000356	-0.000901**
	(0.000226)	(0.000379)
N	1927	1066

Standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Table 2.8: Predictors of Whether All Children Receive Asset, Exit Interviews, Probits

	Estate: All Kids	Life Ins: All Kids	Prim. Res: All Kids
Male	-0.00746	-0.0103	-0.0467
	(0.0113)	(0.0221)	(0.0388)
White	0.0236	0.0350	-0.0308
	(0.0147)	(0.0246)	(0.0418)
Education (years)	-0.00103	0.00107	0.00578
	(0.00173)	(0.00381)	(0.00576)
Age (m.r.)	0.00126	0.00171	-0.00525
	(0.00104)	(0.00204)	(0.00348)
Number of children (m.r.)	0.00159	-0.00999*	0.0268**
	(0.00350)	(0.00605)	(0.0109)
Fair/Poor health (m.r.)	0.00949	0.0330	0.0127
	(0.0109)	(0.0203)	(0.0338)
Number of ADL limitations (m.r.)	-0.00327	0.00920	-0.00560
	(0.00379)	(0.00740)	(0.0122)
Number of IADL limitations (m.r.)	-0.00164	-0.00815	0.0107
	(0.00611)	(0.0118)	(0.0204)
Income (m.r.)	-0.0000183	0.000428	-0.000234
	(0.0000488)	(0.000528)	(0.000431)
Net Wealth (m.r, excl. 2nd residence)	0.0000208	0.0000818*	-0.0000228
	(0.0000152)	(0.0000467)	(0.0000345)
Received help with I/ADLs	0.00164	-0.0568	-0.0701
	(0.0222)	(0.0410)	(0.0731)
Any child helped with I/ADLs	-0.0120	0.0297	0.00457
	(0.0181)	(0.0324)	(0.0646)
All children helped with I/ADLs	0.0289	0.128***	0.00900
	(0.0211)	(0.0477)	(0.0518)
No stepchildren	0.0175	0.0392	0.181***
	(0.0134)	(0.0246)	(0.0547)
All children own homes (m.r.)	-0.0263	0.0297	0.00159
	(0.0169)	(0.0288)	(0.0478)
Any coresident child (m.r.)	-0.0167	-0.0128	-0.0159
	(0.0113)	(0.0210)	(0.0356)
Child average education (years, m.r.)	0.00176	0.00179	0.0213*
	(0.00347)	(0.00718)	(0.0114)
Child education: Max - Min (m.r.)	-0.00403*	-0.0102**	-0.00497
	(0.00243)	(0.00484)	(0.00840)
Child average age (m.r.)	-0.000980	0.000367	0.00247
	(0.00103)	(0.00209)	(0.00351)
Child age: Max - Min (m.r.)	0.000151	-0.000420	-0.00410
	(0.000871)	(0.00160)	(0.00303)
Child average income (m.r.)	0.000338*	0.000740*	0.000822
	(0.000188)	(0.000431)	(0.000556)
Child income: Max - Min (m.r.)	-0.000134	-0.000495*	0.000500
	(0.000118)	(0.000264)	(0.000406)
N	1927	1066	686

Standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Table 2.9: Predictors of Estate Division, Exit Interviews, Multinomial Probit

	Estate: Equal	Estate: All Children	Estate: Other
Male	-0.00129	-0.00739	0.00868
	(0.0218)	(0.0201)	(0.0114)
White	0.0417	-0.0176	-0.0242
	(0.0304)	(0.0279)	(0.0148)
Education (years)	0.00500	-0.00585*	0.000853
	(0.00338)	(0.00310)	(0.00173)
Age (m.r.)	0.00330	-0.00226	-0.00104
	(0.00203)	(0.00187)	(0.00104)
Number of children (m.r.)	0.000141	0.00121	-0.00136
	(0.00699)	(0.00636)	(0.00347)
Fair/Poor health (m.r.)	0.00965	-0.00177	-0.00788
	(0.0205)	(0.0188)	(0.0109)
Number of ADL limitations (m.r.)	-0.00766	0.00367	0.00398
	(0.00728)	(0.00672)	(0.00381)
Number of IADL limitations (m.r.)	0.0115	-0.0112	-0.000231
	(0.0117)	(0.0108)	(0.00610)
Income (m.r.)	0.0000889	-0.000120	0.0000309
	(0.000200)	(0.000221)	(0.0000590)
Net Wealth (m.r, excl. 2nd residence)	0.00000314	0.0000190	-0.0000221
	(0.0000159)	(0.0000126)	(0.0000153)
Received help with I/ADLs	-0.0324	0.0302	0.00211
	(0.0395)	(0.0356)	(0.0220)
One or more children helped with I/ADLs	0.0509	-0.0586**	0.00773
	(0.0320)	(0.0288)	(0.0178)
All children helped with I/ADLs	0.0606*	-0.0349	-0.0257
	(0.0359)	(0.0330)	(0.0211)
No stepchildren	0.0969***	-0.0779***	-0.0190
	(0.0256)	(0.0233)	(0.0132)
All children own homes (m.r.)	0.00624	-0.0353	0.0291*
	(0.0262)	(0.0235)	(0.0150)
One or more children are coresident (m.r.)	-0.0354	0.0168	0.0186*
	(0.0220)	(0.0203)	(0.0113)
Child average education (years, m.r.)	0.0108	-0.00933	-0.00145
	(0.00663)	(0.00607)	(0.00347)
Child education: Max - Min (m.r.)	-0.000166	-0.00355	0.00371
	(0.00477)	(0.00436)	(0.00244)
Child average age (m.r.)	-0.00268	0.00173	0.000950
	(0.00201)	(0.00185)	(0.00104)
Child age: Max - Min (m.r.)	-0.00242	0.00255	-0.000124
	(0.00175)	(0.00159)	(0.000870)
Child average income (m.r.)	0.000924***	-0.000616**	-0.000308
	(0.000324)	(0.000296)	(0.000190)
Child income: Max - Min (m.r.)	-0.000359	0.000227	0.000132
	(0.000224)	(0.000210)	(0.000117)
N	1927	1927	1927

Standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Table 2.10: Predictors of Life Insurance Division, Exit Interviews, Multinomial Probit

	Life Ins.: Equal	Life Ins.: All Children	Life Ins.: Other
Male	0.0275	-0.0419	0.0144
	(0.0318)	(0.0302)	(0.0232)
White	0.104**	-0.0580	-0.0456*
	(0.0404)	(0.0375)	(0.0267)
Education (years)	0.00335	-0.000484	-0.00287
	(0.00560)	(0.00524)	(0.00401)
Age (m.r.)	0.00234	-0.000949	-0.00139
	(0.00310)	(0.00295)	(0.00222)
Number of children (m.r.)	-0.00593	0.0000684	0.00587
	(0.0101)	(0.00933)	(0.00654)
Fair/Poor health (m.r.)	0.0343	0.00364	-0.0379*
	(0.0303)	(0.0285)	(0.0219)
Number of ADL limitations (m.r.)	-0.00883	0.0178*	-0.00898
	(0.0112)	(0.0102)	(0.00798)
Number of IADL limitations (m.r.)	0.00122	-0.0134	0.0122
	(0.0178)	(0.0166)	(0.0127)
Income (m.r.)	0.000432	-0.0000387	-0.000394
	(0.000486)	(0.000438)	(0.000531)
Net Wealth (m.r, excl. 2nd residence)	0.0000356	0.0000384	-0.0000740
	(0.0000403)	(0.0000351)	(0.0000481)
Received help with I/ADLs	0.0668	-0.146**	0.0795*
	(0.0642)	(0.0625)	(0.0441)
One or more children helped with I/ADLs	-0.0698	0.119**	-0.0487
	(0.0530)	(0.0520)	(0.0353)
All children helped with I/ADLs	0.206***	-0.0940*	-0.112**
	(0.0551)	(0.0537)	(0.0504)
No stepchildren	0.0369	0.00755	-0.0444*
	(0.0403)	(0.0380)	(0.0269)
All children own homes (m.r.)	0.0170	-0.0212	0.00424
	(0.0391)	(0.0360)	(0.0286)
One or more children are coresident (m.r.)	-0.0844***	0.0761***	0.00829
	(0.0315)	(0.0291)	(0.0225)
Child average education (years, m.r.)	0.0432***	-0.0383***	-0.00487
	(0.0106)	(0.00972)	(0.00779)
Child education: Max - Min (m.r.)	-0.00499	-0.00386	0.00885*
	(0.00747)	(0.00677)	(0.00527)
Child average age (m.r.)	-0.00372	0.00519*	-0.00147
	(0.00310)	(0.00294)	(0.00225)
Child age: Max - Min (m.r.)	-0.00433*	0.00327	0.00106
	(0.00260)	(0.00243)	(0.00177)
Child average income (m.r.)	0.00109**	-0.000473	-0.000620
	(0.000535)	(0.000507)	(0.000462)
Child income: Max - Min (m.r.)	-0.000895**	0.000189	0.000706**
	(0.000378)	(0.000362)	(0.000284)
N	1066	1066	1066

Standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Table 2.11: Determinants of Whether Child Receives Asset, OLS

