Long-Term Care Insurance

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Abstract

This chapter summarizes the considerable variation in limitations to "activities of daily living" and associated expenditures on long-term care, with an emphasis on US data, then takes up the question of why the market for private insurance against this large risk is small. Donated care from family, otherwise illiquid home equity, and the shortened life and diminished demand for other consumption associated with receiving care may all undermine demand for long-term care insurance. Selection and moral hazard problems also affect the supply of public and private long-term care insurance.

This chapter explores the market for insurance against expenditures on long-term care for limitations to "activities of daily living" (ADLs) such as bathing, dressing, and eating. An organizing theme is understanding why the market for private insurance is small, even though out-of-pocket expenditures are highly variable across individuals and may be very large.[1] Section 1 describes how ADL limitations vary with age, and how the type of care used and expenditures on care vary with family structure and the extent of limitation, with an emphasis on US data.

Section 2 briefly characterizes existing public and private long-term care insurance schemes. Public systems pay a larger share of long-term care costs than private insurance throughout the developed world. Because public schemes are commonly progressive both in funding and in coverage, relatively wealthy households in some countries are exposed to potentially very large losses. Section 3 considers reasons why demand for insuring against long-term

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[1]This theme is shared with other summaries of the literature, e.g. Brown and Finkelstein (2009).

care expenditures may be weaker than demand for insuring against other potentially catastrophic losses, even ignoring social insurance. Donated care from family, otherwise illiquid home equity, and the shortened life and diminished demand for other consumption associated with receiving care may all undermine demand for long-term care insurance. Section 4 discusses selection and moral hazard concerns associated with both public and private insurance design.

Some factors that shape the private long-term care market are worthy of further attention but get relatively short shrift here. First, political outcomes, voter attitudes, social insurance programs, and demand for private insurance are jointly determined. For example, reducing public provision of long-term care insurance might increase demand for private insurance and might thereby reduce support for social insurance coverage. Second, regulation, economies of scale, and other supply side factors may act to raise premiums for private products and thereby limit demand. Third, consumers may have difficulty obtaining or processing information concerning the distribution of likely future long-term costs, the terms of contracts with insurers, or the relationship between long-term care expenditures and the "marginal utility of wealth." Fourth, I have ignored interesting dynamic considerations such as the consumer's choice of date at which to purchase private insurance and the optimal time path of renewal options and premiums over the insured's lifetime.

1 The cost of long-term care

As people age, they become increasingly likely to face difficulty with activities of daily living. Long-term ADL limitations generate demand for care that typically involves either large time commitments from family or expensive nursing services. Norton (2000) concludes that long-term care is the largest expenditure risk facing the elderly in the US. Economists seeking to explain seeming violations of basic predictions of life cycle savings models, such as absence of demand for life annuities and slow decumulation of housing and other assets,

have turned to demand for savings as a precaution against long-term care expenditure risk as an explanation.[2]

In a survey of 12 countries, OECD (2005) reports that a median of 1% of GDP is spent on long-term care, and this figure excludes the opportunity cost of the time family caregivers, who mostly go unpaid (some countries, such as Germany, compensate family caregivers through their social insurance system). Increased longevity, the aging of "baby boomers", and increased real costs of a constant level of care underlie predictions that long-term care costs will rise over time, as they have in the past. Comas-Herrera et al. (2006) project that long-term care costs will double as a share of GDP in each of Germany, Italy, Spain, and the UK over the next 50 years. Figure 1 plots log real spending on nursing home and home health care in the US between 1960 and 2010 from the National Health Expenditure survey. Total US spending on nursing homes and home health care in 2010 was over $200 billion, according to these accounts prepared by the Centers for Medicare and Medicaid Services. Both time series have increased dramatically over the last five decades, with 2010 levels of real nursing home expenditures 25 times greater than 1960 levels and 2010 home health care levels more than 150 times their 1960 levels. Between 1990 and 2010, nursing home expenditures grew by 91 percent, and home health care expenditures by 235 percent. Holding the quantity and quality of care constant, CareScout (2011) reports based on a panel of providers that nominal costs for a private nursing home room rose in the US by 4.35% annually between 2005 and 2011; over the same period annual growth in the US Consumer Price Index was 2.5%.

While ADL limitations can occur at any age, the elderly are at much greater risk than the rest of the population. Congressional Budget Office (2004) reports that approximately two-thirds of US expenditures on long-term care for individuals with ADL limitations go to care for the elderly. National Center for Health Statistics (2009) shows that in the 2003-

[2]Examples, building on the generic analysis of precautionary savings in Leland (1968), include Palumbo (1999), Hubbard et al. (1995), De Nardi et al. (2010), Davidoff (2009), Sinclair and Smetters (2004), Turra and Mitchell (2004), among many others.

2007 National Health Interview Surveys, 3% of respondents aged 65-74 were limited in the performance of at least one ADL, rising to an 18% incidence of limitation among those 85 and over. The occurrence of ADL limitations is greater in the Health and Retirement Study (HRS), but as in the NHIS, the probability of any limitations and the mean number of limitations rise sharply with age. The top panel of Figure 2 plots the fraction of respondents at each integer age with at least one limitation in the 2008 wave of the HRS. Notably, the probability of an ADL approaches 100% at sufficiently advanced age. The bottom panel plots the mean number of ADLs (between 0 and 5 for each respondent) by age; the mean exceeds one starting around age 90.[3] Congressional Budget Office (2004) recognizes offsetting effects on the future path of long-term care expenditures: seniors are becoming healthier, with the fraction impaired by ADL limitations likely to fall sharply from approximately 25% to approximately 15% between 2000 and 2040. However, with increased health comes increased longevity, and the population of seniors, particularly those over 85 will rise by more than enough to compensate. Thus CBO predicts that the probability of use of long-term care over a lifetime for those turning 65 will slowly rise over time.

The cost of prolonged assistance with ADLs may be large relative to the recipient household's resources. Long-term care may be delivered at the disabled individuals' home, at a location to which the disabled individual commutes, or at a nursing home or other residential facility. CareScout (2011) reports median costs in the US for a year of a range of services: the median cost for full-time service from a home health aide is $43,000;[4] receiving care for a year at a day health care center to which an individual commutes costs a median of $15,600; residing in an assisted living facility costs a median of $39,135; semi-private and private rooms in a nursing home have median costs of $70,445 and $77,745. Prudential (2010) cites an "average" cost of a year in a private room in a nursing home of over $90,000, with semi-private rooms an average of a 15% less costly.

[3]Unweighted data taken from the RAND HRS data file.

[4]The mean hourly wage for a home health aide in the 2007 National Home and Hospice Care Survey was approximately $11.

Home health care is used less intensely than nursing homes. Kemper et al. (2005/2006) estimate that an individual turning 65 in the year 2005 will consume nursing home and assisted living facility costs of approximately $39,000 over their lifetime. Mean lifetime home health service consumption is estimated at $8,200. However, the National Health Expenditure Data reported in Figure 1 show that the ratio of home health care to nursing home expenditures has been growing in the US from five percent in 1980 to 49% in 2010.

Fujisawa and Colombo (2009) find that a significant majority of long-term care providers in OECD countries are family members. Houser and Gibson (2008) estimate that the largely uncompensated time of family caregivers represents approximately 60% of the true economic cost of long-term care delivery in the US. Family care appears to be preferred to institutional care, due to both the connection to the caregiver and the familiar fact documented by Bayer and Harper (2000) that the elderly have a strong aversion to leaving their homes. In a survey of EU residents, European Commission (2007) finds that 30% believe that the best means of providing care to disabled elderly is for them to move in with their children; 27% and 24% believe that the dependent elderly should remain at home and obtain care from professionals and children, respectively. Just 10% view moving into a nursing home as the best alternative. Consistent with the preferred nature of family care, Lakdawalla and Schoeni (2003) show in HRS data that having Alzheimer's disease and being single are associated with the same increase in the probability of nursing home entry, conditional on a host of health and demographic covariates. This cross sectional relationship may have aggregate time series implications: Lakdawalla and Philipson (2002) argue that an aging population need not increase long-term care costs if the increase in husbands' lives leads to a decrease in womens' institutionalization.

