The Interaction of Public and Private Insurance: Medicaid and the Long-Term Care Insurance Market

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Abstract: This paper shows that the even very incomplete public insurance can substantially crowd out private insurance demand. We examine the interaction of the public Medicaid program with the private market for long-term care insurance and estimate that Medicaid could explain the lack of private insurance purchases for about two-thirds of the wealth distribution even if there were no other factors limiting the size of the market. We also estimate that, for most individuals, Medicaid provides a very incomplete mechanism for smoothing consumption. Medicaid's large crowd out effect stems from the very large implicit tax (on the order of 60 to 75 percent for a median wealth individual) that Medicaid imposes on the benefits paid from private insurance policies. An implication of our findings is that public policies designed to stimulate private insurance demand will be of limited efficacy as long as Medicaid continues to impose this large implicit tax.

Key Words: Crowd-Out; Implicit Tax; Long-Term Care Insurance; Medicaid

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A long tradition in public finance examines how public programs can crowd out private activity in areas as diverse as education, savings, and insurance, among others. These studies typically focus on aggregate economic implications, particularly for government expenditures and national savings. In this paper, we demonstrate that crowd-out can also have an important effect on individual welfare. Specifically, we show that the provision of even very incomplete public insurance can crowd-out more comprehensive private policies by imposing a large implicit tax on private insurance benefits, thus potentially increasing overall risk exposure for individuals.

We examine the interaction of public and private insurance for one of the largest uninsured financial risks facing the elderly in the United States: long-term care expenditures. At $135 billion in 2004, long-term care expenditures represented over 8.5 percent of total health expenditures *for all* ages, or roughly 1.2 percent of GDP. Moreover, real long-term care expenditures are projected to triple over the next 35 years due to rising medical costs and the aging of the baby boomers. However, only 10 percent of the elderly have any private long-term care insurance, and one-third of expenditures are paid for out-of-pocket (Brown and Finkelstein 2004a, CBO 1999, CBO 2004).

One potential explanation for the small size of the private market is that the public insurance provided by Medicaid may crowd out demand for private insurance. Medicaid was designed to provide long-term care insurance for the poor elderly. Pauly (1989, 1990) has established the qualitative result that, as an incomplete but publicly funded source of long-term care insurance, Medicaid has the potential to substantially reduce demand for private long-term care insurance among the nonpoor. Our work builds on this insight by quantifying the magnitude of Medicaid's crowd out effect and the incomplete nature of Medicaid coverage. We also illustrate the mechanism behind Medicaid's crowd out effect and are therefore able to assess the likely impact of alternative policies on private insurance demand.

We develop a utility-based model of a 65-year old risk averse individual who chooses an optimal inter-temporal consumption path in the presence of uncertainty about long-term care expenditures. We calibrate the model using data on the distribution of long-term care expenditure risk, common state Medicaid rules, and the prices and coverage of typical private long-term care insurance policies.

We use the model to calculate the willingness to pay for a private insurance contract, defined as the dollar-denominated utility gain from following an optimal inter-temporal consumption path with private insurance relative to following an optimal inter-temporal consumption path without private insurance. Using this model, we present three principal findings.

First, our model suggests a quantitatively large crowd-out effect of Medicaid on private insurance demand. Given the current structure of Medicaid, we estimate that even if (contrary to fact) comprehensive private insurance policies were available at actuarially fair prices, about two-thirds of the wealth distribution still would not want to buy this insurance. This suggests that fundamental Medicaid reform is necessary for the private insurance market to expand considerably.

Second, we show that Medicaid's large crowd out effect stems from the combination of means-tested eligibility and its secondary payer status for individuals with private insurance. As a result of these two features, a large part of the premium for a private policy pays for benefits that simply replace benefits that Medicaid would otherwise have provided, a phenomenon that we label the Medicaid "implicit tax." For example, for the median wealth male (female), we estimate that 60 (75) percent of the benefits from a private policy are redundant of benefits that Medicaid would otherwise have paid. We also estimate that recent state and federal policies designed to stimulate private insurance demand are, in fact, poorly suited to reducing Medicaid's implicit tax, and therefore unlikely to have much effect on demand.

Third, we find that, because of its means testing, Medicaid provides an inadequate consumption smoothing mechanism for all but the poorest of individuals. As a result, we estimate that relative to having full insurance, the incomplete coverage provided by Medicaid results in a substantial welfare loss for most of the wealth distribution. For example, for the median wealth 65 year old, we estimate that the welfare gain associated with being able to buy an actuarially fair policy to top up the gaps in Medicaid's coverage would be equivalent to a 10 percent increase in their wealth. In contrast to Medicare, for which individuals can and do purchase private insurance to top up their public coverage, such top up policies are ruled out by Medicaid's design. Taken together, these findings suggest that a public insurance system can substantially crowd-out private insurance, even when the public insurance itself provides incomplete reductions in risk exposure.

The rest of the paper is structured as follows. Section two develops the analytical framework. Section three describes its parameterization, and Section four shows that the parameterized model produces results that are broadly consistent with aggregate data. Section five presents our main findings. Section six considers several important extensions to the baseline model. The final section concludes.

2. Analytical Framework

2.1 Estimating willingness to pay for private insurance

We consider a 65 year old with a stock of financial wealth and a predetermined stream of annuity payments (e.g., from Social Security) who each month chooses an optimal monthly consumption path to maximize remaining expected discounted lifetime utility subject to a budget constraint. The individual faces uncertainty about future long-term care expenditures and mortality. In particular, in each month (*t*) the individual may be in one of five possible states of care (*s*): at home receiving no care, at home receiving home health care, in residence in an assisted living facility, in residence in a nursing home, or dead. Expectations are taken over the probability of being in state of care *s* in month *t* ($Q_{s,t}$) and utility is discounted at the monthly time preference rate of ρ.

When alive, the individual derives utility from real consumption $C_{s,t}$. Following Pauly (1989, 1990), we also allow the individual to derive some consumption value from long-term care, such as from the provision of food or shelter that would otherwise need to be funded out of their income or wealth. We denote the consumption portion of long-term care expenditures by $F_{s,t}$. When the individual receives no care, $F_{s,t}$ is equal to zero, and utility is defined solely over ordinary consumption.