	Estate	Life Ins.	Prim. Res.	Sec. Res.
Helps parent with I/ADLs	0.033***	0.072***	0.31***	0.21**
	(0.011)	(0.015)	(0.025)	(0.093)
Co-resides with parent (m.r.)	0.0056	0.017	0.18***	0.098
	(0.018)	(0.023)	(0.032)	(0.15)
Child Characteristics				
Not a stepchild	0.015	0.12***	0.18***	0.28*
	(0.027)	(0.036)	(0.040)	(0.15)
Male	-0.0041	0.0098	-0.012	0.095
	(0.0093)	(0.012)	(0.018)	(0.086)
Education (years)	0.0076**	0.00070	0.023***	0.035
	(0.0036)	(0.0043)	(0.0054)	(0.022)
Age (m.r.)	0.00038	0.0027**	-0.00022	-0.0080
	(0.00092)	(0.0012)	(0.0014)	(0.0075)
Married (m.r.)	-0.010	0.014	-0.034	-0.080
	(0.011)	(0.015)	(0.021)	(0.090)
Number of own children (m.r.)	-0.0016	0.0034	-0.0062	-0.0061
	(0.0035)	(0.0042)	(0.0058)	(0.019)
Owns home (m.r.)	0.0030	0.020	0.028	0.18*
	(0.016)	(0.021)	(0.025)	(0.10)
Household Income (m.r.)	0.00040***	0.000053	0.00037	-0.00044
	(0.00014)	(0.00020)	(0.00029)	(0.00098)
Parent Characteristics				
Male	0.0068	-0.039	-0.015	-0.18*
	(0.021)	(0.026)	(0.032)	(0.11)
White	0.018	0.14***	0.041	-0.30**
	(0.033)	(0.034)	(0.040)	(0.13)
Education (years)	0.0040	0.0072*	0.0054	0.0093
	(0.0032)	(0.0043)	(0.0043)	(0.0099)
Age (m.r.)	0.0016	-0.0012	0.00023	0.010
	(0.0013)	(0.0019)	(0.0018)	(0.0070)
Number of children (m.r.)	-0.0090	-0.0062	-0.018	-0.015
	(0.0062)	(0.0070)	(0.012)	(0.020)
Fair/Poor health (m.r.)	0.0071	-0.0047	0.015	-0.062
	(0.020)	(0.025)	(0.029)	(0.12)
Number of ADL limitations (m.r.)	-0.0060	-0.0047	-0.011	-0.065**
	(0.0075)	(0.0098)	(0.011)	(0.025)
Number of IADL limitations (m.r.)	-0.022*	0.015	0.015	-0.027
	(0.012)	(0.016)	(0.017)	(0.056)
Income (m.r.)	0.000061*	0.000040	0.00017	0.00085
	(0.000035)	(0.000051)	(0.00038)	(0.00051)
Net Wealth (m.r, excl. 2nd residence)	0.000033***	0.000029	-0.0000086	-0.0000032
	(0.0000095)	(0.000020)	(0.000028)	(0.0000050)
Received help with I/ADLs	-0.0023	0.0029	-0.22***	0.13
	(0.029)	(0.038)	(0.050)	(0.14)
N	8099	4346	2782	155
adj. R^2	0.040	0.196	0.219	0.308
Mean of Dep Var	0.802	0.779	0.460	0.432

Standard errors, clustered at family level, in parentheses. * p<.1, ** p<.05, *** p<.01

Table 2.12: Determinants of Whether Child Receives Asset, Family Fixed Effects

	Estate	Life Ins.	Prim. Res.	Sec. Res.
Helps parent with I/ADLs	0.0100***	0.021***	0.27***	0.19*
	(0.0031)	(0.0054)	(0.023)	(0.094)
Co-resides with parent (m.r.)	-0.0044	-0.011	0.28***	0.11
	(0.0053)	(0.011)	(0.035)	(0.17)
Child Characteristics				
Not a stepchild	0.0090	0.045**	0.17***	0.25
	(0.0097)	(0.022)	(0.043)	(0.17)
Male	0.0018	0.0056	-0.015	0.10
	(0.0017)	(0.0043)	(0.017)	(0.088)
Education (years)	0.00039	0.00057	0.012**	0.010
	(0.00069)	(0.0012)	(0.0049)	(0.028)
Age (m.r.)	0.00055**	0.0026***	-0.0028**	-0.0074
	(0.00026)	(0.00068)	(0.0012)	(0.0088)
Married (m.r.)	-0.0017	-0.0013	-0.0077	-0.030
	(0.0027)	(0.0064)	(0.019)	(0.091)
Number of own children (m.r.)	0.000081	0.00052	0.00077	-0.0046
	(0.00075)	(0.0013)	(0.0041)	(0.019)
Owns home (m.r.)	0.0064*	0.0037	0.021	0.12
	(0.0037)	(0.0071)	(0.024)	(0.12)
Household Income (m.r.)	0.000019	-0.000017	-0.00015	-0.00084
	(0.000037)	(0.000065)	(0.00028)	(0.00100)
Constant	0.75***	0.59***	0.18*	0.35
	(0.021)	(0.045)	(0.100)	(0.60)
N	8125	4347	2789	155
Mean of Dep Var	0.800	0.779	0.459	0.432

Standard errors, clustered at family level, in parentheses.

* p<.1, ** p<.05, *** p<.01

Table 2.13: Determinants of Child-Provided Informal Care to Decedents Receiving Help with I/ADLs, Single and Married Decedents, Exit Interviews

	Any Child Helps: Exit	
Married	-0.331***	(0.0151)
Male	-0.103***	(0.0127)
White	0.00415	(0.0153)
Education (years)	-0.00590***	(0.00185)
Age (m.r.)	0.00280**	(0.00112)
Number of children (m.r.)	0.0228***	(0.00339)
Fair/Poor health (m.r.)	0.0184	(0.0116)
Number of ADL limitations (m.r.)	-0.00464	(0.00398)
Number of IADL limitations (m.r.)	0.00761	(0.00630)
Used nursing home (m.r.)	-0.0303**	(0.0145)
Income (m.r.)	-0.000102	(0.0000968)
Net Wealth (m.r, excl. 2nd residence)	-0.00000640	(0.00000488)
Owned Home (m.r.)	0.00219	(0.0125)
Value of Primary Residence (m.r.)	0.0000558***	(0.0000183)
1+ Child on Home Deed (m.r.)	0.0597***	(0.0197)
Owned Life Insurance (m.r.)	-0.0310**	(0.0153)
1+ Child Benefic. of Life Ins. (m.r.)	0.115***	(0.0169)
No stepchildren	0.120***	(0.0147)
All children own homes (m.r.)	0.0589***	(0.0161)
Child average education (years, m.r.)	0.0102***	(0.00332)
Child education: Max - Min (m.r.)	0.000434	(0.00259)
Child average age (m.r.)	-0.0000103	(0.00113)
Child age: Max - Min (m.r.)	-0.0000873	(0.000991)
Constant	0.234***	(0.0664)
N	6468	
adj. R^2	0.240	
Mean Dep Var	0.635	

Standard errors in parentheses

* p<0.1, ** p<0.05, *** p<0.01

Table 2.14: Determinants of Child-Provided Informal Care to Decedents Receiving Help with I/ADLs, Single and Married Decedents, Exit Interviews

	Any Child Helps: Exit	
Married	-0.317***	(0.0160)
Male	-0.103***	(0.0133)
White	0.00280	(0.0165)
Education (years)	-0.00694***	(0.00202)
Age (m.r.)	0.00324***	(0.00121)
Number of children (m.r.)	0.0225***	(0.00362)
Fair/Poor health (m.r.)	0.0197	(0.0123)
Number of ADL limitations (m.r.)	-0.00587	(0.00433)
Number of IADL limitations (m.r.)	0.00769	(0.00691)
Used nursing home (m.r.)	-0.0281*	(0.0157)
Cognitively Impaired (m.r.)	-0.00279	(0.0293)
Income (m.r.)	-0.0000822	(0.0000916)
Net Wealth (m.r, excl. 2nd residence)	-0.00000301	(0.00000598)
Net Wealth * Cog. imp.	0.0000126	(0.0000465)
Owned Home (m.r.)	0.00250	(0.0138)
Owned Home * Cog. imp.	-0.0509	(0.0450)
Value of Primary Residence (m.r.)	0.0000464**	(0.0000188)
Value of Primary Residence * Cog. imp.	0.000139	(0.000149)
1+ Child on Home Deed (m.r.)	0.0674***	(0.0216)
1+ Child on Home Deed * Cog. imp.	-0.0272	(0.0734)
Owned Life Insurance (m.r.)	-0.0378**	(0.0171)
Owned Life Insurance * Cog. imp.	-0.00347	(0.0550)
1+ Child Benefic. of Life Ins. (m.r.)	0.127***	(0.0186)
1+ Child Benefic. of Life Ins. * Cog. imp.	-0.0311	(0.0565)
No stepchildren	0.127***	(0.0155)
All children own homes (m.r.)	0.0546***	(0.0171)
Child average education (years, m.r.)	0.0103***	(0.00360)
Child education: Max - Min (m.r.)	-0.000283	(0.00275)
Child average age (m.r.)	0.0000889	(0.00121)
Child age: Max - Min (m.r.)	0.000603	(0.00105)
Constant	0.171**	(0.0705)
N	5755	
adj. R^2	0.239	
Mean Dep Var	0.638	

Standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01

Table 2.15: Accidental versus Intentional Bequests: Exit Interview Asset Division by Decedent's Marital Status

	Single	Married
Estate: Left to Children	0.84	0.32
	(0.0073)	(0.0092)
Estate: Divided Equally | Left to Children	0.76	0.73
	(0.0092)	(0.016)
Estate: Percent to Children	36.7	5.14
	(1.31)	(0.43)
Estate: Percent to Children | Percent > 0	60.0	44.1
	(1.54)	(2.53)
Life Insurance: Left to Children	0.88	0.10
	(0.0088)	(0.0069)
Life Insurance: Divided Equally | Left to Children	0.58	0.54
	(0.014)	(0.035)
Primary Residence: Left to Children	0.91	0.045
	(0.0099)	(0.0043)
Primary Residence: All Children | Left to Children	0.24	0.30
	(0.016)	(0.046)
Secondary Residence: Left to Children	0.89	0.12
	(0.047)	(0.028)
Secondary Residence: All Children | Left to Children	0.20	0.13
	(0.064)	(0.085)

Means. Standard errors in parentheses.