The top panel of Figure 3 plots the fraction of respondents in the 2008 wave of the HRS reporting at least one ADL limitation that live in a nursing home, by age, both for married individuals and for individuals with no spouse and no children. Nursing home residence is far more prevalent among singles with no children than among married individuals, as has

been found in numerous prior studies. Notably, in the HRS data, married individuals with at least one ADL limitation are less likely to be in a nursing home than singles with no children unconditional on ADL limitations. Conditional on ADL limitation, the use of professional home health care is more evenly distributed across married and single individuals in HRS. Still, I find that in the 2008 wave of the HRS, among those with at least one ADL limitation, only approximately 2% of married individuals report having spent more than $10,000 on out of pocket expenditures for home health care or nursing home services; among singles with no children, the incidence of at least $10,000 in expenditures is greater than 6%. The bottom panel of Figure 3 plots an indicator for use of home health care in the HRS by age and family structure.[5]

Expenditures on long-term care are unevenly distributed across the population, both because only a (sizeable) minority of individuals ever receive long-term care and because the duration of any care received varies a lot, with a long right tail. Even conditional on age and ADL limitation, the duration (and hence expense) of care varies widely. Dick et al. (1994) find, consistent with Kemper and Murtaugh (1991), that there is a 35% probability of some nursing home use while alive conditional on surviving to 65. However, they conclude that:"few of the elderly have prolonged stays and that those who do account for most nursing home utilization. Thus there is a non-negligible but small risk of 'catastrophic' " nursing home use. Kemper et al. (2005/2006) present simulations of long-term care use based on data from the National Long-Term Care Survey, the Current Population Survey and the HRS that are consistent with this characterization. They find that 42% of individuals turning 65 in the year 2005 will use zero costly (not family provided) long-term care before death; 19% will use care costing 0-$10,000; 22% will generate between $10,000 and $100,000 in expenditures; 11% will use $100,000 to $250,000 of care; and 5% will use over 250,000. Projected out of

[5]Expenditure figures are based on reported nursing home or home health care out of pocket payments, with a lower bound used in lieu of a dollar amount in some cases. Linear probability regressions show the probability of a nursing home stay is increasing in all quantities between 0 and 5 of ADL limitations, and in the interaction of each level of ADL limitation with an indicator for single with no children. Conditional on at least one ADL limitation, there is no significant correlation between being single with no children and use of a professional home health care service.

pocket expenditures are much lower due to public insurance.

2 Private and Public Insurance

Tumlinson et al. (2009) provides a description of typical costs and benefits in private US policies. The US warrants particular attention because it is the largest and most studied private long-term care insurance market. Most US long-term care policies offer reimbursement for expenditures incurred associated with nursing homes, some home care services, limited reimbursement for informal care provided by family and friends, and sometimes negotiated compensation for preventive steps such as home renovation with an eye to reducing the probability of falls.

Several contract features are standard in US contracts. For the premiums to be tax deductible (up to a cap) for the insured, the insured must have the option but not the obligation to renew coverage at the end of a premium period, and the insurer must not reimburse medical services otherwise paid for by Medicare. Regulations generally preclude premium growth based on changes in individual age or health, but permit increases due to changes in aggregate costs.

Insurer underwriting rules out coverage for some households, and places successful applicants into different risk pools based on observable characteristics. Premiums grow with generosity, single status, and age at policy start, with the last feature reflecting the long delay that is common between enrollment and the first use of benefits. As Brown and Finkelstein (2007) emphasize, policies do not price on gender despite the greater risk of long life and extended care posed by women. Inflation protection renders policies front-loaded, such that lapsed policies can prove quite profitable, but insurers cannot force renewal beyond a one year horizon. Tumlinson et al. (2009) show variation in quotes for standard risk classified consumers. Married 40-year-olds jointly seeking a maximum benefit of three years of expense reimbursement would pay approximately $1,000 per year starting at enrollment. A single

70-year-old seeking a five-year maximum benefit would pay $6,000 per year.

Given the uncertain and potentially very large magnitude of expenditures on care, one might expect to see large markets for private long-term care insurance. In fact private long-term care insurance markets are small relative to total expenditures throughout the developed world. For example, Congressional Budget Office (2004) reports that private insurance funds approximately 4% of the economic cost of US long-term medical expenses. The National Health Expenditure tables show 9% of nursing care facilities and continuing care retirement community expenditures were funded by private insurance in 2010. OECD (2011) reports approximately 7% of long-term care costs are covered by private long-term care insurance in the US, but that the US has by far the largest private insurance share of 14 countries surveyed. Brown and Finkelstein (Forthcoming) find that 14% of respondents in the Health and Retirement study hold private long-term care insurance, indicating that coverage is far from complete when compared to the less than 10% of costs covered by long-term care insurance. They estimate that men who purchase insurance can expect roughly 72 percent of long-term care costs to be covered, whereas women can only expect roughly 61% coverage. Caps on reimbursement imply that even the insured are exposed to a significant part of the right tail of expenditure risk.

Brown and Finkelstein (2007) find that 65-year-olds face an average load (or gap between expected present value of payouts less expected present value of premiums) of 18%. This load is close to zero for women, but much greater for men. The fact that single women do not have much greater demand for insurance than single men, despite the much lower loading they face, is striking and suggests that factors other than price serve to limit demand.

The extent of long-term care insurance coverage in the US appears to be similar to the rate of homeowner insurance for earthquake risk in California (Zanjani (2008)), a source of similarly large losses with relatively low probability over owners' tenure. By contrast, Scheffler (1988) reports that 70% of those eligible in the US purchase Medigap insurance; Medigap covers medical expenses for Medicare enrollees that are not covered under standard

Medicare but does not provide long-term care coverage. Likewise, 70% of US households hold life insurance.[6]

A critical feature of long-term care insurance demand is the role of government. Governments of developed countries uniformly pay a large share of the direct costs of formal long-term care. In a survey of 23 member countries, OECD (2011) reports a mean of 83% of long-term care expenditures in 2007 were funded by general revenues or social insurance funds. Congressional Budget Office (2004) estimates that Medicaid and Medicare pay 60% of US costs. This dominant role is consistent with widespread support for the notion that the public sector should provide for the disabled elderly. European Commission (2007) finds 93% agreement with the statement "Public authorities should provide appropriate home care and/or institutional care for elderly people in need" but only 25% agreement with the statement "If a person becomes dependent and cannot pay for care from their own income, their flat or house should be sold or borrowed against to pay for care."

Funding of long-term care in western democracies varies within a general framework of mandated progressive contributions for benefits that are either constant or declining in income and asset wealth. Merlis (2004) describes variation from universal coverage through subsidized and mandated insurance (Germany and Japan) or through general tax funded services (Sweden and Denmark) to means tested support paid through subsidized insurance contributions made over the life cycle (Canada, England, US). OECD (2011) provides a similar classification of universal systems, means tested "safety net" programs, and mixed systems. Public insurance payments for care in France and Canada are relatively smoothly decreasing in patient income and largely independent of asset wealth. In the US, Medicaid eligibility is 0-1 and depends on both low income and low assets. Medicaid is a "payer of last resort" and hence taxes long-term care insurance proceeds, with some exceptions in the case of "partnership" programs described below. However, Medicare is available to all Americans of retirement age and covers for short-term skilled nursing, but does not pay for prolonged

[6] American Council of Life Insurers, *Fact Book* 2011.

care and is not meant to cover assistance with activities of daily living,

Figure 4 shows the evolution since 1960 in the US of Medicare, Medicaid, private insurance, and out-of-pocket payments as shares of total nursing home and home health care costs (top panel) and in log real dollars spent on nursing home and health care costs (bottom panel). The out of pocket share has declined almost continuously from 71% in 1960 to around 21% in 2010. Since about 1990, growth in out of pocket expenditures has been relatively modest as Medicaid and particularly Medicare have grown more rapidly. The Obama administration recently gave up an effort to generate a self-sustaining uniform long-term care insurance product "CLASS" that would have provided up to $50 per day in expense reimbursement.

An important element of Medicaid coverage in the US is that not all nursing facilities accept Medicaid reimbursement, in large part because Medicaid imposes caps on reimbursement. U.S. General Accounting Office (1990) reports that Medicaid recipients have a harder time finding facilities than non-Medicaid patients. This delay is associated with worse health outcomes, and the facilities that accept Medicaid appear to offer lower amenity and treatment quality than private-pay facilities. However, many facilities that accept private-pay only on admission will allow patients to "spend-down" assets so that they may be reimbursed by Medicaid in the event of a long stay. Grabowski et al. (2008) find that patients in mixed Medicaid and private-pay facilities who spend down into Medicaid coverage do not suffer a decline in the quality of care as measured by health outcomes. They may, however, suffer a decline in amenity if they are transferred to a different wing of the facility after transition into Medicaid.

3 Is the marginal utility of wealth correlated with limitations to activities of daily living?

The small portion of long-term care costs paid for by private insurance is a "puzzle" that has attracted considerable attention. Summaries of the growing literature on the question include Brown and Finkelstein (2009), Brown and Finkelstein (Forthcoming) and Pestieau and Ponthiere (2010). The following discussion draws heavily on these studies and considers reasons why consumers with concave utility might not insure themselves against stochastic long-term care needs, even absent government intervention. Given the large and progressive role of government coverage, this analysis is most salient at higher levels of permanent income: it is not much of a puzzle that a poor individual who will surely qualify for Medicaid coverage in the event of extended disability would not choose to pay thousands of dollars a year for private coverage.