The consumer's problem is therefore:

$$\underset{C_{s,t}}{Max} \sum_{t=1}^{T} \sum_{s=1}^{5} \frac{Q_{s,t}}{(1+\rho)^t} \cdot U_s\left(C_{s,t} + F_{s,t}\right)$$

subject to three constraints: (i) an initial level of non-annuitized financial wealth, W_0, and a given trajectory of annuitized income, A_t, from Social Security; (ii) a no borrowing constraint (imposed to eliminate the possibility that the individual may die in debt), and (iii) a wealth accumulation equation. If the individual is not eligible for Medicaid, the wealth accumulation equation is:

$$W_{t+1} = \left(W_t + A_t + \min\left[B_{s,t}, X_{s,t}\right] - P_{s,t} - X_{s,t} - C_{s,t}\right) \cdot \left(1 + r\right) \tag{1}$$

Long term care insurance policies pay a benefit equal to the lesser of the per-period maximum benefit ($B_{s,t}$) and the actual costs incurred ($X_{s,t}$) Companies charge a monthly insurance premium ($P_{s,t}$) that is fixed in nominal terms and is paid only in states in which the individual is not receiving benefits. We convert all nominal features of the insurance policy to real terms for the analysis by assuming a 3 percent annual rate of inflation. When the individual has no private insurance, $B_{s,t}$=$P_{s,t}$=0. Unconsumed financial wealth accumulates at the real rate of interest r. Therefore, equation (1) indicates that wealth next period is simply wealth this period plus inflows (income and insurance payments) minus premium payments, care expenditures, and consumption, plus interest. Medicaid alters the form of the wealth accumulation equation, as described in the next subsection. The mathematical appendix provides the complete set of constraints, and shows how this expected lifetime utility function is translated into a recursive Bellman equation and solved, subject to constraints, using numerical techniques.

Using this framework, we can estimate how much a risk-averse life-cycle consumer would be willing to pay, over and above the required premiums, to purchase a particular long-term care insurance contract. To do so, we first calculate the maximum expected lifetime utility that can be achieved when the individual chooses his optimal consumption trajectory after purchasing a particular insurance contract. We then "take away" this insurance contract and find the increment to financial wealth such that, when the individual follows his new optimal consumption path, he achieves the same level of expected lifetime utility that he had when he was insured. This allows us to put a dollar value on the utility gains from insuring long-term care expenditure risk, which we refer to as the individual's "willingness to pay" for the insurance above and beyond the required premium payments. A positive (negative) value suggests that the ability to purchase the long-term care insurance contract is welfare enhancing (reducing). Our approach is modeled on the existing literature that calculates similar measures of the willingness to pay for annuities (e.g., Kotlikoff and Spivak 1981, Mitchell et al 1999, Davidoff et al., 2005).

It is worth noting that this model considers the utility maximization of an individual rather than a married couple. This approach is by far the norm in the consumption and insurance literature. This reflects several factors, including the fact that it avoids a large number of theoretical issues such as problems with preference aggregation (Samuelson, 1956), cuts down on the number of parameter assumptions for which there is little consensus in the literature (Hurd 1999), and dramatically improves the tractability of the model (e.g., by keeping track of 5 health states rather than 5^2=25 states.) However, our approach raises the possibility that demand for private insurance could be different for married households than for individuals. Having a spouse could increase the value that the household places on protecting assets while in care, thus potentially making private insurance more valuable. In addition, Medicaid allows a community-based spouse to retain more assets and income when one member of the couple enters a nursing home than an institutionalized individual is allowed on his own, which could increase the crowd-out effect of Medicaid. Finally, as discussed in Kotlikoff and Spivak (1981), the ability to engage in risk-sharing within couples serves as a partial substitute for formal insurance markets, which also reduces the value of private insurance. We discuss these issues in more detail in Brown and Finkelstein (2004b), where we show that under a particular model of household decision making, the latter two effects dominate, and we continue to find large crowd out effects and high implicit taxes for Medicaid.

2.2 Estimating the Medicaid implicit tax

Eligibility for Medicaid coverage of long-term care expenditures requires that when receiving care, the individual's income and assets each fall below a specified threshold. Medicaid's *marginal* contribution to long-term care costs switches from 0 to 100 percent as the individual crosses these thresholds, both of which must be newly met each month. Medicaid's income test requires that, after paying for all medical expenses (net of any payments made by a private insurance policy), the individual's income falls below the income threshold, which we denote $\underline{C}_s$. In other words, the income test requires $A_t + \min[B_{s,t}, X_{s,t}] + r^*W_{t-1} - X_{s,t} < \underline{C}_s$. Medicaid's asset test requires that, after paying all medical expenditures, an individual's financial wealth (W_t) falls below a threshold, which we denote $\underline{W}$.

If the individual is eligible for Medicaid, Medicaid pays an amount equal to:

$$X_{s,t} - \left(A_t - \underline{C}_s\right) - \min(B_{s,t}, X_{s,t}) - \max(W_t - \underline{W}, 0)$$

Using these relations, we can write the wealth accumulation equation that applies when receiving Medicaid as follows:

$$W_{t+1} = \left[W_t - \max(W_t - \underline{W}, 0) + \left(\underline{C}_s - C_t\right)\right]\left(1 + r\right) \tag{2}$$

To see the impact of the income threshold, suppose an individual has $1000 in income and that the income threshold is $30. Uninsured medical expenditures must be at least $970 before Medicaid will make any payments. Below $970, Medicaid pays nothing. Above $970, Medicaid pays 100 percent of marginal expenditures (assuming that the asset test is also met). To see the impact of the asset threshold, consider an individual who has no private insurance, $6,000 of financial wealth, and is in a nursing home that costs $5,000 per month. If $\underline{W}$=$2,000, the individual has to pay the first $4,000 of nursing home costs out of pocket to reduce his assets to $2,000, after which Medicaid would pay the remaining $1,000 of expenditures.