CHAPTER 3

Inferring Intra-household Allocations from Patterns of Intergenerational Transfers

3.1 Introduction

Considerable research has shown that knowledge of the intra-household distribution of resources is important for many policy objectives. A substantial literature has found, for example, that unearned income in the hands of a mother has a larger effect on expenditures on the household's children and on their health outcomes than unearned income in the hands of the father (e.g., Thomas (1990); Lundberg et al. (1997); Duflo (2000)). In addition, several recent papers illustrate the importance of the intra-household distribution of resources in the context of the on-going national debate on inequality (Couprie et al. (2009); Lise and Seitz (2011)). These papers articulate the point that extrapolating from results on inter-household inequality to inequality on an individual level requires an understanding of how a household's resources are divided among its constituents. Finally, there is now ample evidence that the unitary, or common preference, model of household behavior is not an accurate representation of household decisions making (e.g., Browning and Chiappori (1998)).

Conventional household data do not allow the analyst to observe the allocation of goods *within* the household. However, the literature on the collective model, beginning with Chiappori (1988) and Chiappori (1992), has demonstrated that it is possible to infer the intra-household allocation using household consumption data if one is able to assign some portion of household consumption to each member. Goods fitting this definition are referred to as "assignable" goods.[1] Beyond the existence of assignable consumption, the further requirements for identification are the assumption that household allocations are Pareto efficient plus modest restrictions on the utility functions of household members.

This paper contributes to the collective model literature by proposing a novel assignable good: financial transfers by the household to children who are the own children of one member and the stepchildren of the other member.[2,3] Specifically, the assumption is that the financial transfers to the wife's own children (husband's stepchildren) are a "good" that only she "consumes," and similarly, that financial transfers from the household to the husband's own children (wife's stepchildren) are only consumed by the husband.[4,5] A weaker assumption, which is still sufficient for the identification results in this paper, is that each member values transfers to the other member's own children only up to a certain point, above which utility becomes exclusive.[6,7]

The identification of a new source of assignable consumption represents a valuable contribution to the literature, which offers few examples of assignable goods. The most commonly used assignable goods are clothing and leisure, each of which has certain limitations.[8] On the one hand, leisure is problematic for at least two reasons. First, leisure is quite difficult to measure. Even with time use data, it is difficult to determine what constitutes leisure versus domestic production. Moreover, it is difficult to separate public and private components of

[1] To give one example, in a household with two members one of whom is a vegetarian, all meat purchases can be treated as consumption that is assignable to the meat-eating member of the household.

[2] Throughout this paper, the phrase "own children" includes both the biological and adopted children.

[3] The focus of this paper is on what can be learned about intra-household dynamics from observed transfers to children rather than more generally on the determinants of those transfers. For a better treatment of that topic, see e.g. McGarry (1999) or McGarry (2012).

[4] Note that the expenditure on children has been studied in the context of the collective model before. For example, see Blundell et al. (2005) and Mazzocco (2006b). However, in these cases, children are uniformly treated as public goods rather than as assignable private goods on the basis of their relationships to each parent, as they are in this paper.

[5] Note that a stepfather, for example, can still (indirectly) value transfers to his stepchildren if he is altruistic toward his wife, who in turn values transfers to her own children (his stepchildren). Identification only requires that he does not directly value transfers to his stepchildren.

[6] On this point, see footnote 5 of Browning et al. (1994).

[7] This paper remains agnostic about whether each parent values their own child's well-being (e.g. parental altruism) or the financial transfer itself (e.g. the warm glow motive). For identification of the sharing rule, it is not necessary to take a stand on this issue.

[8] Within the empirical literature on the collective model, Fortin and Lacroix (1997), Chiappori et al. (2002), and Couprie (2007) use leisure as an assignable good. Browning et al. (1994) and Couprie et al. (2009) use clothing.

leisure. There are many reasons to think that leisure is publicly consumed. On the other hand, clothing may be related to income and wages for other reasons than bargaining power.[9] In addition, like other exclusive goods found in household consumption data (e.g., cigarettes when one household member smokes, alcohol when one member drinks, or meat when one member is a vegetarian) data on clothing consumption are not available in many data sets. An advantage of an approach using data on intergenerational transfers is that such data are becoming increasingly available.

In this paper, the intra-household allocation is estimated from data in the Health and Retirement Study using two different identification strategies. The first method relies on the stability of preferences for financial transfers to own children for married and single women, and the second method uses data on married couples. The results indicate that married women receive on average roughly half of household income, and that their share of household income is increasing in their wage but is unaffected by most other aspects of the economic environment.

The paper proceeds as follows. Section 3.2 describes the theoretical model of demand for transfers to children, which derives from the collective model of household behavior. Section 3.3 details how the theoretical model is translated into an empirical framework that can be estimated. Section 3.4 presents the data from the Health and Retirement Study, and Section 3.5 presents the results of the estimation. A final section concludes.

3.2 Model

The framework is a static model of household behavior under collective rationality (Chiappori (1988, 1992)).[10] A married household has two members, A and B. The theoretical primitives of the household's behavior are utilities for both members (U^A, U^B) and a Pareto weight μ, which may itself be a function of the economic environment. Rather than fully identifying these primitives of the decision making process, the goal of this paper is more modest:

[9] This statement is disputed in Browning et al. (1994), who find that, conditional on household expenditure, income is not an important predictor of clothing purchases for single individuals.

[10] For a dynamic treatment of the collective model, see Mazzocco (2006a).

to identify the impact of the economic environment on how households allocate resources internally.[11]

The standard assumptions are made: (i) household decisions are Pareto efficient, (ii) preferences for each member are egoistic (members care about their own consumption; there are no externalities in the consumption of private goods), (iii) it is known whether each good is publicly or privately consumed, and (iv) there exists an assignable good that is observed. In this application, the assignable goods for the wife are financial transfers to her own children, who are her husband's stepchildren. For the husband, the assignable goods are transfers to his own children, who are the stepchildren of the wife. To be more precise, individuals are assumed to derive utility directly from money transfers to their own children but not from household transfers to their spouse's children.[12] The first assumption regarding efficiency is the fundamental assumption of the collective framework. The second assumption guarantees that there are no consumption externalities or that they take a very specific form. The model assume that all goods are privately consumed.[13]

This paper uses the standard "decentralization" of the household maximization problem that is used throughout the literature, the purpose of which is to generate exclusion restrictions that facilitate identification. The decentralization uses the fact that Pareto efficiency in a collective model with only private consumption is equivalent to the existence of a sharing rule. Put another way, any Pareto efficient solution to the household problem can be represented as the solution to a problem in which the household first divides up its resources according to some sharing rule and then each member independently maximizes his or her utility.

Suppose the existence of an assignable good T_j for member j. Assume that the demand for T_j depends on the amount of household income Y_j assigned by the sharing rule to member

[11]Identification of the complete primitives of the model would be rather more difficult. Supposing that parents derive utility from transfers to their children because they are altruistic toward them, then the utility U^j of member j contains the indirect utility of her child V^j. Separately identifying U^j and V^j is beyond the scope of this paper.

[12]As noted above, a stepparent may derive utility indirectly from transfers to their spouse's children, for they may be altruistic toward their spouse, who derives utility from such transfers.

[13]Public goods can be accommodated. If so, utility should be assumed to be separable in public and private goods.

j, her wage w_j, and other characteristics x_j:

$$T_j = f_j(Y_j, w_j, x_j) \tag{3.1}$$

In addition, suppose that the allocation of income to each member is governed by the following sharing rule:

$$Y_j = Y \times \phi_j(w_A, w_B, Y, z) \tag{3.2}$$

where $\phi_A+\phi_B = 1$ (the sum of the members' shares must be one), w_j is the wage of household member $j \in \{A, B\}$, Y is household full income, and z is a vector of "distribution factors," which are variables that might affect the intra-household allocation but do not directly affect preferences.[14]

The goal of this paper is to identify this sharing rule ϕ from observable data on transfers made to a household's children. Under the assumptions stated above, non-parametric identification of the intra-household allocation (up to a constant) follows for the case with price (wage) variation as in Chiappori (1988, 1992), or for the case where distribution factors are used as in Browning et al. (1994). For a more recent treatment of the latter case, see Bourguignon et al. (2009). Another method of identification uses similarities between the problems for single and married individuals to identify the sharing rule. For a recent example, see Couprie (2007), which uses leisure as an assignable good. Nonparametric identification results in this case require that the Engel curves are invertible in income and that preferences are stable across marital status. The advantage of this approach is that identification of the constant in the allocation is possible, meaning that one can learn the actual allocation of household income received by each member rather than just observing how the economic environment influences that allocation.

[14]Distribution factors are variables that influence the household problem but do not affect preferences or the budget constraint. In other words, these variables affect the location of the household allocation on the Pareto frontier but not the frontier itself. Given data on the wages of both members, information on distribution factors z is not strictly necessary for identification.