To frame the discussion, I start with a single-period model that can incorporate some intertemporal considerations. A consumer (possibly a couple) derives utility from two sources: expenditures on care, k, and expenditures on all other goods. The consumer is endowed with w_0 of the non-care good and may engage in an insurance program that pays the consumer $i\left[b(k,x)-a\right)]$, where i is the units of insurance purchased, b is a function mapping from diagnosis x and expenditures k to a reimbursement, and a is a constant premium paid regardless of health state. An actuarially fair policy would set $a = Eb(k,x)$. The consumer's utility can thus be written $u(w_0 - k + i\left[b(k,x)-a\right], k, x+z)$. I assume u is increasing and concave in its first argument (non-care expenditures) and concave, but not necessarily increasing, in its second argument, k. Utility over both non-care and care expenditures is shaped by both observable diagnosis of a need care x and unobservable drivers of expenditures z. z represents an index of factors that an insurer may not observe, such as family structure and variation in individual experience of a given diagnosis. A key property is that $u_{23} > 0$, so that care is more attractive when health is poor. k could be decomposed into a list of services

multiplied by the quality level of each service, but I avoid this to economize on notation.

The welfare gain to purchasing a unit of insurance is given by:

$$\frac{\partial Eu}{\partial i} = EbEu_1 + cov\left(b, u_1\right) - aEu_1. \tag{1}$$

Naturally insurance will be more attractive if the premium a is small relative to the expected payout Eb. A critical question regardless of pricing is whether the covariance between insurance payouts and marginal utility is positive. Given that the remarkable empirical fact to be explained is not a low level of coverage conditional on insurance, but rather the absence of insurance coverage at all, I consider the consumer's problem with $i = 0$, and ask whether marginal utility is likely to rise with medical expenditure needs in the absence of insurance.

Optimal care expenditures k upon realization of need $x + z$ imply:

$$u_2(w_0 - k, k, x + z) - u_1\left(w_0 - k, k, x + z\right) = 0. \tag{2}$$

Define indirect utility v for a given stochastic draw as:

$$v(w_0, x, z) = \max_k u\left(w_0 - k, k, x + z\right) \tag{3}$$

By an envelope condition, integrating over stochastic outcomes x and z, expected marginal utility is:

$$Ev_1 = \int_x \int_z u_1\left(w_0 - k(x, z), k(x, z), x + z\right) f(x, z) dz dx. \tag{4}$$

To determine whether marginal utility increases in diagnosis, differentiate the optimality condition (2) and use the definition of indirect utility (4) to obtain:

$$\frac{dEv_1}{dx} = \int_z \left[u_1 \frac{df(x,z)}{dx} + \left[u_{13} + [u_{12} - u_{11}] \frac{dk}{dx} \right] f(x,z) \right] dz \tag{5}$$

$$\frac{dk}{dx} = - \frac{u_{23} - u_{13}}{u_{11} - 2u_{12} + u_{22}}. \tag{6}$$

$$\frac{dEv_1}{dx} = \int_z \left[u_1 \frac{df(x,z)}{dx} + \frac{u_{23}[u_{11} - u_{12}] + u_{13}[u_{22} - u_{12}]}{u_{11} + u_{22} - 2u_{12}} f(x,z) \right] dz. \tag{7}$$

Insurance is only likely to be desirable to the extent that expression (7) is positive over a sufficiently large range of x values that the covariance between insurance payouts and marginal utility is positive. The first term on the right hand side of equation (7) reflects the fact that x and z may be correlated, although a diagnosis of observable limitation (x) would presumably incorporate information about unobservable conditions z that are associated with x. Hence this first term is likely to be small or zero in magnitude.

Assuming x and z are uncorrelated, a set of jointly sufficient conditions for marginal utility of wealth to increase in diagnosis is: (i) the marginal utility of care grows more quickly with need than demand for non-care consumption shrinks with need ($u_{23}+u_{13} > 0$); (ii) utility is more concave in non-care than care consumption ($u_{11} < u_{22}$); and (iii) the marginal utility of non-care consumption falls more rapidly in non-care than care consumption: $u_{11} - u_{12} < 0$. That these conditions are sufficient follows from the concavity of u and hence the negativity of the denominator of the second term in (7).

Part of condition (i), that desired care expenditures increases with poor health ($u_{23} > 0$) is not open to much doubt. However, the magnitude of this effect may not be large for those who are married or have children. As described above, conditional on age and ADL limitations, nursing home use is less common for those with spouses or children . Pauly (1990) observes that in the absence of a bequest motive, care paid for (or directly supplied) by children is effectively free. Children may wish in that case to pay for insurance. The act of providing care for a spouse may or may not affect the level of the care giver's utility, but the effect on the marginal utility of wealth for the potential caregiver or the insured is not clear

(the effect is presumably more likely to be positive to the extent that care is a substitute for earnings). Parents may not allow the children to pay for insurance if family care is preferred and bequest strength is weak. Since most long-term care is provided by family, these are not minor considerations, and they rationalize the fact that married couples receive considerably better pricing for long-term care insurance jointly than they would individually. Given that long-term expenditures reflect the joint risk of activity limitation and absence of family care, it may not be surprising that life insurance is far more prevalent among respondents in the Health and Retirement Study (approximately 62% in the 9th wave) than long-term care insurance (approximately 12%).[7]

Condition (i) for marginal utility to increase in observable need x is jeopardized by the likely negativity of u_{13}, the effect of observable medical need on the marginal utility of non-care consumption. This negativity may arise from at least three sources. First,the need for care is correlated with reduced longevity. Pauly (1990) summarizes evidence that life expectancy falls significantly conditional on poor enough health to require long-term care. Consistent with this observation, Figure 5 shows that conditional on age, the fraction of individuals surviving through the 9th (2008) wave of HRS by age is much lower for individuals reporting at least one ADL limitation (plotted with an "X") in the 4th wave (1998) than among those reporting no ADL limitations in the 4th wave (plotted with an "o"). Those in a nursing home in wave 4 (plotted with a "Y"), presumably in worse than average states of limitation given at least one ADL problem, have very little probability of surviving to the 9th wave. Most wealth is not annuitized, so the marginal utility of wealth rises with age and expected longevity. Thus the relative marginal utility of wealth when in need of care versus when healthy is determined in part by a "horse race" between the added expenditures of optimal care costs against the reduced expenditures required to fund a constant level of non-care expenditures while alive.

[7]Brown (1999) presents results that suggest caution in the interpretation of life insurance as a precaution against long-term care expenditures: life insurance policies are generally quite small, and many appear to be held for tax, rather than insurance, purposes.

Even conditional on life expectancy, the marginal utility of non-care expenditures would likely fall as health deteriorates. Travel and fancy restaurants, for example, must yield less enjoyment while suffering from ADL limitations, and almost no consumption can be enjoyed while confined to intensive care in a nursing facility. Indeed Pauly (1990) assumes $u_1 = 0$ conditional on a need for long-term care. Finkelstein et al. (2009a) cite several papers that offer ambiguous evidence on the relationship between the marginal utility of wealth and overall health. Many of these studies, however, conflate multiple terms in equation (7). Taking care not to conflate terms, Finkelstein et al. (2009b) find a significantly negative effect of chronic health problems on the marginal utility of consumption among the elderly.

A third significant factor rendering u_{13} negative, raised by Skinner (1996) and Davidoff (2010), is that home equity may act as a precautionary buffer against large out-of-pocket long-term care costs. Venti and Wise (2000), Megbolugbe et al. (1997), and Walker (2004), among others show that nursing home stays are highly correlated with sale of a home among the elderly. Figure 6, taken from Davidoff (2010), shows that HRS homeowners are much likelier to sell their homes if they enter a nursing home, and that prolonged stays in nursing homes are associated with continued elevation of the hazard out of homeownership. ADL limitations are also associated with exit from homeownership. Among wave 8 respondents who had no ADL limitations in wave 4 and none in wave 8, 80% remain homeowners in wave 8. Among those with no limitations in wave 4 but at least one limitation in wave 8, 61% remain homeowners. Among those with at least three ADL limitations in wave 8, just 43% remain homeowners.

Sale of a primary residence is highly correlated with liquid wealth because home equity release through increased mortgage debt is uncommon among the elderly and because home equity represents a large share of wealth and a large fraction of likely long-term care expenditures conditional on ADL limitation. Davidoff (2010) observes that 12% of homeowners over age 62 in the 2004 wave of the HRS owed any mortgage debt, and among this 12%, median mortgage debt to value was just 33%. Much of this mortgage debt is held over from working

years, with the median ratio of home equity to home value 84% among owners in their 60s and 96% among owners in their 90s. Davidoff (2010) also shows that 79% of respondents aged 62 or older in the 2004 wave of the HRS respondents are homeowners. Among owners, median equity is $110,000 and the median ratio of home equity to total wealth is 55%.