Private insurance does not disqualify an individual from Medicaid per se. However, private insurance reduces expected Medicaid expenditures for two reasons. First, by protecting assets against negative expenditure shocks, private insurance reduces the likelihood that an individual will meet Medicaid's asset-eligibility requirement. Second, Medicaid is by law a secondary payer. When the individual has private insurance, the private policy pays first, even if the individual's asset and income levels make him otherwise eligible for Medicaid; Medicaid then covers any expenditures not covered by the private policy. The combined effect of Medicaid's means testing and secondary payer status is that the net benefits from private insurance may be substantially less than the gross benefits.

We define Medicaid's "implicit tax" on private insurance as the proportion of the EPDV of benefits from the private policy that are redundant of benefits that Medicaid would otherwise have paid:

$$\text{Implicit Tax} = \frac{\Delta\,(\text{EPDV of Medicaid Expenditures})}{\text{EPDV(Gross Benefits from LTC Insurance Policy)}} \qquad (3)$$

The implicit tax thus captures the difference between the gross and net benefits from the private policy, as a percentage of the gross benefits. Estimation of the implicit tax requires solving the consumer's constrained dynamic optimization problem as both elements of the numerator – Medicaid expenditures in the absence and presence of a private insurance policy – depend on the individual's optimal consumption path, which determines his assets and income each month and therefore his Medicaid eligibility.

3. Model Parameterization

3.1 Transition Probabilities Across States of Care

As detailed in the Appendix, solving for the optimal consumption paths in our dynamic programming model requires that we use age- and gender-specific transition probabilities across all five states of care. It also requires that we be able to identify those episodes of care that would be eligible for insurance reimbursement, which is a function of the health of the individual. While there exist excellent published studies on nursing home utilization (see e.g. Dick et al. 1994, Kemper and Murtaugh, 1991, Murtaugh et al. 1997, and Society of Actuaries 1992), they do not characterize the full distribution of nursing home utilization – let alone the full set of transition probabilities across different types of care – and do not distinguish between insurance reimbursement-eligible and non-eligible care episodes.

To meet all of these requirements, we use an actuarial model of health and care transition probabilities that is widely used by insurance companies, regulators, and government agencies (Robinson, 2002). Brown and Finkelstein (2004b) provide more information on the data and estimation methods behind the actuarial model and show that, where there is overlap, the model produces comparable estimates to those in the literature. We consider only reimbursement-eligible care utilization, which means that the individual must satisfy the health-related "benefit triggers" used by Medicaid and the vast majority of private policies (Wiener et al., 2000, LIMRA 2002, Stone 2002). We adjust home health care expenditure risk downward to reflect that fact that Medicare, the nearly universal (and non means tested) public health insurance for the elderly, will cover a portion of home health care costs, whether or not the individual has private insurance; Brown and Finkelstein (2004a) provide more details of this adjustment. We estimate the model on the over 98 percent of 65 year olds who meet the health-related criteria for eligibility to purchase private insurance (Murtaugh et al. 1995, Finkelstein and McGarry, 2006). As is standard practice in both industry and academic research, the estimates do not incorporate any projected changes in morbidity or care utilization (see e.g. Tillinghast-Towers Perrin, 2002 and Wiener et al. 1994). Consistent with the empirical evidence (Society of Actuaries, 2002, Finkelstein and McGarry, 2006), we assume that care utilization is the same for the insured and the uninsured population; in Section 6.1 we consider an extension that allows for moral hazard effects of private insurance. We assume a maximum lifespan at 65 of 105 years, so that T=480 months.

Table 1 reports some summary statistics on the distribution of long-term care utilization from the model. They indicate a considerable right tail to this distribution, suggesting that insurance coverage may potentially produce large welfare gains. For example, although 73 percent of 65 year old men (and 54 percent of 65 year old women) will never enter a nursing home, of those who do, 12 percent of men (and 22 percent of women) will spend more than three years there.

3.2 Estimates of Current and Future Long-Term Care Costs ($X_{s,t}$)

The 2002 MetLife Market Surveys provide data on average national daily care costs for nursing homes and assisted living facilities, and the hourly costs of both skilled and unskilled home health care (MetLife 2002a, MetLife 2002b). The national average daily cost of nursing home care was $143 per day for a semi-private room and $72 per day for assisted living. To estimate home health care expenditures, we combine the hourly cost data in the MetLife Survey with the estimates from the actuarial model of the expected number of hours of skilled home health care and unskilled home health care used by individuals in home health care in each age-gender cell. Home care is substantially less expensive than either form of institutional care. We project forward the 2002 cost estimates based on the industry and academic consensus that costs will grow at the rate of real wage growth (Wiener et al., 1994, and conversations with industry officials), and the standard assumption of 1.5 percent annual real wage growth (e.g. Wiener et al., 1994, Abt, 2001).

3.3 Medicaid Thresholds ($\underline{W}, \underline{C}_s$)

We use the modal state income and asset thresholds in 1999 for a single individual. These require that for Medicaid to cover institutional costs, the individual must have exhausted all but $2,000 of his assets (i.e. $\underline{W} = \$2000$), and all but $30 per month of his income (i.e. $(\underline{C}_{alf}, \underline{C}_{nh}) = \$30$). These parameters – which are used by 35 states – are on the low end of the states' thresholds (AARP 2002). By choosing relatively restrictive parameters, we make Medicaid a less attractive substitute for private insurance and bias ourselves against finding a crowd-out effect of Medicaid. As noted, the asset threshold for married couples is substantially higher; see Brown and Finkelstein (2004b) for more details.

For home health care, the same asset test applies, but the income threshold ($\underline{C}_{hhc}$) is considerably higher, at $545 per month. Medicaid allows the individual to keep a higher level of income when in home care than in institutional care in order to meet day-to-day living expenses. Again, our choice is on the restrictive end of the spectrum. However, we may overstate the generosity of the Medicaid home health care benefit since, Medicaid home care benefits, although provided by all states, are not an entitlement the way that nursing home care is; states set enrollment caps and these may bind (AARP 2002). We discuss an extension to the model in section 6.2 designed to capture the fact that Medicaid may not always cover home health care – and that individuals may prefer receiving care at home to receiving it in an institution or foregoing care.