3.3 Empirical specification

Let the intra-household allocation in family i be governed by $\phi_i \in [0, 1]$, such that member A receives $Y_{iA} = \phi_i Y_i$ and member B receives $Y_{iB} = (1 - \phi_i)Y_i$. Let the sharing rule ϕ_i be parameterized as follows:

$$\phi_i = \frac{exp(\psi_i)}{1 + exp(\psi_i)} \tag{3.3}$$

$$\psi_i = \pi_0 + \pi_Y log(Y_i) + \pi_A log(w_{iA}) + \pi_B log(w_{iB}) + z_i' \pi_z \tag{3.4}$$

where Y_i denotes full household income, w_{ij} indicates the wage of member j, and z_i is a vector of distribution factors, which includes the differences (wife minus husband) in the ages and educations of the two members. Throughout this section, "*log*" should be understood to mean the inverse hyperbolic sine function, which is necessary to accommodate non-positive values.[15]

Under the decentralization, one can write the demand for transfers as a function of each member's (unobservable) income allocation Y_{ij}, their wage w_{ij}, and other variables x_{ij}. Let the demand function be parameterized as follows:

$$ln(T_{ij}) = \beta_{j0} + \beta_{jY} log(Y_{ij}) + \beta_{jw} log(w_{ij}) + x_{ij}' \beta_{jx} + \epsilon_{ij} \tag{3.5}$$

and note that the coefficients are subscripted with j so that demand equations may differ by gender. These functions should be thought of as approximations to the true functions, and the error terms ϵ_{ij} should be considered approximation error. For a semi-parametric estimation of Engel curves, see Couprie et al. (2009). To appreciate the merits of the decentralization, observe that w_{iB}, z_i, and Y_i do not enter A's problem except through Y_{iA}. This fact provides the "exclusion restrictions" required for estimation. The decentralization also illustrates the similarity of the problem for a married person and a single person. The only difference is that, for the single person, Y_{ij} is directly observed, for it is exactly equal to Y_i.

Finally, note that only positive values of transfers are used in the estimation as $ln(T_{ij})$

[15] The inverse hyperbolic sine of x is $ln\left(x + \sqrt{1 + x^2}\right)$.

is on the left-hand side of Equation 3.5. This restriction is due to the identification results in the literature, which typically require either differentiability or invertibility of demand functions (i.e. interior solutions).

3.3.1 Identification using married and single women

Identification can be achieved in two ways. One method is to estimate the equations for a given type, e.g. A, simultaneously over single and married individuals. For this to be feasible, one needs to assume (1) preferences do not differ by marital status, and (2) Engel curves for single individuals are invertible in $log(Y_{ij})$. The complete empirical specification for this strategy, for women $j = A$, is:

$$ln(T_{iA}) = \beta_0 + \beta_Y log\left((1-d_i) \times Y_i + d_i \times \phi_i \times Y_i\right) + \beta_w log(w_{iA}) + x'_{iA}\beta_x + \epsilon_{iA} \quad (3.6)$$

$$\phi_i = \frac{exp\left(\psi_i\right)}{1 + exp\left(\psi_i\right)}$$

$$\psi_i = \pi_0 + \pi_Y log(Y_i) + \pi_A log(w_{iA}) + \pi_B log(w_{iB}) + z'_i \pi_z \quad (3.7)$$

$$d_i = \begin{cases} 1 & \text{if } i \text{ is a married household} \\ 0 & \text{otherwise} \end{cases}$$

Identification is obtained from the assumption that $(\beta_0, \beta_Y, \beta_w, \beta_x)$ are common to married and single women. Effectively, one can think of these as estimated from the sample of single women, and then $(\pi_0, \pi_Y, \pi_A, \pi_B)$ are estimated from the sample of married women. In this setting, the constant in the sharing rule π_0 is identified.

3.3.2 Identification using married couples

An alternative identification and estimation strategy is to estimate the equations for A and B (married couples) simultaneously, using the results in Chiappori (1988, 1992) or Browning et al. (1994) with price variation (wages), or distribution factors (differences in ages, educations). The empirical specification for this strategy can be written as:

$$
\begin{aligned}
ln\,(T_{ij}) &= d_{ij} \times (\alpha_0 + \alpha_Y log\,(\phi_i \times Y_i) + \alpha_w log(w_{iA}) + x_{iA}'\alpha_x) \\
&\quad +(1-d_{ij}) \times (\beta_0 + \beta_Y log\,((1-\phi_i) \times Y_i) + \beta_w log(w_{iB}) + x_{iB}'\beta_x) + \epsilon_{ij} \quad (3.8) \\
\phi_i &= \frac{exp\,(\psi_i)}{1 + exp\,(\psi_i)} \\
\psi_i &= \pi_0 + \pi_Y log(Y_i) + \pi_A log(w_{iA}) + \pi_B log(w_{iB}) + z_i'\pi_z \quad (3.9) \\
d_{ij} &= \begin{cases} 1 & \text{if } j \text{ is female (i.e. the wife)} \\ 0 & \text{otherwise} \end{cases}
\end{aligned}
$$

The α coefficients parameterize the demand curves for wives (member A) while the β coefficients parameterize the demand curves for the husbands (member B). Identification is obtained from functional form assumptions as well as exclusion restrictions: when $d_{ij} = 1$, (Y_i, w_{iB}, z_i) affect $ln(T_{ij})$ only through ϕ_i, and when $d_{ij} = 0$, (Y_i, w_{iA}, z_i) affect $ln(T_{ij})$ only through ϕ_i. Note that it is not necessary to assume $\alpha = \beta$: that is, demand functions for transfers between husbands and wives need not be the same for identification. In this specification, in contrast to the case of the identification strategy using married and single women, the constant π_0 is not identified and requires a normalization.[16]

All models are estimated by minimizing the sum of squared residuals (non-linear least squares), using data from the Health and Retirement Study, which is described in the following section.

3.4 Data

The data used in this paper are from the Health and Retirement Study (HRS), a biennial longitudinal survey which began in 1992 and which, when properly weighted, is approximately representative of the American population over the age of 50. Most data are from the HRS data sets compiled by the RAND Corporation: this article uses version N of the

[16]In particular, for the models reported in Table 3.9, π_0 is chosen such that $\phi = 0.5$ when all of its determinants (Y_i,w_{iA},w_{iB},z_i) are equal to their means.

RAND HRS File and version C of the RAND Family Files. Data from 1998-2010 are used to create a sample over which all variables were consistently defined.

On the basis of the identification strategies outlined above, the estimation results in this paper draw on three samples: the children of single women, of married women, and of married men.[17] The unit of observation in each of the samples is a child at the time of a particular interview (hereafter, a "child-interview").[18] The criteria for the inclusion of a child in the sample for single women are that (i) the child is the own (biological or adopted) child of the woman, and (ii) the child's mother is separated or divorced. The criteria for the inclusion of a child in the sample for married women (men) are that (i) the child is the own child of the wife (husband) and (ii) the child is the stepchild of the husband (wife). In these latter two samples, only the observations for wives are retained so that each child appears only once per interview.[19] Table 3.1 shows the numbers of observations in each of the samples as well as the numbers of distinct children and parents that are represented. In the top half of the table, only observations with non-missing data on financial transfers from parents to children are counted. The sample for single women, for example, has $26,828$ child-interviews (referred to in the table as "Observations"), representing $8,591$ children and $2,866$ parents. The bottom half of the table only includes observations where a financial transfer from parent to child was observed. These are the samples used in the structural estimation in the following section. Using the example of single women again, the sample includes $3,715$ child-interviews, which represent $2,143$ children and $1,310$ parents.[20]

The outcome of interest is the log of the transfer amount. The transfer variable is derived from an HRS question regarding whether the respondent's household gave "financial help totaling $500 or more" "including help with education but not shared housing or shared food" in the last two years (or since the prior interview for re-interviewees) to each of their children. Table 3.2 compares the financial transfers across the three groups: single women,

[17]Estimation comparing single and married men is left for future work.

[18]The phrase "child-interviews" should not be misinterpreted: the interviews are given by the parents.

[19]Even if an HRS household divorces and both partners remarry, a child will appear only once per interview because of the restriction (i) above. Only observations linked to the household containing the own (biological or adoptive) parent of the child are retained in these samples.

[20]Both parents and children can appear multiple times. Note that, in the current version of this paper, standard errors in the tables below do not correct for repeat observations.

married women, and married men. The first row shows the frequency of transfers across the three groups, ranging from 10% of married men to 16% of married women making transfers to their own children. This shows the very high degree of left-censoring (at $500) in the data. Conditional on a transfer, mean transfer amounts range from $6,183 for single women to $7,260 for married men. The bottom panel of the data shows the skewness and kurtosis of the log-transformed transfer variable and performs a Shapiro-Wilk test for normality. In all cases, the tests strongly reject normality.

Tables 3.3 and 3.4 contain the descriptive statistics for the full set of variables used in the estimation for all three samples. Table 3.3 has the statistics for married and single women, and Table 3.4 compares married men and married women. (Note that married women appear in both tables.) Each table contains three columns: the first two show the means of the variables used in the estimation, and the third performs t-tests across the groups. Dollars variables are inflated to 2010 dollars and annualized.[21] Throughout the paper, none of the statistics or results use sample weights. The notation "ln" means the natural logarithm, "ihs" means "inverse hyperbolic sine," and "m.r." means that the "most recent" non-missing data are used if data in the current interview are missing.[22]

The most important independent variables in the estimation are chosen to demonstrate how the economic environment impacts the allocation of resources within the household. These are the full income of the household Y_i, the wage of the wife w_{iA}, the wage of the husband w_{iB}, the difference (wife minus husband) in their ages, and the difference in their educations. Let full income Y_i (also referred to as "potential income") be defined as the sum of household non-labor income y_i and total potential earned income of each member:

$$Y_i = H\left(w_{iA} + w_{iB}\right) + y_i$$

[21]Income data are already annual. Transfers data are annualized by dividing by the number of years elapsed between the end dates of interviews. If the data for the previous interview are missing, elapsed time is assumed to be 2 years.