Among the wealthiest quintile of households, for whom public insurance is unlikely to cover long-term care costs, 84% of respondents report home equity over $100,000. That is, 84% of those who might plausibly be interested in private insurance have home equity that is greater than 84% of the distribution of lifetime long-term care expenditures conditional on positive expenditures calculated by Kemper et al. (2005/2006). Table 1 confirms these findings in the 2008 wave of the HRS/AHEAD survey, presenting mean values of a long-term care insurance coverage indicator housing and home equity for each of ten non-housing wealth deciles for individuals (unweighted) over age 70. To the extent that marginal utility declines faster in liquid wealth than in unspent home equity, for most plausible candidates for long-term care, the marginal utility of wealth while in need of care may well be lower than in good health, once both care expenditures and home equity are accounted for.

Simulations suggest that in the realistic setting in which private savings are not annuitized and home equity is not spent until a sale, the correlations between ADL limitation and both longevity and home equity spending may sharply curtail demand for long-term care insurance for households with weak bequest motives. Sinclair and Smetters (2004) show that for sufficiently high risk aversion, the presence of calibrated uninsured health shocks can eliminate demand for life annuities. Turra and Mitchell (2004) provide similar results.

Davidoff (2009) calibrates expected lifetime utility for a healthy 62 year-old facing uncertainty over length of life and health, with health and mortality transitions following the model of Robinson (1996). In a world with fully liquid home equity, the value of the right to take on an actuarially fair and complete long-term care insurance more than doubles when all savings are annuitized rather than held in a bond. When most savings is annuitized, the welfare gain to taking on an optimal long-term care insurance policy for a homeowner with

$100,000 in liquid savings and $200,000 in home equity is more than 10 times greater when home equity is liquid than when equity is only liquidated on sale (which only occurs upon entry into long-term care).

Condition (ii), $u_{11} < u_{22}$, that the marginal utility of expenditures decline more rapidly for non-care rather than care, seems plausible. In a given time-period, long-term care expenditures induced by poor health can easily exceed expenditures on all other goods when the same household is in good health. Two considerations operate in the opposite direction: first, among households wealthy enough to consider private insurance as a substitute for public provision, utility may be close to linear in wealth. Second, some long-term care expenditures are luxuries, such that u_{22} may be more negative than the jumps in expenditures with poor health suggest.

Both De Nardi et al. (2010) and Lockwood (2011) use simulated moment methods to find that life cycle savings choices among older Americans are consistent with preferences under which bequests are a superior good and utility over bequests is closer to linear than is utility over own consumption. Lockwood (2011) argues that these preferences justify weak demand for long-term care insurance among the higher income households for whom Medicaid coverage is a poor substitute. These households will hold a lot of wealth to leave as bequests, but if insurance is worse than fairly priced, the near linearity of bequest utility will not generate demand for insuring the bequest against long-term care expenditures. A caveat to this interpretation are that Lockwood finds more concavity in bequest utility when long-term care insurance purchases is not used to estimate the model. The functional form of utility over bequests in both papers is constant relative risk over consumption plus an intercept, implies increasing relative risk aversion past some level of wealth and may be inconsistent with a dip in long-term care purchases at very high wealth levels indicated in Table 1. It is worth further investigation to see if the dip at highest wealth levels is significant and if utility parameters would have to change to fit this pattern.

u_{22} may be quite negative. Some of the right tail of long-term care expenditures reflects

payments for a level of amenity in surroundings that may yield very little improvement in health outcomes. In British Columbia, publicly subsidized nursing homes monthly costs generally charge a total of $3,000 per month. Private rates range from 4,000 to 8,200 per month depending on the quality and location of the facility but industry participants suggest that licensing requirements imply that the quality of care for ADL limitations may not be very different in public- versus private-pay facilities. In the US, there is considerable flexibility in choice of expenditures on the bundle of location, amenity, and intensity of care. CareScout (2011) cites a range from $46,355 (Texas) to $130,305 (Connecticut) in state mean nursing home costs for a year in a semi-private room. Even within New York State (and thus within a Medicaid regime), Genworth reports that a year in a nursing home in Buffalo has a median cost of approximately $110,000 versus over $160,000 in Manhattan.[8] Within California, costs range from $73,000 for a semi-private room in Stockton to just under $100,000 for a semi-private room in San Francisco, to $130,00 for a private room in San Francisco. Privacy, proximity to relatives and amenity are presumably less of a necessity than receiving care at all. Thus the difference between the marginal utility of care generated by the last $50,000 spent on care in Manhattan or San Francisco and the marginal utility of the first 100,000 conceivably may not be much less negative than the difference in non-care utility generated by the last $50,000 and the first $100,000 spent on other goods over the remaining life cycle.

The third condition for marginal utility to rise in medical need, that $u_{11} - u_{12} < 0$ requires that non-care consumption is not a perfect substitute for care consumption. Most plausibly, $u_{12} > 0$ so that there is substitution, but $u_{11} - u_{12} > 0$ such that substitution is imperfect. The natural sources of crowd-out are the portion of long-term care costs that are associated with room and board. OECD (2011) states that room and board can represent up to 50% of long-term care costs (OECD (2011)).[9] Back-of-the-envelope calculations based on cost

[8]It is unlikely that a retiree living in Manhattan would wish to move into a facility in Buffalo, but she might be more willing to do so than to live in extreme poverty after any exit from long-term care while alive.

[9]Rental housing provided as part of nursing home expenditures represent a negative contribution to the expression u_{12}. This is different from the undoing of the "asset commitment" to home equity induced by the

survey data from CareScout (2011) and Prudential (2010) suggest a somewhat lower cost share. Alternatively, combined mean expenditures on food and rent for consumer units that rent their housing in the Consumer Expenditure Survey US are under $17,000. Charges for institutional room and board for single individuals at undergraduate colleges average around $10,000 based on casual empiricism.

Summarizing, several considerations add ambiguity to the relationship between the marginal utility of wealth and need for care. Recourse to family care and home equity attenuate the financial costs associated with a need for care. Limited consumption needs while in care due to inability to enjoy consumption and the bundling of room and board with care likely render the marginal utility of a fixed level of expenditures while in care lower than the marginal utility of the same level of expenditures while healthy. Some of the right tail of long-term care expenditures represents improvements in the quality of room and board, and the marginal utility of these improvements may not be large relative to the gain from money allocated to non-care expenditures.

4 The Design of Long-Term Care Insurance

Private insurers face an environment in which public insurance, family care, and home equity provide substitutes for a large fraction of the population. There is reason to suspect that households who demand private insurance despite the presence of substitutes may be bad actuarial risks.

Governments face the problem of how to structure any intervention into markets. Optimal tax theory provides some reason to question a role for public intervention at all: Corlett and Hague (1953) and Atkinson and Stiglitz (1971) show that subsidies to particular commodities are typically undesirable if a perfect system of income taxation already exists. Indeed in their theory of public design, Cremer and Pestieau (2011) observe that high ability individuals are

liquidation of home equity, attributed above to the term u_{13}. The first effect relates to present dividends, the latter relates to future dividends flowing from the original home.

on average longer-lived than low ability individuals; this argues for a tax on long-term care insurance to soften moral hazard problems inherent to a redistributive income tax scheme.

Public opinions studied by European Commission (2007) show clear support for government intervention into long-term care markets, and there are economic rationalizations for this view. First, compulsory insurance avoids problems of selection. Finkelstein and McGarry (2003) show that purchasers of long-term care insurance have offsetting characteristics that lead to no clear relationship between nursing home use and insurance purchase: purchasers believe that they are likelier to develop ADL limitations, but also engage in more preventive care. However, Murtaugh et al. (1995) observe that between 13% and 30% of retirees (who represent the bulk of long-term care purchasers) would be unable to purchase policies due to insurer underwriting policies. If insurers were unlikely to face adverse selection, they might find it more profitable to eliminate underwriting requirements and charge higher average premiums.[10] Individuals face the risk of being in a poorly priced risk pool if they are allowed to purchase insurance but are less than fully healthy at the date of purchase.

Selection concerns suggest that an optimally designed elective insurance system would involve purchase of insurance starting early in working life. The incidence of ADL limitation is not zero during working years, and information asymmetries are weaker over long horizons than short horizons (see, e.g. Chalmers and Reuter (2009) with respect to longevity risk): young workers may not know much more about their own joint probability of survival and ADL limitation decades than insurers. Indeed, consistent with the theory of dynamic adverse selection laid out in Dionne and Doherty (1994), Finkelstein et al. (2005) show that individuals who let long-term care contracts lapse (thereby foregoing subsidized payments) enter nursing homes less frequently than those who keep contracts in force, indicative of worsening adverse selection with age.