3.4 Other Parameters

We assume a common constant relative risk aversion (CRRA) utility function

$$U(C) = \frac{C^{1-\gamma}}{1-\gamma}$$

in all 4 living states $(U_s = U \;\forall\; s \neq \text{death})$, and we assume that the individual gets no utility from wealth bequeathed after death. Our main findings are robust to allowing for state-dependent utility across living states or for a bequest motive (Brown and Finkelstein, 2004b).We assume a coefficient of relative risk aversion (γ) of 3. This choice follows that made by a long line of simulation literature (including Hubbard, Skinner, and Zeldes 1995; Engen, Gale, and Uccello 1999; Mitchell et al 1999; and Scholz et al. 2006). However, in recognition of the disagreement in the literature over the value of γ (see e.g. Hurd (1989) for a lower estimate and e.g. Palumbo (1999) for a higher estimate), Brown and Finkelstein (2004b) show that our principal findings are robust to a wide range of higher and lower assumptions about risk aversion. Consistent with U.S. historical experience and standard assumptions in this same literature, we assume the annual real interest rate, discount rate, and inflation rate are each equal to 0.03.

For the real food and housing consumption value when in facility-based care (i.e. $F_{alf,t}$ and $F_{nh,t}$), we use the monthly amount ($515) that the Supplemental Security Income (SSI) program pays to a single, elderly individual in 2000. We choose this value since SSI is designed to provide a minimum subsistence level of food and housing. We assume no consumption value from home health care expenditures (i.e. $F_{hhc,t} = 0)$ since, unlike facility-based care expenditures, home health care expenditures do not substitute for food or rent that must otherwise be purchased.

The decision to allow for some consumption value from institutional care is relevant for the model's ability to match stylized facts about this market. Without any consumption value from institutional care, Medicaid limits one's consumption to the income threshold of $30 per month (or roughly $1 per day) and the asset threshold of $2,000. Correspondingly, we find that willingness to pay for private insurance would rise so that – contrary to fact – most of the wealth distribution would appear willing to purchase private insurance. Relatedly, the model would produce an unreasonably small Medicaid share of long-term care expenditures at about 30 percent, compared to about 50 percent in actuality (CBO, 2004) and 55 percent in our preferred specification; we discuss this calculation in more detail in Section 4. Moreover, on prima facie grounds, we do not consider it reasonable to assume that the individual is receiving no consumption value from institutional care, as the individual is in fact receiving the consumption value of modern shelter and three meals per day. By contrast, since the Medicaid income threshold in home care is substantially higher ($545 compared to $30), our results are not sensitive to the assumption of no consumption value from home health care ($F_{hhc,t}$ = 0).

Finally, we estimate the deciles of the wealth distribution based on a sample of individuals who are 65 in the 1996, 1998 or 2000 Health and Retirement Survey (HRS), and a definition of total wealth that is the sum of financial wealth (which excludes housing wealth and any annuitized wealth) and annuitized wealth. Annuitized wealth is defined as the sum of present discounted value Social Security benefits and defined benefit pension wealth, and is calculated using the Social Security and pension calculators in Coile and Gruber (2000). All wealth measures are computed on a household basis, and converted to individual wealth levels using an assumed equivalence scale of 1.25. [1]

4. Baseline Willingness to Pay Estimates for Current Policies

The model and parameterization just described produces willingness to pay estimates that are broadly consistent with the empirical ownership patterns for long-term care insurance. It also produces an average Medicaid share of long-term care expenditures that is consistent with aggregate statistics. The ability to match these moments in the data increases our confidence in our modeling and parameter assumptions.

We consider the willingness to pay for the typical long-term care insurance policy purchased in 2000. This policy covers all three types of care with no deductible and a constant nominal maximum daily benefit of $100; expenditures above the benefit cap are paid for by Medicaid if the individual is Medicaid eligible, and otherwise are paid for out of pocket. We assume the policy is sold at current market loads, which we define as 1 – (EPDV benefits / EPDV premiums). Brown and Finkelstein (2004a) estimate that current market loads are 0.50 for men, and -0.06 for women. This indicates that, on average, the policy pays 50 cents in EPDV benefits for every dollar in EPDV premiums paid by a man, and $1.06 in EPDV benefits for every dollar paid by a woman. Loads are substantially higher for men than women because premiums are the same by gender but, as seen in Table 1, women have substantially higher expected utilization.

[1] We are extremely grateful to Courtney Coile and Josh Rauh for help in constructing these wealth estimates.

Figure 1 shows the results separately for men and women at each wealth decile. For a male (female) at the median of the wealth distribution, willingness to pay is -11,400 (-11,500) over and above the required premiums. This indicates that if the individual purchased the policy, it would reduce his welfare by the same amount as a loss of $11,400 (or $11,500) in financial wealth or, equivalently, a loss of about 5 percent of the individual's total wealth of approximately $222,500. Willingness to pay becomes positive at the 70th percentile of the wealth distribution for men and the 60th percentile for women. This is broadly consistent with the small portion of the elderly who purchase insurance.

Willingness to pay is not systematically higher for women than for men, despite the substantially higher load for men (0.50 vs. -0.06). This is consistent with the similar coverage rates by gender observed in the data, a finding that cannot be explained simply by a high within-household correlation in demand (Brown and Finkelstein 2004a, HIAA 2000). We will show below that the structure of Medicaid is an offsetting factor that decreases willingness to pay for women more than for men and resolves this ostensible puzzle. More generally, the finding that willingness to pay is negative for women for most of the wealth distribution *despite* prices that are lower than actuarially fair (i.e. negative loads) is suggestive of a role for Medicaid in constraining demand.

Willingness to pay rises monotonically with wealth. This is again consistent with the empirical distribution of insurance coverage (Brown and Finkelstein, 2004a, HIAA 2000) but is hard to explain in the absence of Medicaid, since all else equal CRRA utility implies that willingness to pay to insure a given absolute loss should be decreasing with total wealth. We show below how the structure of Medicaid makes private insurance more appealing to wealthier individuals.

Medicaid expenditures are determined in the model by individuals' life cycle consumption choices, which in turn affect their Medicaid eligibility. On average across the wealth distribution, our model predicts that 55 percent of EPDV long-term care expenditures are paid by Medicaid. This is broadly consistent with the Congressional Budget Office (2004, Table 1-2) estimates that about half of long-term care expenditures in 2004 were paid by Medicaid.[2]

5. The Impact of Medicaid

5.1 The Medicaid crowd-out effect

The results in Figure 1 contain several suggestions of a crowd out effect of Medicaid. However, demand may also be affected by the features of current policies. The $100 constant nominal daily benefit cap covers less than half of the EPDV of long-term care expenditures (Brown and Finkelstein, 2004a). Moreover, at least for men, the substantial load on the contract may limit demand.