[22]For nearly all of the variables pertaining to child characteristics, questions are asked in only every second interview. To preserve a sufficiently large sample, it is necessary to use lagged values of these variables. If data from the previous interview are also missing, data in earlier interviews are used until the most recent non-missing data are found.

where $H = 40 \times 52$ is the number of working hours available in one year, assuming 40 hours work weeks.[23] Where missing, wages were imputed with non-missing wage data in the HRS. The differences in ages and educations are distribution factors, which as mentioned before are not strictly necessary for the identification results employed here.

The remaining control variables for the respondents are an indicator for whether the respondent is white, the respondent's age and years of education, the inverse hyperbolic sine of household assets, and the total number of children (both own and stepchildren) of the household's members. For the child, covariates include the child's gender, age, whether married, whether co-resident, the number of children the child has, whether the child lives within ten miles of their parent, whether the child owns a home, whether the child works full- or part-time, and the inverse hyperbolic sine of the child's household income. In most waves of the HRS, child family income is reported as a categorical variable, providing brackets within which the true income lies. Continuous values for income were imputed using data from March Current Population Surveys.

Table 3.3 also provides some insight into whether the assumptions required for identification of the sharing rule using data on single and married women are supported by the data. Recall that identification relies on the assumptions that single and married women have similar preferences over financial transfers to their own children. Table 3.3 shows that, among the set of women that make financial transfers to their children, married and single women, as well as the children of these two groups of women, are very different. In fact, nearly all of the differences reported in Table 3.3 are statistically significant at the 1% level. Married women earn less, are younger and less well educated, are more likely to be white, have more children, and live in households with higher assets and potential income. The children of married women are older, more likely to be married and own a home, less likely to be co-resident or to live within 10 miles, have more of their own children, and have

[23]The use of "full income" instead of non-labor income y is helpful in the empirical specifications. If the household shares non-labor income, e.g. (y_{iA}, y_{iB}) where $y_{iA} + y_{iB} = y_i$, then, in principle, y_{ij} can be negative. In that case, constraining ϕ_i to lie in the unit interval is undesirable. However, if the household divides full income Y_i, then Y_{ij} cannot be negative so there is no problem in constraining ϕ_i. One issue with this approach, however, is that Y_i is fairly collinear with w_{iA} and w_{iB}. To reduce collinearity, some versions of the model specify a slightly different, but equivalent, sharing rule as a function of w_{iA}, w_{iB}, y_i, and z_i, where household non-labor income y_i replaces household full income Y_i.

higher family income. Given the observable differences in these groups, it is conceivable that their demands for financial transfers could be different, thereby invalidating this assumption above. Partly because of this concern, this paper employs multiple identification approaches. Further work is needed to demonstrate the comparability of these two groups.

Figure 3.1 provides evidence on the assumption that the Engel curves for single women are invertible in income Y_i. The figure presents a scatterplot of the residuals from two ordinary least squares regressions. First, against the y-axis, are the residuals from the regression of $\ln(T_{ij})$ on all of the relevant controls in Table 3.3 excluding full income Y_i. Second, against the x-axis, are the residuals from on OLS regression of $\log(Y_i)$ against the same controls. Both regressions are done on the sample of single women. The figure also depicts a linear fit line and a non-parametric fit line, demonstrating the relationship between these sets of residuals. Both lines are clearly upward sloping over the bulk of the data and lie very close to one another. This evidence suggests a positive, monotonic, and nearly linear relationship between $\log(T_{ij})$ and $\ln(Y_i)$ for single women, controlling for the other covariates in Table 3.3, which supports the invertibility assumption.

3.5 Results

This section presents the main results of the paper. The first sub-section contains an exploratory analysis intended to motivate the use of the structural model. The second sub-section contains structural estimates.

3.5.1 Exploratory Analysis

The findings of the exploratory analysis are presented in Tables 3.5, 3.6, and 3.7. In each table, the first two columns (coefficients with standard errors in parentheses) correspond to probit models for whether a transfer greater than $500 occurred. The second two columns show the estimates from an OLS model of the log transfer amount. These columns correspond most closely to the structural models of the following section. The final two columns present the results from a Tobit model of log transfers.[24] Although the Tobit model relies on strong distributional assumptions (normality and heteroskedasticity), the standard alternatives to the Tobit model, Censored Least Absolute Deviations (CLAD) and Symmetrically Censored Least Squares (CSLS), are inappropriate because the median transfer amount is zero due to the heavy left-censoring of financial transfers.

Table 3.5 shows the results from these three models of financial transfers, estimated over the sample of single and married women. First, the results indicate that across specifications household full (potential) income is an important determinant of transfers. Second, consider the influence of the variable d, which is equal to 1 if i is a married household and 0 otherwise, and its interactions. Assuming that married and single women have similar demand functions for transfers, the interaction variables affect demand through their impact on the allocation of resources *within* the household. In the probit model (but not the other two models), an increase in household potential income, all else equal, increases transfers to the wife's children both directly (as these transfers are a normal good) and indirectly (the interaction with d) by increasing the resources allocated to the wife within the household. An increase in the wife's wage has an ambiguous effect on the wife's share of household resources: it appears to reduce her allocation from the probit results but to increase it in the OLS results. An increase in the husband's wage decreases the transfers to the wife's children through a decrease in the wife's allocation in both probit and Tobit models. An increase in the wife's education relative to her husband's appears to decrease her allocation across the three specifications, contrary the typical findings in the collective model literature.[25] Despite the ambiguity of the results, the significant impact of the interactions variables suggests that the intra-household allocation of resources is being affected by certain aspects of the economic environment.

[24] In the case of the Tobit model for log transfers, the left-censoring point is taken to be equal to $min(\ln(T_{ij}))$, the minimum of the log-transformed transfer variable.

[25] This finding may be indicative of a violation of the assumption in the model that the husband (the stepfather of the child) does not value transfers to his stepchild. A stepfather with more education may prefer investing more in the education of all children in his household, resulting in larger transfers. In this case, these transfers can no longer be considered assignable to the child's mother. Future work will experiment with different sub-samples of stepchildren to strengthen the assignability assumption. It will also consider restricting the sample to children beyond college age when educational investments may be less relevant.

Tables 3.6 and 3.7 present the exploratory results for married women and married men, respectively. The results are generally consistent with those in Table 3.5. Table 3.6 shows that household income positively affects transfers to the wife's own children. Her own wage appears to have a positive but insignificant effect on transfers, while her husband's wage exerts a negative effect in two of three specifications. In line with this finding, the results in Table 3.7 indicate that an increase in the wife's wage reduces transfers to the husband's own children, though in this case, an increase in his wage also has a negative but insignificant effect. Given the structure of the collective model and the assignability assumption, the effect of the wife's (husband's) wage on transfers to the husband's (wife's) own children must be coming via its effect on the intra-household allocation of resources. These findings are indicative of such an effect and therefore motivate the estimation of the sharing rule from these data.

Following Cameron and Trivedi (2009), tests of normality and heteroskedasticity were performed using the generalized residuals from the Tobit models in the previous three tables. In all cases, both normality and heteroskedasticity were strongly rejected. These tests conclusively rejected the use of the Tobit model for the structural analysis, and therefore the OLS model of log transfer amounts was chosen for the structural estimation in the following section. As a consequence, only a small fraction of the total data are used in the estimation of the structural models.

3.5.2 Structural Models

Tables 3.8 and 3.9 present the estimates from the structural models. Table 3.8 contains the results from the identification strategy that relies on similarities between single and married women, and Table 3.9 shows the estimates obtained from the alternative strategy that uses data from married individuals. The models include all of the control variables used in the models from the previous section, but the output includes only coefficients of interest from Equations 3.6 and 3.7 for single and married women and Equations 3.8 and 3.9 for married couples.

In Table 3.8, the β coefficients are parameters of the demand functions, and the π coefficients parameterize the sharing rule. The table has four columns. The first two columns use household full income Y_i (see the coefficient π_Y) in the parameterization of the sharing rule ϕ_i, while the latter two columns use household non-labor income y_i (see π_{ynl}).[26] The second and fourth columns include the effect of the distribution factors: the difference (wife minus husband) in ages π_{za} and educations π_{ze}. The effects of the wife's wage are captured by π_{wa} and her husband's wage by π_{wb}.

The results indicate that household income has a positive but insignificant effect on the wife's share of household resources (π_Y and π_{ynl}) but that the wife's wage has a strong positive effect on her share across specifications (π_{wa}). Her husband's wage has a positive but insignificant effect on her share. As observed in the exploratory results, and contrary to expectations, increasing the difference between the wife's age or education and her husband's tends to decrease her share.

In Table 3.9, the α and β coefficients parameterize the wife's and husband's demand functions, respectively, while π parameterizes the sharing rule as before. In the first two specifications, none of the coefficient estimates are significant, suggesting that the economic environment has little effect on the household's allocation of resources. As suggested above, this may be due to collinearity between full income Y_i and the wages of the husband and wife, so attention should be focused on the third and fourth columns of the table that swap non-labor income y_i for household full income. Turning to these columns, one finds results consistent with those in Table 3.8. In particular, an increase in household income (π_{ynl}) has a positive but insignificant effect on the wife's share of resources while an increase in her wage (π_{wa}) has a strong positive effect. Her husband's wage does not significantly affect her share. The effect of the distribution factors is negative, as before, but insignificant.

Taken together, the results in these two tables provide some evidence that, all else equal, women receive a larger share of household resources when their wages are higher. This evidence is tempered somewhat by the finding that the husband's wage has no effect on

[26] Recall from the definition of full income $Y_i = H(w_{iA} + w_{iB}) + y_i$ that Y_i may be highly collinear with w_{iA} and w_{iB}. Therefore, the third and fourth columns may improve on the results by reducing collinearity.

the wife's share and that the effect of the distribution factors is opposite of what would be expected a priori.