Absent government intervention, consumers with foresight might enter into dynamic con-

[10]Sloan and Norton (1997) report evidence of adverse selection on prospective health, but no favorable selection on risk aversion in earlier waves of the HRS. Courbage and Roudaut (2008) find that individuals in poor health and with strong bequest motives are more likely to take on long-term care insurance in SHARE survey data covering France.

tracts early in life, avoiding the poor pricing that arises from selection in contracts entered into late in life. It is not obvious, however, that rational young consumers would want to commit to a long-term contract. Liquidity constraints (e.g. due to down payment constraints) might swamp the gain from informational symmetry, deferring purchase to at least middle age. The existence of, and uncertainty over, the adequacy of home equity and family substitutes to long-term care insurance also presumably argue against early purchase. Even existing contracts, which are typically purchased around retirement, feature lapse rates of approximately 7% per year (Finkelstein et al. (2005)). Brown and Finkelstein (Forthcoming) show that even for 65-year-olds, the average effective load on contracts rises from 18% to 51% once lapses are accounted for. Merlis (2003) argues that favorable pricing from early purchase would evaporate if not for lapses. It is not at all clear (particularly with inferior public insurance available) that lapses occur in states of the world with relatively low marginal utility. Long-term care typically occurs late in life, and the high fraction of working age households purchasing life insurance suggests that survival to retirement is correlated with relatively low lifetime marginal utility. Thus contracts that transfer away from those who lapse may not be preferred by risk averse consumers to worse priced contracts that are entered after the resolution of life cycle uncertainty.

European Commission (2007) provides evidence suggesting that younger people do not accurately assess the likelihood of future limitation. The fraction of respondents to a survey asking "Do you expect that at some stage during your life, you will, for a prolonged period of time, become dependent upon the help of others because of your physical or mental health condition?" answering that this event is "unlikely, but you would not exclude this possibility" or "almost certain" of no future dependency falls continuously with age from 46% between ages 15-24 to 16% among those 85 or older. RoperAsw (2011) and others have shown that many Americans are confused about whether or not their private insurance or future Medicare coverage will pay for long-term care, and that most have imprecise understanding of long-term care costs. Cutler (1996) elaborates on another consideration that affects the

desirability of long-term care contracts: a large part of long-term care expenditure risk relates to price inflation, a risk that cannot be diversified away by insurers. Merlis (2003) shows that paying an insurer expected lifetime costs would be beyond the means of many households, particularly older households. However, the ability to pay for insurance is in part endogenous to savings that reflect reaction to Medicaid and other public provision.

In light of these considerations, it seems unlikely that governments will leave long-term care insurance entirely to the private sector anytime soon. Naturally, public provision may crowd out private insurance throughout the income distribution. In the US, Medicaid pays after private insurance and only if income and assets are low (subject to "partnership arrangements"). Allowable income and wealth are greater when there is a "community spouse" outside of care.

Means-tested support for long-term care generally implies taxation of private savings and insurance. Generalizing the analysis in Brown and Finkelstein (2007) with respect to preferences, but reducing the problem to a single period, utility using the US Medicaid program may be approximated by:

$$v^{\text{medicaid}}(w_0, x, z) = \max_{k \in \left[0, \bar{k}(x)\right]} u\left(\max\left(\min\left(w_0 - k, \bar{w}\right), \underline{w}\right), k, x + z\right). \tag{8}$$

In equation (8), $\bar{w}$ is a maximal amount of wealth and income that may be retained after entry into Medicaid. Some resources may be hidden with friends or relatives despite Medicaid look-back policies, and couples may generally retain home equity (see Greenhalgh-Stanley (2011) for a discussion). The lower bound $\underline{w}$ reflects the fact that Medicaid will pay for resources once assets and income have been run down to a sufficiently low level.

US states vary in their treatment of housing assets. Generally speaking, a Medicaid recipient or community spouse may reside in a home and retain home equity without impact on Medicaid eligibility. However, if no living spouses remain in the home, and a recipient moves to a nursing facility with no "intent to return" states may place a lien on future sale proceeds or deny coverage. States generally do not capture home equity while the recipient

is alive. Some states aggressively enforce liens against single recipients after death or transfer of the home. Medicaid prohibits the enforcement of liens against surviving spouses and in some cases against siblings or adult children who have lived with the recipient more than two years prior to entry into Medicaid.[11]

Conditional on wealth, Medicaid utility (8) can only be less than uninsured utility (3) if the constraint on the level of care imposed by Medicaid $\bar{k}$ binds with sufficient force or if resources w_0 are sufficiently large relative to the allowance $\bar{w}$. Assuming k is normal, Medicaid will become a worse substitute for the better of self-insurance or private insurance as resources w_0 rise. Mechanically, with w_0 sufficiently large, the lower bound on non-care consumption provided by Medicaid becomes less valuable.

Private or self-insurance is more attractive to the extent that features such as attractive and convenient surroundings, more personalized care, and better food are important, that is as the constraint $\bar{k}$ binds with more force. Survey evidence from 887 individuals aged 54 to 90 presented by Ameriks et al. (2007) suggests that these amenities loom large in the financial planning of the elderly. Respondents were asked in a hypothetical world in which they were 85, and had $200,000 in total wealth, whether they would prefer to (a) give all of the money to heirs, but receive care in a nursing home that takes Medicaid payment, or (b) give $150,000 to heirs and spend $50,000 on superior care in a private facility. 85% chose option (b).

Consistent with these observations, Brown and Finkelstein (2007) estimate that for approximately 60% of the US population, a combination of self-insurance and Medicaid is a better way to finance long-term care than is private insurance. Table 1 lists quantiles of HRS Wave 4 non-housing assets against the fraction of respondents at that wealth decile covered by long-term care insurance. Supporting an important role for Medicaid and the calibration of Brown and Finkelstein (2007), the rate of private coverage rises in assets, with a rate of increase that becomes sharper past the mean of the distribution. However, mean coverage

[11]Regulations are discussed at `http://aspe.hhs.gov/daltcp/reports/hometreat.htm`.

never exceeds 31% for any of 20 wealth quantiles.

Either public or private insurance that conditions on use (k in the notation above) rather than diagnosis (x) would seem to invite moral hazard on use of care. The fact that nursing home use is highly responsive to the presence of potential family caregivers suggests that use might also be sensitive to after-insurance price. A surprising finding in this light is that nursing home use does not appear to be responsive to financial incentives conditional on observable characteristics. Grabowski and Gruber (2007) show, based on variation across time and states in six different types of Medicaid policies and microdata from respondents in the US National Long-Term Care Survey, that the decision to enter a nursing home depends at most insignificantly on the extent of public subsidies. They interpret this finding as consistent with households using nursing homes only when family or home health aide support is not feasible; this is broadly consistent with the preferences and attitudes expressed in the European Commission (2007) survey. Cutler and Sheiner (1994), using only cross-state variation, find evidence of moral hazard, but other similar studies find no such evidence.

Having sufficiently low wealth and income to qualify for Medicaid is an outcome of both lifetime resources and consumption and investment choices. Whether due to bequest motives or savings for a possible period of life after receiving care, spending assets down to a sufficiently low level to pass income and tests will presumably be less attractive as resources rise. Hubbard et al. (1995) argue that means-tested public insurance may explain the fact that households with low permanent income save at a lower rate than households with higher permanent income and this pattern is confirmed in De Nardi et al. (2010). Gruber and Yelowitz (1999) confirm empirically that expansion of Medicaid increased the consumption and reduced the savings of targeted households.[12] Savings may fall both because potentially marginal households face a high implicit tax on savings due to the discrete nature of eligibility and because the need for precautionary savings against care expenditures is reduced among

[12]Gittleman (2011) shows that the reduction in savings are less easily detected in the National Longitudinal Survey of Youth, 1979 than in the Survey of Income and Program Participation data used by Gruber and Yelowitz (1999).

households likely to qualify for Medicaid.

There is evidence that households 'game" eligibility through asset choice. Engelhardt and Greenhalgh-Stanley (2010) show that state laws that encourage the use of home-health care services increase homeownership rates among the elderly, and Greenhalgh-Stanley (2011) shows that state recovery rules that are generous towards estates also increase homeownership rates among older married couples. In particular, Greenhalgh shows that in states that actively recover home equity from singles, the difference between the ownership rates of singles and couples (whose homes are only subject to Medicaid recapture in the rare event that both members receive Medicaid-financed care) is more negative. Given that Medicaid discourages non-housing accumulation, it is not clear whether a distortion that makes home equity a favored form of savings is more desirable than taxing housing and other forms of savings at equally punitive rates.

Recognizing the moral hazard induced by Medicaid coverage of qualifying long-term care expenses, the US offers partial tax deductibility of long-term care insurance premiums. Several states have also devised "partnership" policies which permit purchasers of long-term care policies to exempt more assets from Medicaid eligibility tests than they would otherwise be able to exempt, in the event that care expenditures exceed contracted benefits. US Government Accountability Office (2007) estimates that 80% of partnership policyholders would have bought conventional plans in the absence of the partnership program, such that the program is a small net cost to the Medicaid system.