In order to isolate the effect of Medicaid from whatever private market failures might contribute to these high loads and limited benefits, Figure 2 reports the willingness to pay for a counterfactual private insurance contract that provides fully comprehensive coverage (i.e. no daily benefit cap) at actuarially fair prices (i.e. zero loads). In comparison to Figure 1, we see that willingness to pay rises for men at all wealth deciles, consistent with the fact that the premium paid per dollar of expected benefits has been cut in half (i.e. the load has declined from 0.50 to 0). For women, the premium has increased slightly (the load has increased from -0.06 to 0), but the main effect is the change from a $100 daily benefit cap to an unlimited policy. At low levels of wealth, where women did not want to buy a limited policy, the willingness to pay drops further, as they are now being forced to buy even more of a product they do not want. At higher wealth levels, where willingness to pay was already positive, willingness to pay tends to rise further since they now have access to more of the product that they want.

The results in Figure 2 are striking and represent a key finding of our paper: *even if we were to eliminate all potential market failures and make fully comprehensive policies available at actuarially fair prices, much of the population would still be unwilling to pay for these policies in the presence of Medicaid*. Indeed, willingness to pay does not become positive until the 60th percentile of wealth for men

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[2] We compute the average Medicaid share in our model based on the estimates in Table 2 of Medicaid's share of long-term care expenditures (by gender) at each wealth decile with and without private insurance, and the estimates from Figure 1 of which deciles (by gender) would buy private insurance. We exclude Medicare expenditures from the denominator of the CBO estimate to make it comparable to our estimate. Medicare-covered institutional care does not meet the definitions for reimbursable care (by either Medicaid or private insurance), and Medicare-covered home care is, as discussed, already taken out of our denominator.

and the 70th for women. Thus our results suggest that, even absent any market failures, Medicaid is capable of explaining the lack of private insurance purchases for the bottom two-thirds of the wealth distribution. A related implication is that correcting whatever supply-side market failures exist in the private insurance market would not induce most individuals to purchase this insurance.

5.2 Why Does Medicaid Crowd-Out Private Insurance: Medicaid's Implicit Tax

We estimate that Medicaid's implicit tax is substantial and that accounting for it sheds light on the low overall demand for private insurance, as well as the purchase patterns by gender and wealth seen in both the data and our model. These results are summarized in Table 2. A comparison of columns 1 and 2 shows that ownership of the $100 daily benefit policy substantially reduces expected Medicaid expenditures. For example, at the median of the wealth distribution, Medicaid's share of EPDV expenditures falls for men from 60 percent without insurance to 32 percent with insurance; for the median wealth woman, Medicaid's share falls from 72 percent without insurance to 38 percent with insurance. Combining these two columns, column 3 indicates that the implicit tax – which measures the extent to which private insurance is redundant of benefits that Medicaid would otherwise have paid –is quite high, particularly at the lower end of the distribution. For example, at the first decile, the implicit tax is close to 100 percent, meaning that the individual is paying premiums for a policy that provides virtually no net benefits. Even for the median male (female), three-fifths (three-quarters) of the EPDV of expenditures from the private policy are redundant of expenditures that Medicaid would have otherwise covered. The implicit tax declines with wealth, as wealthier individuals' expenditures are less likely to be eligible for Medicaid coverage; this explains why we find that willingness to pay increases with wealth.

The measure of the load we have used thus far (1 – EPDV benefits / EPDV premiums) is an accurate measure of the load from the perspective of the insurance company, which must pay benefits irrespective of whether they are redundant of what Medicaid would otherwise have paid. However, as a result of the implicit tax, this "gross load" understates the effective, or net, load from the consumer's perspective. We calculate the net load by omitting any benefits paid by the private policy that simply replace what Medicaid would have paid had the person not been insured:

$$\text{Net Load} = 1 - \frac{\text{EPDV(Benefits) - (EPDV Mcaid Expend w/o Private Ins - EPDV Mcaid Expend w/ Private Ins)}}{\text{EPDV(Premiums)}} \tag{4}$$
$$= \text{Gross Load} + \frac{\Delta\ \text{(EPDV Medicaid Expenditures)}}{\text{EPDV(Premiums)}}$$

The fourth column of Table 5 reports our estimates of this net load, which are much higher than the gross loads. For example, for the median male (female), we estimate a net load of 0.80 (0.75), compared to a gross load of 0.50 (-0.06). This explains why even at prices that are lower than actuarially fair from the company's perspective, so few women wish to purchase private insurance. The greater similarity in the net load than the gross load by gender also helps explain why men and women purchase insurance coverage in roughly equal proportions, despite facing such different gross loads. The net load rises more from the gross load for women than for men because women have higher expected long-term care expenditures (see Table 1); therefore, for a given wealth level, in the absence of private insurance, a higher proportion of their expenditures would have been covered by Medicaid (see Table 2, column 1).

5.3 Medicaid as incomplete insurance

Medicaid's income and asset eligibility requirements restrict an individual's ability to engage in optimal consumption smoothing across care states and over time. When an individual is receiving Medicaid-financed care, means testing limits the resources available for non-care consumption. It also limits the wealth out of which the individual can consume if he recovers and exits from care, which is not uncommon (see Table 1 and also Dick et al., 1994). As a result, we estimate that Medicaid leaves all but the poorest of individuals exposed to substantial out of pocket expenditure risk.

The first column of Table 2 illustrates the comprehensiveness of Medicaid coverage by showing the fraction of total long-term care expenditures Medicaid will cover if the individual does not have private insurance. It indicates that Medicaid achieves its intention of providing close to comprehensive insurance for the poor. For example, for individuals below the 1st wealth decile, Medicaid covers almost 100 percent of expenditures. However, it also shows that the fraction of expenditures covered by Medicaid is substantially below 1 for most of the rest of the wealth distribution. For the majority of the nonpoor, our analysis indicates that Medicaid has the unintended consequence of reducing private insurance demand (see Figure 1) while providing far from complete insurance (see Table 2, column 1).