Figures 3.2 and 3.3 plot kernel density estimates of the wife's share of household resources ϕ_i generated from the estimates of the models in Tables 3.8 and 3.9. In Figure 3.2, the center of the distribution (which is identified) is around 0.5, indicating the women on average receive roughly one-half of household resources. For comparison, Couprie (2007) finds a median of 40% using leisure time. The inclusion of distribution factors in the parameterization of ϕ_i increases the dispersion of the distribution. Relative to Figure 3.2, the densities in Figure 3.3 are much tighter around the center of the distribution (which is normalized to 0.5).

3.6 Conclusion

The goal of this paper is to use observable data on intergenerational financial transfers to make inferences about the distribution of resources within the household and how that allocation is affected by the economic environment. The fundamental assumption introduced in the paper to facilitate this analysis is that stepparents do not value financial transfers sent to their spouse's own children. Instead, it is assumed that such transfers are private goods that are exclusively consumed by the (biological or adoptive) parent of that child. In addition, one must assume that household behavior of collectively rational in the sense of Chiappori (1988).

The results in both exploratory and structural analyses indicate that the economic environment does appear to influence that allocation of resources within the household. However, in the structural models, the only important determinant of the intra-household allocation appears to the wife's wage. Here, the results are as expected: in households where the wife earns a higher wage, she exerts control over a larger share of the household's resources. This is observed in the form of larger financial transfers to her own children (the stepchildren of her husband) as her wage increases. The results also indicate that women on average receive approximately one-half of household income.

Two findings cast some doubt on the results in this paper. First, the summary statistics comparing single and married women showed that these two groups are different in many observable dimensions. One of the two identification techniques used in the paper requires that these two groups have similar preferences for financial transfers, but if these two groups are sufficiently different, this assumption may be violated. Second, the results also indicate that a husband's education positively affects the transfers made to the wife's own children. It may be the case that the model is correct and that an increase in the husband's education increases the share of resources allocated the wife as more educated husbands favor a more egalitarian distribution of resources in the household. However, it may also be that more educated husbands value transfers to their stepchildren more, hence violating the assignability assumption which underlies the results in this paper. Future work is necessary to yield a conclusive answer to these issues.[27]

[27]Future work will pursue restrictions of the sample that use a more narrow definition of "stepchildren." For instance, children from a previous relationship who were born, say, 18 years before marriage likely never lived with their stepparent. It is conceivable that transfers to these children would be "more" assignable.

Table 3.1: Sample Counts

	Single Women N	Married Women N	Married Men N
Observations	26,828	16,189	25,308
Number of Children	8,591	5,273	7,146
Number of Parent Households	2,866	2,238	2,852
Conditional on a Positive Transfer			
Observations	3,715	2,542	2,642
Number of Children	2,143	1,485	1,610
Number of Parent Households	1,310	974	1,031

Notes: “Observations” are child-interviews. The first three rows of the table include all observations from each sample over the period 1998-2010 for which non-missing data on whether a transfer occurred were available. These are the samples used for the “Probit” and “Tobit-log” models in the tables below. The bottom three rows of the table include observations over the period 1998-2010 for which a positive transfer from parent to child was observed. These are the samples used in the “OLS-log” models and the structural models in the tables below. The numbers of observations do not match exactly between this table and the tables below because additional observations had to be dropped from the latter tables due to missing values for some of the covariates in those models.

Table 3.2: Summary Statistics: Financial Transfers to Children

	Single Women	Married Women	Married Men
Any Transfer to Child	0.14	0.16	0.10
Amount of Transfer (Transfer > 0)	6183.2	6370.4	7260.8
ln(Amount of Transfer)	7.94	7.98	7.98
Skewness of $\ln(T_{ij})$	0.388	0.451	0.496
Kurtosis of $\ln(T_{ij})$	2.625	2.805	2.917
Shapiro-Wilk Test (p-value)	5.36e-23	1.20e-18	1.62e-21

Table 3.3: Summary Statistics: Single versus Married Women

	Single Women	Married Women	Difference	
Any Transfer to Child	1	1	0	(0)
Amount of Transfer	6183.2	6370.4	187.2	(300.7)
ln(Amount of Transfer)	7.943	7.976	0.0330	(0.0308)
ihs(Household Full Income)	11.59	12.56	0.978***	(0.0180)
ln(Wife's Wage)	2.841	2.870	0.0295	(0.0186)
ihs(Wife's Income)	10.27	9.278	-0.997***	(0.0839)
Married (d)	0	1	1	(0)
White	0.680	0.865	0.186***	(0.0108)
W Education (years)	13.72	13.52	-0.199***	(0.0657)
W Age	60.85	59.45	-1.400***	(0.236)
ihs(Household Assets)	10.02	12.09	2.064***	(0.156)
Household Num. Children	2.953	4.714	1.761***	(0.0491)
Child Characteristics				
Male Child	0.456	0.462	0.00585	(0.0128)
Age (m.r.)	33.48	34.15	0.671**	(0.268)
Married (m.r.)	0.339	0.428	0.0886***	(0.0124)
Co-resident (m.r.)	0.259	0.113	-0.146***	(0.0101)
Number of Children (m.r.)	1.271	1.405	0.134***	(0.0376)
Lives Within 10 Mi. (m.r.)	0.547	0.398	-0.148***	(0.0127)
Owns Home (m.r.)	0.261	0.328	0.0676***	(0.0116)
Works Full-time (m.r.)	0.655	0.668	0.0130	(0.0124)
Works Part-time (m.r.)	0.135	0.143	0.00746	(0.00901)
ihs(Family Inc.) (m.r.)	10.72	10.96	0.231***	(0.0441)

Note: Standard errors in parentheses.
* p<.1, ** p<.05, *** p<.01

Notes: Summary statistics are conditional on the child receiving a financial transfer. The unit of observation is a child-interview. Statistics are unweighted. The first two columns report means, and the third column reports the results of a t-test of the difference in the means. Notation: "W" and "H" mean wife and husband, respectively; "ln" means natural logarithm; "ihs" means inverse hyperbolic sine, $\text{ihs}(x) = \ln\left(x + \sqrt{1 + x^2}\right)$; "(m.r.)" means that the most recent non-missing data are used (that is, if data in the current interview are missing, data in previous waves are used). Dollar amounts in 2010 dollars.

Table 3.4: Summary Statistics: Married Women versus Married Men

	Married Men	Married Women	Difference	
Any Transfer to Child	1	1	0	(0)
Amount of Transfer	7299.7	6370.4	-929.3*	(540.1)
ln(Amount of Transfer)	7.976	7.976	-0.000337	(0.0337)
ihs(Household Full Income)	12.76	12.56	-0.194***	(0.0195)
ln(Wife's Wage)	2.898	2.870	-0.0277	(0.0198)
ln(Husband's Wage)	3.283	3.053	-0.230***	(0.0240)
W Education (years)	13.91	13.52	-0.395***	(0.0678)
W Age	58.09	59.45	1.364***	(0.290)
H Education (years)	13.86	13.62	-0.236***	(0.0768)
H Age	64.09	63.12	-0.967***	(0.285)
ihs(Wife's Income)	8.780	9.278	0.498***	(0.113)
ihs(Husband's Income)	10.35	10.45	0.0998	(0.0883)
Child is Wife's Own Child (d)	0	1	1	(0)
White	0.849	0.865	0.0164*	(0.00973)
ihs(Household Assets)	12.91	12.09	-0.824***	(0.133)
Household Num. Children	4.508	4.714	0.206***	(0.0626)
Child Characteristics				
Male Child	0.489	0.462	-0.0270*	(0.0139)
Age (m.r.)	35.32	34.15	-1.164***	(0.299)
Married (m.r.)	0.445	0.428	-0.0166	(0.0138)
Co-resident (m.r.)	0.0458	0.113	0.0668***	(0.00742)
Number of Children (m.r.)	1.326	1.405	0.0795*	(0.0409)
Lives Within 10 Mi. (m.r.)	0.252	0.398	0.146***	(0.0129)
Owns Home (m.r.)	0.375	0.328	-0.0469***	(0.0133)
Works Full-time (m.r.)	0.692	0.668	-0.0241*	(0.0132)
Works Part-time (m.r.)	0.131	0.143	0.0113	(0.00972)
ihs(Family Inc.) (m.r.)	10.94	10.96	0.0117	(0.0501)

Note: Standard errors in parentheses.
* p<.1, ** p<.05, *** p<.01

Notes: Summary statistics are conditional on the child receiving a financial transfer. The unit of observation is a child-interview. Statistics are unweighted. The first two columns report means, and the third column reports the results of a t-test of the difference in the means. Notation: "W" and "H" mean wife and husband, respectively; "ln" means natural logarithm; "ihs" means inverse hyperbolic sine, $\text{ihs}(x) = \ln\left(x + \sqrt{1 + x^2}\right)$; "(m.r.)" means that the most recent non-missing data are used (that is, if data in the current interview are missing, data in previous waves are used). Dollar amounts in 2010 dollars.