From the analysis in Section 3, it seems likely that long-term care insurance demand is depressed not only by public provision, particularly for lower wealth households, but also by absence of annuitization and the strong positive correlation between nursing home use and home equity liquidation.

Combining long-term care insurance with annuities has been proposed both due to demand complementarities described in Section 3, but also on "supply side" selection grounds. Murtaugh et al. (2001) use the 1986 National Mortality Followback Survey to show that

life expectancy is much less for individuals with enough limitations to be underwritten out of long-term care than for otherwise similar individuals. Thus the risk of long-term care need is less among the long-lived than the short-lived, and the risks facing annuity and long-term care providers are negatively correlated. They show that actuarially fair pricing of a bundled annuity and long-term care policy could reduce premiums by 3 to 5 percent while weakening underwriting standards to screen out only 2% of 65-year-olds as opposed to the then prevalent 23% exclusion. Bundling thus promises to improved pricing, resolve a major liquidity problem in annuity demand (by reducing the need for cash in the event of ADL limitation), and increase the relative marginal utility of wealth in the event of care need (by annuitizing wealth and equalizing marginal utility with across longevity outcomes). Webb (2009), assuming a perfectly negative correlation between survival and long-term care risk, lays out the theoretical case for a pooling equilibrium in a bundled contract that may not be achievable in stand-alone annuities or long-term care insurance contracts.

Bundled long-term care insurance and annuities are currently available in the US (Lysiak (2007)), but demand does not appear to be strong. Davidoff (2009), building on Davidoff et al. (2005) offers a demand-side explanation for why this seemingly compelling product is only very rarely traded. Annuities and long-term care are complementary in that an ADL limitation that occurs soon after annuity purchase will require immediate liquidity, but annuities are inherently illiquid (see, e.g. Direr (2007) and Sheshinski (2010)). However, annuities and long-term care are substitutes in that they both offer greater expected benefits to those who are longer-lived, in that ADL limitation risk grows with age. To the extent that liquidating home equity reduces the need for liquidity in the event of long-term care, the complementarity between long-term care insurance and annuities is weakened, but the force of substitution is not. Home equity, long-term care insurance, and annuities are all "back loaded." A complete and bundled solution to the problems of uncertain longevity, stochastic care needs, and home equity illiquidity may be required to develop thick markets for any of annuities, long-term care, or reverse mortgages.

As detailed in Ahlstrom et al. (2004), the American Homeownership and Economic Opportunity Act of 2000 provides a waiver of guarantee fees for reverse mortgage borrowers who use loan proceeds to purchase long-term care insurance, but the US Department of Housing and Urban Development has not yet implemented this proposal. How home equity bundling would affect equilibrium is an open question for research. Reverse mortgages embed a bet against borrower longevity on the lender's part,[13] so the same case for bundling long-term care insurance with annuities may be made for bundling with reverse mortgages. Bundling an annuity and a reverse mortgage might invite worse selection problems in these small markets than already exist. The complexity and informational problems of a three-part insurance solution, which would involve complicated bets on interest rates, home prices, health, and longevity may well be beyond the capabilities of insurers and consumers for some time.

5 Conclusions

Long-term care insurance is currently dominated by compulsory government programs that are progressively funded and typically also provide benefits that decline in wealth and income. There is evidence that the sharp means testing in Medicaid in the US yields reduces the level of savings and shifts the composition of savings towards housing, which is relatively protected. Medicaid may also reduce labor supply over the life cycle (e.g. Yellowitz (1995)). Whether benefits for long-term care in Medicaid depress the accumulation of wealth is a more open question.

There is no clear evidence that costly nursing home use in lieu of family or professional care at home is increased by public payment. Absence of moral hazard on use may arise from widespread preferences for care at home and undertaken by patients' spouses or children. This may argue for the reimbursement model of insurance in the US over the indemnity model which is more prevalent in the French public and private insurance systems (see

[13] Witness the disastrous "viager" contract that Andre-Francois Raffray offered 90 year old Jeanne Calment in 1965 (source: Mazonis)

OECD (2011) and Pestieau and Ponthiere (2010)). The extent of moral hazard on the use of home care is not known. Whether cash payments based on diagnosis are superior to reimbursement also depends on the correlation between observable diagnosis and true need for care, a set of quantities that has not been compellingly estimated.

Why public support for social insurance of long-term care insurance is as strong as survey data suggest is an open question. Per Atkinson and Stiglitz (1971), there might be efficiency gains to limiting social insurance schemes to income redistribution, with the long-term care insurance coverage left to private contracts between consumers and firms. An obvious possibility is that voters are both altruistic and myopic, so that there is majority support for aid to the needy elderly without recognition of the present or future tax costs. To the extent that the political process represents an exercise in social welfare maximization, some combination of adverse selection into private insurance, supply side barriers to competition and failure of foresight on the part of some consumers may rationalize public intervention. Cremer and Pestieau (2011) provide a rationalization for the system seen in the US and France. When there are limits to the efficiency of a redistributive tax, they conclude that a progressive social insurance benefit formula is optimal, and that private long-term care insurance should be subsidized on average, but taxed on the margin. In this way, the wealthy self-insure, but middle earners purchase private insurance, alleviating the tax burden and moral hazard problems of subsidies for care of the poor. Failure of the CLASS legislation in the US highlights that there is not infinite political support for public provision of long-term care payments.[14]

There is scope for private long-term care insurance in markets such as the US where eligibility involves stringent income and asset tests and where facilities that admit patients on Medicaid are less available and offer lower amenity than private-pay facilities. Approximately 10% of older Americans take on private long-term care insurance, with the fraction sharply rising in wealth up to roughly 30% between the 90th and 95th percentiles of non-housing

[14]The fact that CLASS was self-financed may be taken as evidence of a link between myopia and popular support for public payments.

wealth. An apparent dip in participation at highest wealth levels may help inform the characterization of preferences over bequests.

The presence of potential family care, housing wealth, and uninsured longevity risk make stand-alone long-term care insurance, and particularly a long-horizon commitment to insurance difficult to sell. There is some evidence of a failure to plan for ADL limitations among younger households.[15] Long-term care insurance bundled with annuities alone or with reverse mortgages alone do not appear to be popular. Future research could usefully explore an option to purchase long-term care that is tied to death of a spouse, as spousal death removes a potential free caregiver and some commitment to home equity and makes costly nursing home entry much more likely. Multi-product combinations of home equity liquidation with spousal life, own longevity, and long-term care may be necessary to spur consumer demand above 30% at high wealth levels, but would involve enough dimensions of selection and moral hazard to warrant fear from suppliers, and further analysis from economists. An important near-term research task is to refine our understanding of the correlation between the lifetime present discounted value of long-term care expenditures and longevity. Webb (2009) and Kemper et al. (2005/2006) premise their analysis of gains to bundling on a negative correlation, but Brown and Finkelstein (2007) find that longer-lived women are a worse actuarial risk to long-term care insurers than are shorter-lived men.

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[15] Brown and Finkelstein (Forthcoming) report searching in vain for directly relevant evidence concerning consumer irrationality or present bias in the long-term care insurance market, but survey some relevant results from related markets.

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Table 1: Wealth Quantile (out of 20), Median net value of primary residence, fraction covered by long-term care insurance, and median ratio of net value of primary residence to non-housing wealth, respondents over age 70 to the 2008 Health and Retirement Study/AHEAD

Wealth Quantile	Median net residence value	long-term care coverage	$\frac{\text{Net value of primary residence}}{\text{Non-housing wealth}}$
1	0	0.05	0.00
2	0	0.02	Infinite
3	0	0.03	0.00
4	0	0.03	0.00
5	20000	0.03	5.20
6	40000	0.08	5.00
7	50000	0.07	3.67
8	48500	0.05	2.12
9	60000	0.09	1.76
10	60500	0.09	1.15
11	99000	0.17	1.34
12	99500	0.17	0.88
13	125000	0.14	0.88
14	117500	0.22	0.59
15	130000	0.19	0.49
16	130000	0.19	0.38
17	150000	0.19	0.32
18	150000	0.28	0.20
19	200000	0.31	0.18
20	269000	0.26	0.10

Figure 1: Log real expenditures on nursing homes and home health care, 1960-2010. National Health Expenditure Data deflated by US CPI for all goods.