The last column of Table 2 provides an estimate of the welfare loss associated with incomplete Medicaid coverage relative to having full insurance coverage. We calculate this welfare loss by finding the value, in dollar terms, of the individual's utility gain if he or she were provided with a free comprehensive policy instead of Medicaid, and subtracting off from this gain the incremental cost of providing such a policy relative to existing Medicaid expenditures; this incremental cost is simply the EPDV of total medical expenditures covered by the comprehensive policy minus the EPDV of current Medicaid expenditures. Our approach is analogous to calculating the unrealized welfare gain from an individual's inability to purchase an actuarially fair insurance policy to top up the gaps in Medicaid coverage, without incurring any implicit tax on the benefits provided. Medicaid's current design does not allow for such top up policies, and our analysis therefore provides a gauge of the resultant welfare loss.

The results suggest that the welfare loss is substantial. Nearly the entire wealth distribution would find it welfare enhancing to be able to pay the actuarial cost to top up Medicaid coverage. For the median male (female), the welfare gain associated with buying an actuarially fair policy that transforms Medicaid into a full insurance policy is equivalent to an increase in their financial wealth of nearly $20,000 ($30,000), or about 10 percent of their total wealth. Moreover, in results not shown, we estimate that even if men had to face current market loads of 0.50 for this supplemental coverage, even the 40th percentile male would have a positive welfare gain for a top up policy. Of course, this welfare analysis ignores the general equilibrium effects of increased insurance coverage on long-term care expenditures via moral hazard effects. In Section 6.1 we extend the analysis to allow for moral hazard effects of private insurance and show that these can, indeed, lower the net welfare gain from insurance coverage, although the gain from being able to top up Medicaid remains substantial.

5.4 Implications for total insurance coverage

We have estimated that Medicaid crowds out private insurance demand despite providing incomplete coverage. If most individuals would purchase comprehensive private insurance in the *absence* of Medicaid, it may therefore reduce total (public plus private) insurance coverage. This is the case in our baseline model, and can be seen without solving the dynamic programming problem. At actuarially fair prices, simple expected utility theory says that in our model all individuals would purchase insurance in the absence of Medicaid. The same holds for all women at current market loads, since these are better than actuarially fair. Moreover, we estimate that most men would also purchase at current market loads. In the absence of Medicaid, the minimum amount of financial wealth necessary to avoid the possibility that long-term care expenditures could completely exhaust one's resources is $1.55 million; this represents the amount needed in the unlikely "worst case" outcome that an individual enters a nursing home at age 65 and remains in it until death at the maximum age of 105. As a result, any male with financial wealth of less than $1.55 million – which is approximately double our estimate of total wealth at the 90th percentile of the distribution – would purchase insurance in the absence of Medicaid to eliminate the possibility of exhausting his wealth and thus having zero consumption in some states of the world (which, with CRRA preferences, would result in negative infinite disutility).

A concern with the foregoing analysis is that it may be driven by two assumptions: that marginal utility of consumption becomes infinite as consumption goes to zero and that, in a world without Medicaid, there would be no other payers-of-last resort to prevent an individual's consumption from getting that low. Both of these assumptions serve to increase willingness to pay for private insurance in the absence of Medicaid. We have therefore verified that our finding that most individuals would purchase private insurance in the absence of Medicaid – but not under the current Medicaid system – is robust to alternative modeling approaches that do not have this feature. In one alternative model, we replaced the CRRA utility function with a CARA utility function; thus we can allow utility to remain defined even when medical expenditures exceed available resources. We set the coefficient of absolute risk aversion equal to γ/C^* where γ is the coefficient of relative risk aversion and C^* is the annuitized value of total wealth for households at a given decile of the wealth distribution. In another alternative model, we maintained the CRRA utility assumption but assumed that family members or private charities would step in to bound consumption away from zero in a counterfactual world without Medicaid. Consistent with the empirical evidence, we assume that these private welfare alternatives would be smaller scale than the public transfer program. Specifically, we assume that in the absence of Medicaid, family members or private charities would provide medical care to individuals whose assets and income fall below 10 percent of the level used by the Medicaid program, and that institutional care financed this way would provide consumption value (F) at 10 percent of the usual level. The interpretation is that charity would cover the medical care, but would be only 10 percent as generous on other margins.[3]

In both alternative models, we continue to find that, in the absence of Medicaid, most individuals would purchase private insurance. For example, if we assume a world without Medicaid but with the type of private charity care described above, we estimate that willingness to pay for comprehensive actuarially fair insurance would be positive for men throughout the wealth distribution and for women at some point above the first decile, so that more than 80 percent of the elderly would buy private insurance.

Within our model, therefore, we estimate that Medicaid reduces total insurance coverage. However, we emphasize that this conclusion is subject to an important caveat: Our model abstracts from a number of other factors that might limit private insurance demand in the absence of Medicaid. For example, it is possible that some or all individuals are not fully rational and forward looking, and that such individuals would not buy private insurance in the absence of Medicaid even if it were rational to do so. In addition, because of private market failures such as asymmetric information, the private insurance contracts offered in the absence of Medicaid might look substantially different – and perhaps less appealing – than those offered in the current equilibrium. Whether or not elimination of the Medicaid implicit tax would be sufficient to stimulate substantial private insurance demand depends crucially on these and other factors that are beyond the scope of the current paper. The primary conclusion of this paper is that such Medicaid reform is a *necessary*, but not necessarily sufficient, condition for substantial demand for comprehensive private insurance coverage.

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[3] Because we are assuming that the private charity pays for all of one's medical expenses, our model of private charity care is substantially more generous than what is likely to be the case in reality, which biases us against finding large private insurance demand. For example, Gruber and Hungerman (2005) estimate that charitable church spending was only 10 percent of the subsequent level of New Deal spending and Cox and Jakubson (1995) simulation estimates suggest that if all government spending to low-income families were eliminated, family transfers would replace only a small fraction of government spending.