Table 3.5: Models of Financial Transfers to Children: Single and Married Women

	Probit		OLS-log		Tobit-log	
ihs(Household Full Income)	0.186***	(0.0259)	0.247***	(0.0392)	1.538***	(0.201)
ln(Wife's Wage)	0.0418*	(0.0251)	-0.107***	(0.0383)	0.250	(0.193)
Married (d)	-0.264	(0.394)	-0.506	(0.650)	-2.122	(3.063)
d * ihs(Household Full Inc.)	0.0672*	(0.0396)	-0.00720	(0.0640)	0.500	(0.307)
d * ln(Wife's Wage)	-0.0615*	(0.0339)	0.122**	(0.0554)	-0.399	(0.262)
d * ln(Husband's Wage)	-0.130***	(0.0246)	0.0284	(0.0382)	-0.971***	(0.188)
d * (W Educ. - H Educ.)	-0.0465***	(0.00478)	-0.0185**	(0.00881)	-0.373***	(0.0377)
d * (W Age - H Age)	-0.00212	(0.00180)	-0.00351	(0.00320)	-0.0168	(0.0141)
White	0.149***	(0.0209)	0.283***	(0.0370)	1.238***	(0.164)
W Education (years)	0.0981***	(0.00400)	0.0578***	(0.00717)	0.788***	(0.0320)
W Age	0.00135	(0.00177)	0.0212***	(0.00320)	0.0154	(0.0139)
ihs(Household Assets)	0.0215***	(0.00151)	0.0158***	(0.00266)	0.174***	(0.0120)
Household Num. Children	-0.109***	(0.00454)	-0.0393***	(0.00835)	-0.871***	(0.0364)
Child Characteristics						
Male Child	-0.113***	(0.0172)	0.0362	(0.0298)	-0.863***	(0.135)
Age (m.r.)	-0.0269***	(0.00168)	-0.0154***	(0.00303)	-0.213***	(0.0133)
Married (m.r.)	-0.153***	(0.0209)	-0.0306	(0.0369)	-1.239***	(0.164)
Co-resident (m.r.)	0.0421	(0.0298)	0.211***	(0.0483)	0.317	(0.230)
Number of Children (m.r.)	0.0596***	(0.00637)	-0.0192	(0.0124)	0.472***	(0.0504)
Lives Within 10 Mi. (m.r.)	0.139***	(0.0195)	-0.0403	(0.0344)	1.079***	(0.153)
Owns Home (m.r.)	-0.141***	(0.0220)	0.125***	(0.0395)	-1.081***	(0.173)
Works Full-time (m.r.)	0.0119	(0.0233)	-0.103**	(0.0405)	0.0364	(0.182)
Works Part-time (m.r.)	0.118***	(0.0324)	-0.0187	(0.0523)	0.798***	(0.250)
ihs(Family Inc.) (m.r.)	-0.0837***	(0.00851)	-0.0291**	(0.0139)	-0.609***	(0.0652)
Constant	-2.639***	(0.256)	3.951***	(0.398)	-20.57***	(1.993)
sigma					8.331***	(0.0948)
N	39729		5876		39729	

Note: Standard errors in parentheses.
* p<.1, ** p<.05, *** p<.01

Notes: The dependent variable in the probit model (first two columns) is equal to 1 if a financial transfer of $500 or more was made to the child in the last two years or since the previous interview for re-interviewees. The dependent variable in the "OLS-log" and "Tobit-log" models is the log of the transfer amount. For the Tobit model, the left-censoring point is set to the minimum of the log-transformed transfer variable. The sample for these models includes both married and single women. Covariates also include dummy variables for each of the survey waves.

Table 3.6: Models of Financial Transfers to Children: Married Women

	Probit		OLS-log		Tobit-log	
ihs(Household Full Income)	0.167***	(0.0352)	0.186***	(0.0590)	0.948***	(0.187)
ln(Wife's Wage)	0.0224	(0.0265)	0.0158	(0.0450)	0.118	(0.141)
ln(Husband's Wage)	-0.102***	(0.0259)	0.0247	(0.0390)	-0.514***	(0.135)
W Education (years)	0.0639***	(0.00629)	0.0612***	(0.0109)	0.359***	(0.0340)
W Age	0.00408	(0.00287)	0.0170***	(0.00496)	0.0291*	(0.0153)
H Education (years)	0.0558***	(0.00539)	0.0378***	(0.00993)	0.311***	(0.0292)
H Age	0.00411**	(0.00189)	0.00412	(0.00333)	0.0229**	(0.0101)
White	0.232***	(0.0401)	0.201***	(0.0714)	1.279***	(0.216)
ihs(Household Assets)	0.0165***	(0.00289)	0.0185***	(0.00492)	0.0939***	(0.0156)
Household Num. Children	-0.0826***	(0.00602)	-0.0206*	(0.0109)	-0.448***	(0.0328)
Child Characteristics						
Male Child	-0.105***	(0.0274)	0.0478	(0.0462)	-0.539***	(0.146)
Age (m.r.)	-0.0279***	(0.00272)	-0.0150***	(0.00476)	-0.154***	(0.0147)
Married (m.r.)	-0.162***	(0.0332)	-0.0640	(0.0563)	-0.904***	(0.177)
Co-resident (m.r.)	-0.0119	(0.0589)	0.0618	(0.0895)	-0.127	(0.309)
Number of Children (m.r.)	0.0671***	(0.0102)	0.00299	(0.0191)	0.367***	(0.0551)
Lives Within 10 Mi. (m.r.)	0.183***	(0.0307)	0.0591	(0.0523)	0.998***	(0.165)
Owns Home (m.r.)	-0.160***	(0.0342)	0.146**	(0.0598)	-0.816***	(0.184)
Works Full-time (m.r.)	-0.0333	(0.0375)	-0.172***	(0.0636)	-0.254	(0.200)
Works Part-time (m.r.)	0.121**	(0.0517)	-0.0625	(0.0817)	0.539**	(0.272)
ihs(Family Inc.) (m.r.)	-0.0811***	(0.0146)	-0.0137	(0.0231)	-0.402***	(0.0763)
Constant	-2.787***	(0.349)	3.298***	(0.581)	-12.93***	(1.869)
sigma					5.674***	(0.101)
N	14551		2362		14551	

Note: Standard errors in parentheses.
* p<.1, ** p<.05, *** p<.01

Notes: The dependent variable in the probit model (first two columns) is equal to 1 if a financial transfer of $500 or more was made to the child in the last two years or since the previous interview for re-interviewees. The dependent variable in the "OLS-log" and "Tobit-log" models is the log of the transfer amount. For the Tobit model, the left-censoring point is set to the minimum of the log-transformed transfer variable. The sample for these models includes only married women. Covariates also include dummy variables for each of the survey waves.

Table 3.7: Models of Financial Transfers to Children: Married Men

	Probit		OLS-log		Tobit-log	
ihs(Household Full Income)	0.332***	(0.0282)	0.338***	(0.0502)	2.084***	(0.170)
ln(Wife's Wage)	-0.0741***	(0.0210)	-0.0306	(0.0381)	-0.446***	(0.125)
ln(Husband's Wage)	-0.0171	(0.0185)	-0.0151	(0.0335)	-0.115	(0.110)
W Education (years)	0.0568***	(0.00587)	-0.00344	(0.0115)	0.340***	(0.0356)
W Age	0.00320*	(0.00177)	0.00276	(0.00351)	0.0212**	(0.0106)
H Education (years)	0.0341***	(0.00487)	0.0294***	(0.00943)	0.212***	(0.0294)
H Age	0.00571**	(0.00256)	0.0206***	(0.00494)	0.0377**	(0.0154)
White	0.105***	(0.0352)	0.241***	(0.0709)	0.697***	(0.213)
ihs(Household Assets)	0.0246***	(0.00341)	0.0215***	(0.00658)	0.156***	(0.0209)
Household Num. Children	-0.0929***	(0.00579)	-0.0401***	(0.0119)	-0.571***	(0.0359)
Child Characteristics						
Male Child	-0.0806***	(0.0248)	0.128***	(0.0486)	-0.429***	(0.149)
Age (m.r.)	-0.0274***	(0.00238)	-0.0103**	(0.00468)	-0.164***	(0.0145)
Married (m.r.)	-0.122***	(0.0292)	-0.0815	(0.0567)	-0.782***	(0.176)
Co-resident (m.r.)	0.246***	(0.0824)	0.214	(0.132)	1.367***	(0.483)
Number of Children (m.r.)	0.0272***	(0.00917)	0.000927	(0.0192)	0.167***	(0.0555)
Lives Within 10 Mi. (m.r.)	0.168***	(0.0310)	-0.0287	(0.0598)	0.992***	(0.187)
Owns Home (m.r.)	-0.0233	(0.0299)	0.262***	(0.0593)	-0.0665	(0.180)
Works Full-time (m.r.)	0.0269	(0.0344)	-0.135**	(0.0670)	0.0985	(0.206)
Works Part-time (m.r.)	0.158***	(0.0476)	0.0408	(0.0886)	0.904***	(0.285)
ihs(Family Inc.) (m.r.)	-0.0935***	(0.0130)	-0.0763***	(0.0212)	-0.548***	(0.0749)
Constant	-4.708***	(0.297)	2.913***	(0.539)	-26.24***	(1.827)
sigma					6.313***	(0.113)
N	22615		2412		22615	

Note: Standard errors in parentheses.
* p<.1, ** p<.05, *** p<.01

Notes: The dependent variable in the probit model (first two columns) is equal to 1 if a financial transfer of $500 or more was made to the child in the last two years or since the previous interview for re-interviewees. The dependent variable in the "OLS-log" and "Tobit-log" models is the log of the transfer amount. For the Tobit model, the left-censoring point is set to the minimum of the log-transformed transfer variable. The sample for these models includes only married men. Covariates also include dummy variables for each of the survey waves.