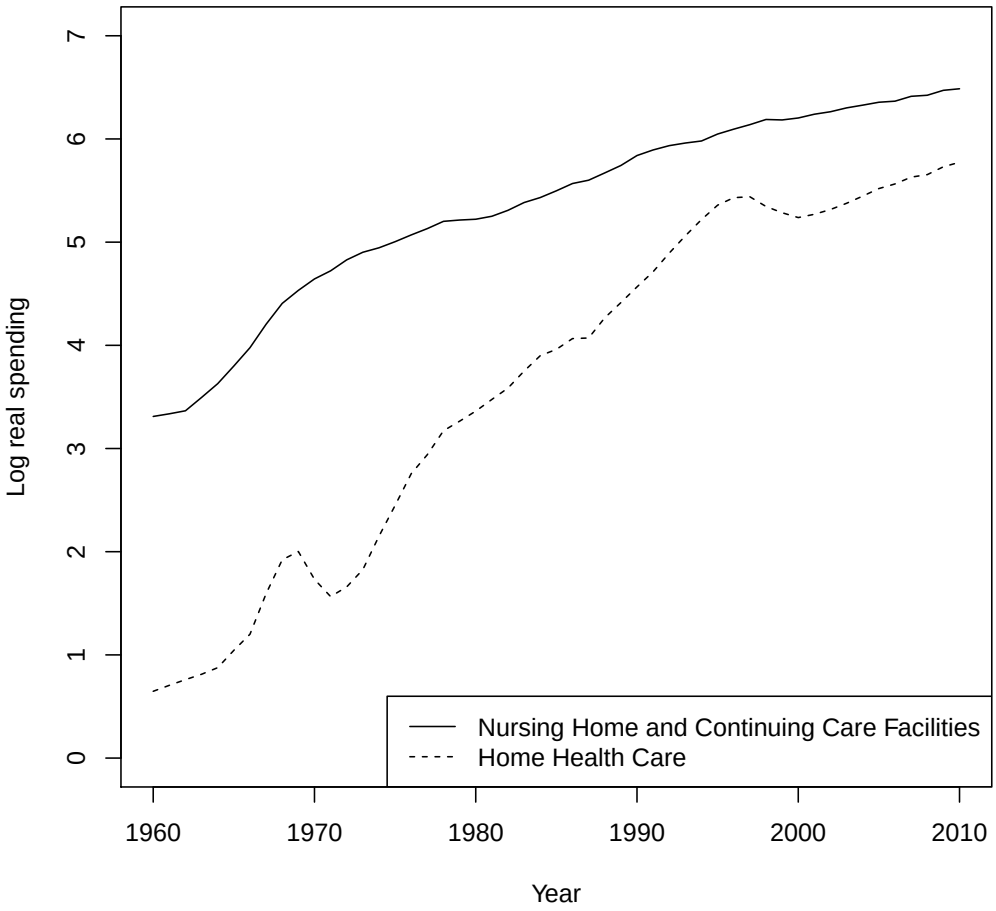
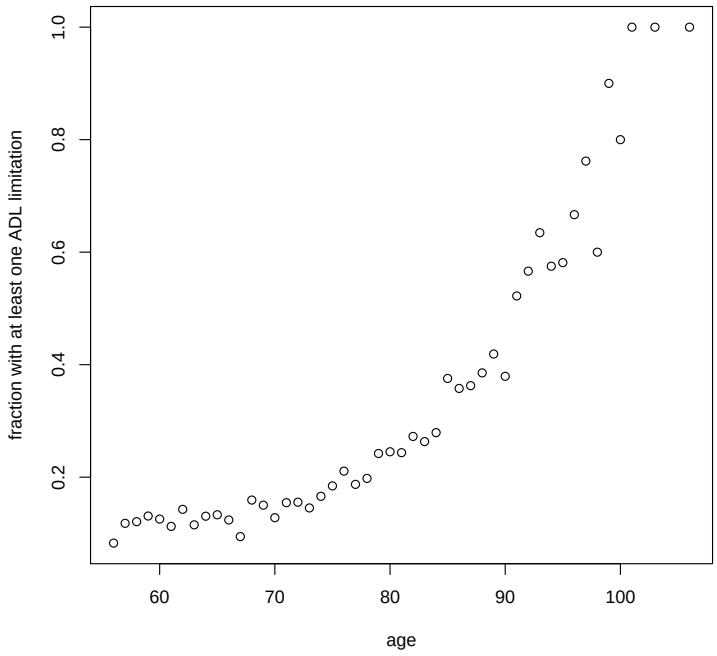


Figure 2: Age and Activities of Daily Living (ADLs) in the 2008 Wave of the Health and Retirement Study (RAND summary data). Top Panel: percentage of respondents with at least one ADL limitation. Bottom panel, mean number of ADL limitations.



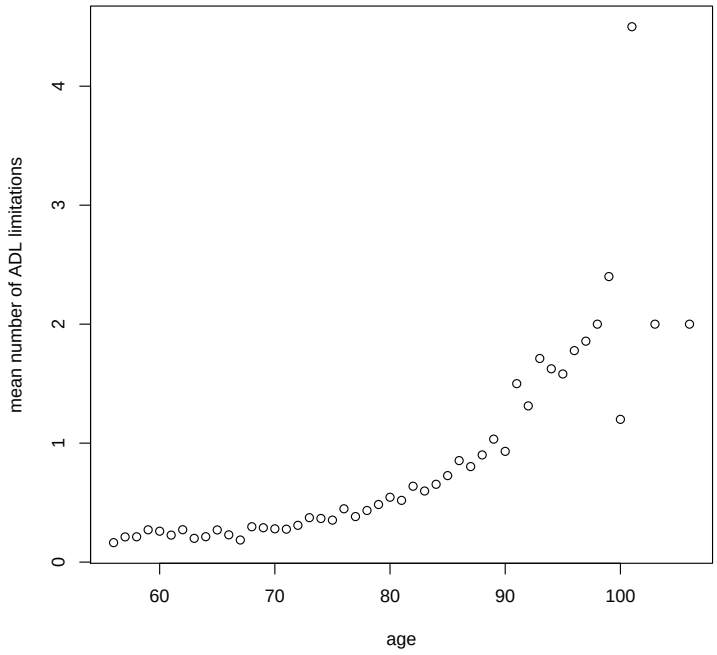
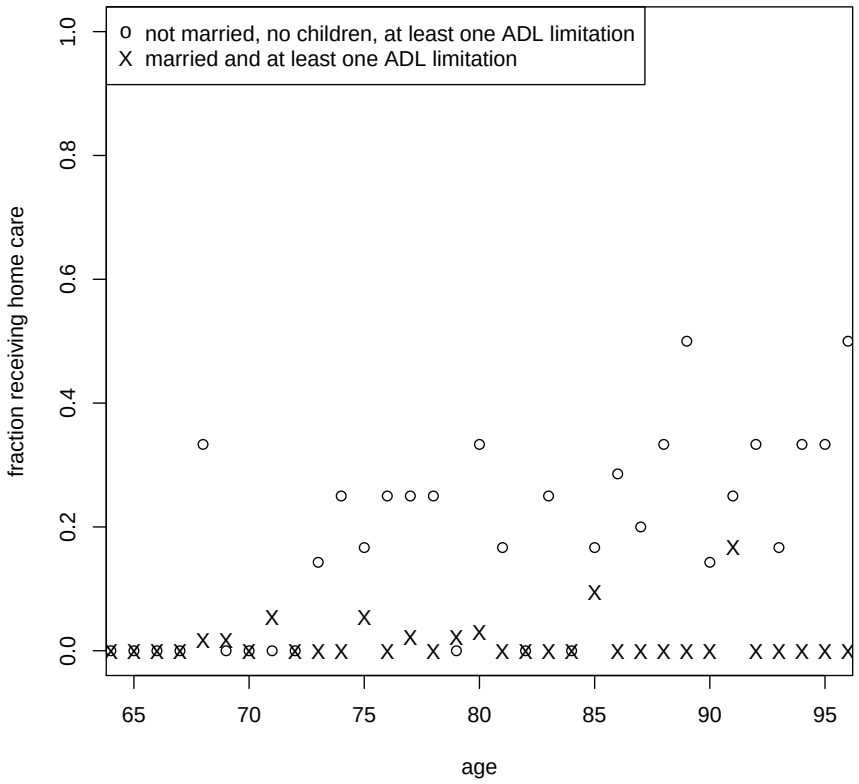


Figure 3: Fraction of Respondants With at least one ADL Limitation Living in a Nursing Home (top panel) or Receiving Home Health Care (bottom panel) by Age and Family Structure . 2008 Wave of the Health and Retirement Study