5.5. Public Policy Interventions, the Medicaid Implicit Tax and the Demand for Private Insurance

Our model also allows us to explore the likely impact of recent public policy interventions designed to stimulate private insurance demand. We estimate that these reforms will have little effect on Medicaid's implicit tax and, therefore, on insurance demand. For example, a 1996 Federal tax reform made employer-provided long-term care insurance exempt from employee taxable income (Wiener et al., 2000). Under the generous assumptions that the employer pays the entire premium and that the incidence of the subsidy is fully on the employee, this could reduce the (gross) load on the policy for a median wealth male from 0.50 to 0.17, and for a median wealth female from -0.06 to -0.76.[4] Despite this substantial reduction in the (gross) load, we estimate that willingness to pay for insurance remains negative for the median male and female. This is because the tax subsidy does little to reduce Medicaid's implicit tax. Thus the net load remains high, falling only from 0.80 to 0.67 for the median wealth male (and from 0.75 to 0.59 for the median wealth female). Moreover, the fact that marginal tax rates (and thus the tax subsidy) increase with wealth while the implicit tax decreases with wealth indicates the difficulty in using tax deductions to reduce the implicit tax.

Several states have experimented with reforming Medicaid to make the asset eligibility thresholds less stringent if the individual purchases private insurance. For example, a New York policy eliminates Medicaid's asset test for individuals who purchase a minimum specified amount of insurance (Weiner et al., 2000). We estimate that this only reduces the median male's implicit tax from 0.59 to 0.45, and only raises the median male's willingness to pay at current market loads from -$11,400 to -$8,200. The implicit tax remains high despite the relaxation of Medicaid's asset test because Medicaid remains a secondary payer; the reform makes individual more likely to be eligible for Medicaid, but their private insurance still pays first. Consistent with these findings, only a handful of private insurance policies have been sold to individuals through these state-run reform programs (Wiener et al., 2000). This is also broadly consistent with the empirical evidence in Brown, Coe and Finkelstein (2006) that variation in the

[4] This is calculated using the formula from Gruber and Poterba (1994) and assuming a payroll tax of 7.65% on both the employer and employee and a 27.5% marginal tax rate on income.

Medicaid asset eligibility threshold has a statistically significant but economically small effect on demand for long term care insurance.

To eliminate the implicit tax, it is necessary to structure the Medicaid program so that the EPDV of Medicaid payments are not reduced when the individual buys private insurance. We estimate that eliminating one but not both of the two features that produce the implicit tax – Medicaid's means testing and secondary payer status – has little effect by itself on the implicit tax, and hence on willingness to pay for private insurance. As long as Medicaid remains means tested, private insurance, by protecting assets, reduces the probability of being eligible for Medicaid. As long as Medicaid remains a secondary payer, private insurance benefits reduce Medicaid benefits one-for-one, even if eligible for Medicaid.

A policy that would eliminate the implicit tax would be to allow individuals who purchase private insurance to receive a refundable tax credit equal to the EPDV of the Medicaid benefits replaced by the private insurance. In practice, such a policy would be difficult to implement. The amount of the tax credit would need to vary based on wealth and expected care utilization, since both affect expected Medicaid benefits. Both can be difficult for the government to observe accurately, raising concerns that the policy could generate adverse selection out of the public program.

6. Extensions to Baseline Model

We explore three extensions to our baseline model to capture important features of the consumer problem which the baseline model abstracts from. These are, respectively, moral hazard effects of private insurance, Medicaid aversion, and strategic asset transfers to family members. The results provide interesting insight into how such features might affect the demand for private insurance and the comprehensiveness of Medicaid. They also show that our core findings continue to hold under a wide range of alternative assumptions.

6.1 Moral hazard effects of private insurance

Our baseline model assumes that the transition probabilities across different states of care are the same regardless of whether the individual has private insurance. It thus ignores any potential moral hazard effects of private insurance. Empirically, the evidence suggests that long-term care insurance may increase home health care use by individuals who would otherwise have been out of care, but does not induce individuals to move from nursing homes to home care; Weissert et al. (1988) provide a review of the evidence. Based on this review, we assume that if the individual has private insurance, the EPDV of lifetime home health care expenditures increases by 80 percent, with a corresponding decline in the time the individual spends at home receiving no care. This has the effect of increasing the EPDV of long-term care expenditures for men – and correspondingly the premiums on private insurance – by $2,200, or about 12.5% of the premium for a comprehensive, actuarially fair private policy.

Moral hazard increases willingness to pay for insurance in partial equilibrium, since it allows the individual to move to a state that provides higher utility, but decreases willingness to pay in general equilibrium, since it increases premiums for private insurance by more than the individual values the new consumption. We model this by assuming that every dollar of expenditures on home health care that is the result of moral hazard provides the individual with the consumption value of the unskilled component of this care, or about three-fifths of the total increase in expenditures. For a male at the median of the wealth distribution, we find that the willingness to pay for a comprehensive, zero load policy falls from -$2,700 in our baseline specification with no moral hazard (see Figure 2), to -$4,300 when we allow for moral hazard. The Medicaid implicit tax remains large For example, for the median male, it is 0.59 without moral hazard and only falls to 0.53 when we allow for moral hazard. Similarly, the willingness to pay to top up Medicaid remains large, falling slightly from $19,600 with no moral hazard to $19,500 with moral hazard.

6.2 Privately-financed care superior to Medicaid-financed care

Our baseline model implicitly assumes that Medicaid-financed long-term care is a perfect substitute for privately-financed care. This may be an overly generous assumption about Medicaid for several reasons. Private insurance may pay for some types of care that Medicaid does not cover. For example, as noted above, Medicaid coverage of home care is capped in many states. Therefore an individual who needs home health care but lacks the private resources to pay for it may have to forgo this care and potentially suffer negative health consequences, or may have to go into a less appealing setting (e.g., a nursing home) to receive care. Moreover, some nursing homes may not accept Medicaid patients, so that an individual without private insurance may end up in a worse nursing home. They may also receive lower quality care than privately-funded payers within a given nursing home. The empirical evidence on this issue is decidedly mixed, with some studies finding no quality differential between Medicaid-financed and privately-financed care, and others finding non-trivial differences (Norton 2000 provides a review of this evidence). However, even if the quality of care received is the same, if individuals believe the quality of care is worse, or feel some stigma associated with Medicaid receipt, the quality of the *experience* may be worse when financed by Medicaid. Consistent with this, the empirical evidence suggests that individuals prefer to avoid Medicaid when receiving long-term care (Ameriks et al., 2005, Norton 1995).