Table 3.8: Structural Models of Financial Transfers to Children: Single and Married Women

	$ln(T_{iA})$		$ln(T_{iA})$		$ln(T_{iA})$		$ln(T_{iA})$	
β_0	3.857***	(0.378)	3.832***	(0.374)	3.829***	(0.344)	3.803***	(0.344)
β_Y	0.272***	(0.0373)	0.269***	(0.0367)	0.275***	(0.0339)	0.272***	(0.0341)
β_{wa}	-0.111***	(0.0365)	-0.113***	(0.0364)	-0.113***	(0.0347)	-0.115***	(0.0349)
π_0	-5.055	(5.159)	-5.149	(5.220)	-3.516***	(1.348)	-3.679***	(1.396)
π_Y	0.163	(0.451)	0.156	(0.463)				
π_{ynl}					0.0205	(0.0547)	0.0168	(0.0558)
π_{wa}	1.016***	(0.373)	1.131***	(0.381)	1.073***	(0.364)	1.187***	(0.372)
π_{wb}	0.0715	(0.285)	0.00178	(0.324)	0.121	(0.250)	0.0560	(0.277)
π_{za}			-0.0197	(0.0239)			-0.0193	(0.0239)
π_{ze}			-0.111*	(0.0633)			-0.111*	(0.0629)
N	5882		5876		5882		5876	

Standard errors in parentheses
* p<.1, ** p<.05, *** p<0.01

Notes: The dependent variable in all models is the log of the transfer amount. The models include additional controls not reported in the table. The remaining control variables for the respondents are an indicator for whether the respondent is white, the respondent's age and years of education, the inverse hyperbolic sine of household assets, and the number of children of all types for the household's members. For the child, covariates include the child's gender, age, whether married, whether co-resident, the number of children the child has, whether the child lives within ten miles of their parent, whether the child owns a home, whether the child works full- or part-time, and the inverse hyperbolic sine of the child's household income. Indicators for the survey wave are also included. The β coefficients are parameters of the Engel curve, and the π coefficients are parameters of the sharing rule ϕ. The subscripts are: Y household potential income, ynl household non-labor income, wa wife's wage, wb husband's wage, 0 intercept, za the difference (wife minus husband) in ages, and ze the difference in years of education.

Table 3.9: Structural Models of Financial Transfers to Children: Married Couples

	$ln(T_{ij})$		$ln(T_{ij})$		$ln(T_{ij})$		$ln(T_{ij})$	
α_0	1.999	(1.458)	1.873	(1.552)	3.205***	(0.624)	2.938***	(0.625)
α_Y	0.352***	(0.128)	0.364***	(0.139)	0.273***	(0.0606)	0.296***	(0.0608)
α_w	0.0290	(0.0739)	-0.0106	(0.0827)	-0.0591	(0.0558)	-0.0862	(0.0578)
β_0	4.049***	(0.583)	4.056***	(0.587)	2.822***	(0.657)	2.897***	(0.609)
β_Y	0.255***	(0.0470)	0.248***	(0.0464)	0.366***	(0.0564)	0.352***	(0.0545)
β_w	0.00725	(0.0364)	0.00606	(0.0361)	-0.0241	(0.0548)	-0.0437	(0.0567)
π_Y	-0.587	(0.426)	-0.644	(0.444)				
π_{ynl}					0.0104	(0.0432)	0.00480	(0.0418)
π_{wa}	-0.0994	(0.298)	0.0748	(0.324)	0.359**	(0.163)	0.471***	(0.163)
π_{wb}	0.210	(0.199)	0.178	(0.201)	0.0145	(0.261)	-0.129	(0.242)
π_{za}			-0.00990	(0.0156)			-0.0131	(0.0147)
π_{ze}			-0.0511	(0.0499)			-0.0645	(0.0455)
N	4774		4774		4774		4774	

Standard errors in parentheses
* p<.1, ** p<.05, *** p<0.01

Notes: The dependent variable in all models is the log of the transfer amount. The models include additional controls not reported in the table. The remaining control variables for the respondents are an indicator for whether the respondent is white, the respondent's age and years of education, the inverse hyperbolic sine of household assets, and the number of children of all types for the household's members. For the child, covariates include the child's gender, age, whether married, whether co-resident, the number of children the child has, whether the child lives within ten miles of their parent, whether the child owns a home, whether the child works full- or part-time, and the inverse hyperbolic sine of the child's household income. Indicators for the survey wave are also included. The α and β coefficients are parameters of the Engel curves for women and men, respectively, and the π coefficients are parameters of the sharing rule ϕ. The subscripts are: Y household potential income, ynl household non-labor income, wa wife's wage, wb husband's wage, 0 intercept, za the difference (wife minus husband) in ages, and ze the difference in years of education. The constant π_0 (not reported) is normalized such that $\phi = 0.5$ when its determinant variables are equal to their sample means.

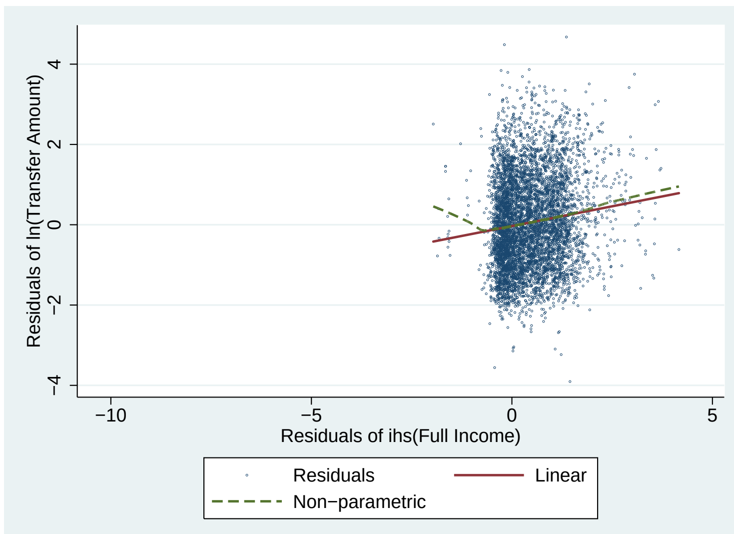

Figure 3.1: Residuals: Single Women

Notes: The residuals plotted against the y-axis are from an ordinary least squares regression of the log transfer amount $\ln(T_{ij})$ on all of the covariates in Table 3.5 excluding the d variable and its interactions as well as the inverse hyperbolic sine of full income Y_i. The residuals plotted against the x-axis are from an OLS regression of the inverse hyperbolic sine of full income against the same set of covariates. The solid red line is the fit line from an OLS regression of the first set of residuals on the second set of residuals. The dashed green line is non-parametric (locally weighted) version of the same regression.

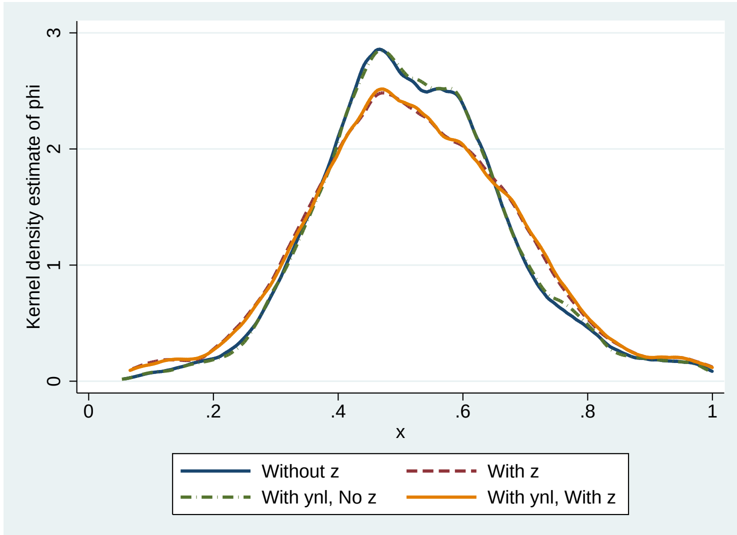

Figure 3.2: Kernel Density Estimates of ϕ_i: from Single/Married Women Results
Notes: The distributions depicted in the figure are kernel density estimates of ϕ_i, i.e. that estimated shares of household income allocated the wives in the married couples in this sample. The notation z refers to distribution factors, and ynl refers to non-labor income y_i. The lines in the figure correspond to Table 3.8. The solid blue line corresponds to the first column, the dashed red line to the second column, the dashed and dotted green line to the third column, and the solid yellow line to the fourth column.

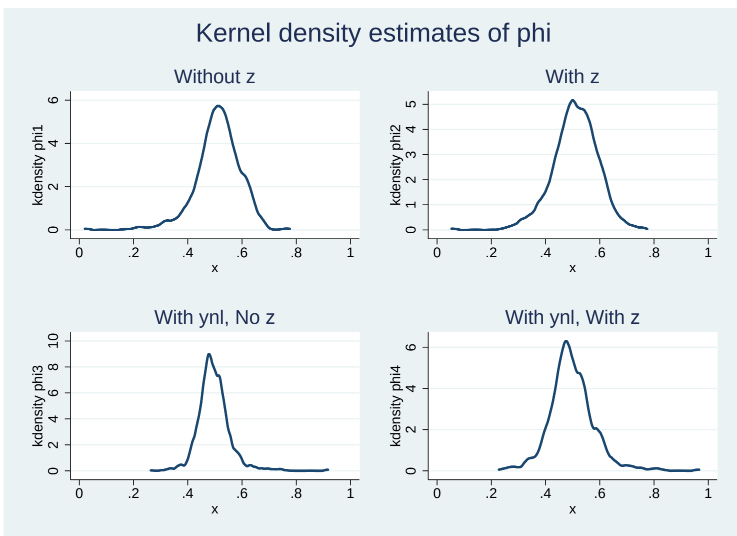

Figure 3.3: Kernel Density Estimates of ϕ_i: from Married Couple Results
Notes: The distributions depicted in the figure are kernel density estimates of ϕ_i, i.e. that estimated shares of household income allocated the wives in the married couples in this sample. The notation z refers to distribution factors, and ynl refers to non-labor income y_i. The lines in the figure correspond to Table 3.9. Beginning in the upper left quadrant and moving clockwise, the figures correspond to the four columns of the table. Each distribution is centered at 0.5 because of a normalization on π_0. See the text for details.

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