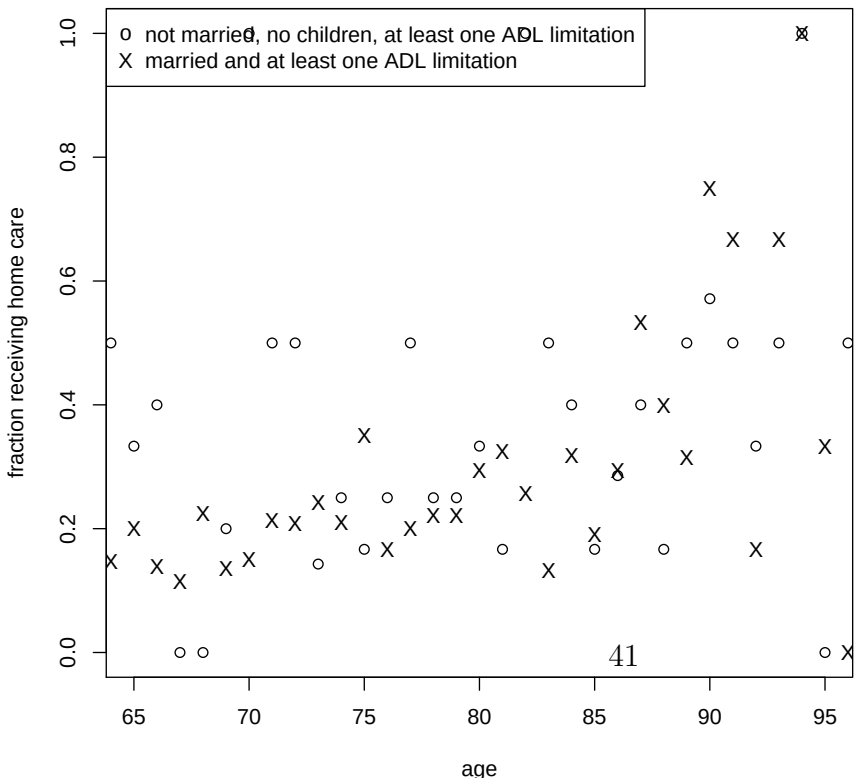
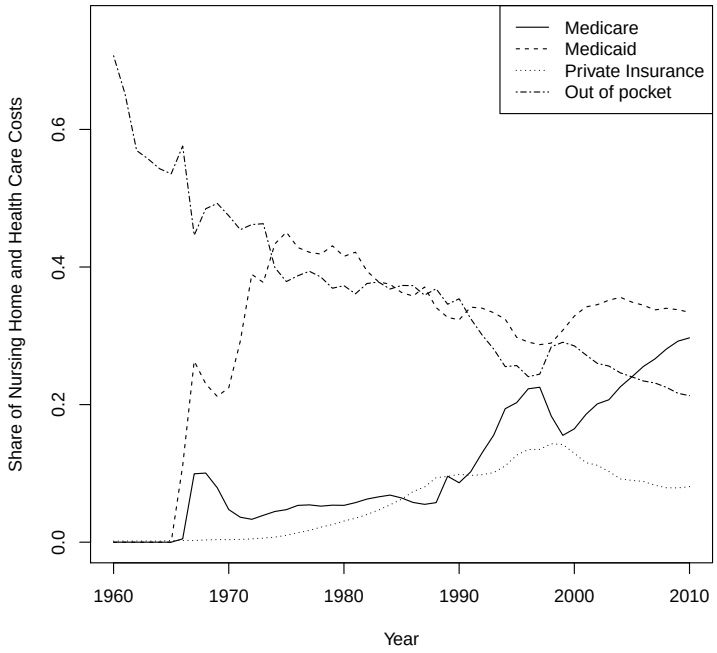


Figure 4: Top panel: Share of nursing home and home health care expenditures by source. Bottom panel: Real nursing home and home health care expenditures by source. US National Health Expenditure Data, deflated by US CPI for all goods.



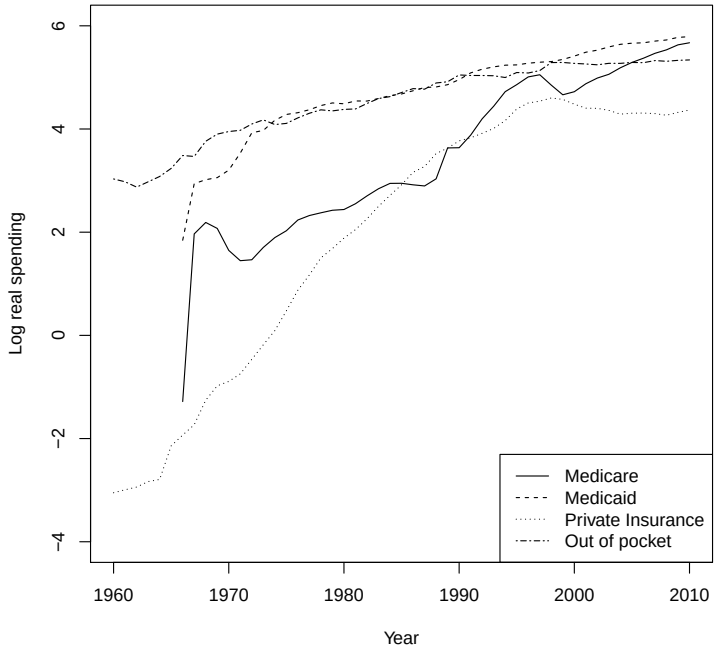


Figure 5: Fraction of respondents in the 4th Wave of the Health and Retirement Study (1998) surviving to the 9th wave (2008). Circles: no ADL limitations in Wave 4. "X": one or more ADL limitations in Wave 4.

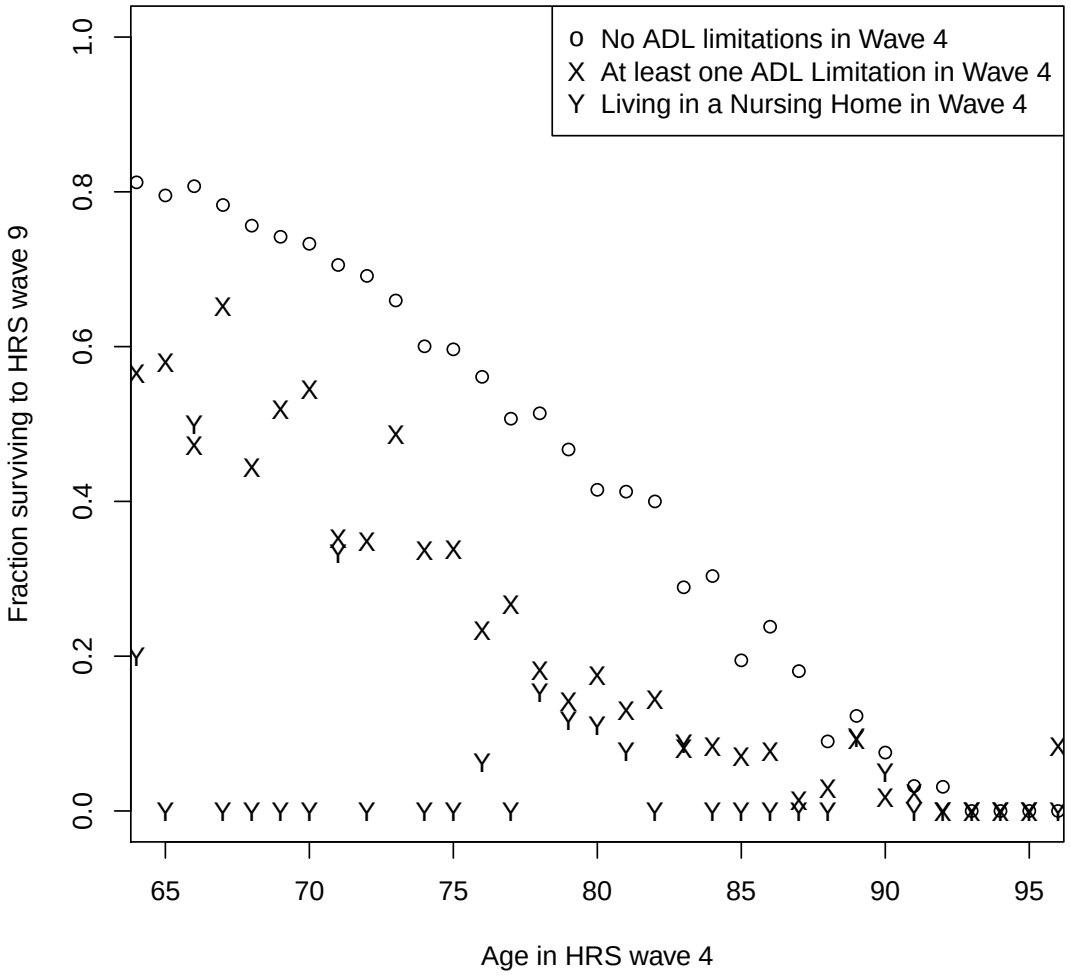


Figure 6:

Figure 1: Exit rates from homeownership at, and after first report of self or spouse living in a nursing home among those 62+ and alive in the HRS/AHEAD panel. "o" represents all 1998 homeowners who first entered a nursing home in 2006, "X" first entered a nursing home in 2004, "Y" first entered in 2002, and "Z" in 2000. 0 is the survey year of first report of living in a nursing home, e.g. 2006 for the "o" cohort.