We therefore extend our model to incorporate these various possibilities in a reduced form way. We allow individuals to receive greater consumption value from care when this care is privately financed than when it is covered by Medicaid. This extension captures the idea that an individual may prefer privately-financed care because it allows her to receive the needed care at home rather than an institution, because it gives her access to higher quality care, or because it allows her to avoid any stigma associated with Medicaid receipt.

Specifically, we redefine the arguments of the utility function so that it is now defined as:

$$U\left(C_{s,t} + I_{s,t}^{M} \cdot F_{s,t} + \left(1 - I_{s,t}^{M}\right) \cdot \alpha_s \cdot F_{s,t}\right)$$

where $I_{s,t}^{M}$ is an indicator variable equal to 1 if the individual is on Medicaid, and zero otherwise. Therefore $\alpha_s \geq 1$ captures the higher consumption value of care when that care is paid for by private, rather than public, resources. This modeling approach is similar to the "flat" stigma effect of welfare found by Moffit (1983); individual receives the lower value of care just by being on Medicaid, regardless of the fraction of expenditures Medicaid reimburses.

This has very little effect on our main findings. For example, even if we allow the consumption value of entirely privately-financed care to be double the consumption value when on Medicaid $(\alpha_s = 2)$, the median wealth male's willingness to pay for comprehensive actuarially far insurance only rises from -$2,700 in our baseline model, in which the consumption value of care is the same regardless of the financing source ($\alpha_s = 1$), to -$1,900.Our estimate of Medicaid's implicit tax changes only imperceptibly, while willingness to pay to top up Medicaid increases, reflecting the increased welfare loss from foregoing private insurance coverage. Of course, in principle it is possible to set the consumption value of privately-financed care even higher relative to that of Medicaid, and thus further increase willingness to pay for private insurance. This would, however, contradict the evidence of low private insurance coverage and of a relatively high (about 50 percent) Medicaid share of total long-term care expenditures.

6.3 Willingness to pay for private insurance when strategic asset transfers are permitted

Our baseline model may overstate the stringency of Medicaid's means testing, as it does not allow individuals to hide any of their assets from Medicaid by transferring them to a spouse or a child. In order to make such asset transfers more difficult, state Medicaid programs impose a 3 to 5 year look back period on assets (Stone, 2002). The fact that one-third of long-term care expenditures are paid for out of pocket suggests that there are limits to individuals' opportunities to "game" the Medicaid system. One reason may be the inability of most families to commit to and enforce implicit contracts to return the money to the parents if needed, which may be responsibility more generally for the low levels of inter-vivos transfers at all but the extreme right tail of the wealth distribution (Poterba, 2001). Indeed, there is some evidence that the direction of transfers goes the other way, with individuals in nursing homes receiving transfers from family members in order to avoid Medicaid (Norton, 1995).

Nonetheless, it is likely that some amount of asset-hiding takes place, and concerns about this behavior have motivated recent Congressional legislation which extended the look back period (U.S. House of Representatives 2006). To gauge the potential impact of asset-hiding, we investigated what would happen if an individual could hide some fraction of his accumulated wealth at age 65 from Medicaid, without losing access to consuming this wealth. Not surprisingly, we find that the ability to hide assets makes Medicaid a much more desirable substitute for private insurance, as it effectively reduces the means test. Thus, it increases the crowd-out effect of Medicaid.

For example, we considered the impact on our findings of assuming that an individual can hide 25 percent of his wealth at 65 from Medicaid. This is likely an overly generous assumption about the amount of assets an individual can hide. With this assumption, Medicaid's estimated share of long-term care expenditures increases to three-quarters, which is substantially above its actual share of about 50 percent (CBO, 2004) and the estimated share in our preferred specification of 55 percent. We find that the median male's willingness to pay for actuarially fair comprehensive insurance falls to $12,100, from -$2,700 in the base case with no strategic asset transfers. Allowing for strategic transfers also makes the implicit tax larger since, by making means testing effectively less stringent, strategic transfers increase the proportion of expenditures Medicaid would cover in the absence of private insurance. For example, the implicit tax for the median male rises from 0.59 in the base case with no transfers to 0.69 if we allow for transfers of 25 percent of wealth. Of course, by the same token, allowing for strategic transfers also makes Medicaid more comprehensive insurance. In the limit, were individuals able to hide all of their wealth from Medicaid, Medicaid crowd out would be 100 percent, but Medicaid would be fully comprehensive. However, we find that even at relatively large levels of strategic transfers, the welfare gains from being able to top up Medicaid remain large. For example, if the median wealth male is able to hide 25 percent of his assets from Medicaid, his willingness to pay to top up Medicaid is $9,200; while this is substantially less than the $19,600 in the base case, it represents a welfare gain equivalent to a 4 percent increase in total wealth at age 65.

7. Conclusions

This paper has examined the magnitude and mechanism by which Medicaid affects demand for private long-term care insurance. We do so by developing and calibrating a risk averse individual's willingness to pay for private insurance in a stochastic, dynamic life cycle model. We have three main findings. First, given the presence of Medicaid, the bottom two-thirds of the wealth distribution would not want to purchase private insurance *even if it were available at actuarially fair prices*. Second, the crowd out effect of Medicaid stems from the implicit tax it imposes on private insurance policies, on the order of 60 to 75 percent for the median wealth individual. Third, Medicaid provides far from comprehensive insurance for all but the poorest of individuals. For example, for the median wealth individual, we estimate that the welfare loss associated with Medicaid's incomplete coverage relative to comprehensive coverage is equivalent to about 10 percent of total wealth. Our findings thus indicate that public insurance can substantially crowd-out private insurance, even when the public insurance provides only limited coverage against risk exposure.

Our findings also suggest that reforms that substantially reduce or eliminate Medicaid's implicit tax are necessary conditions for stimulating the private market. We do not, however, make the stronger claim that reductions in Medicaid's implicit tax would be *sufficient* to substantially increase private coverage. There may be other factors limiting demand that are not in our baseline model, such as individual myopia (as in Feldstein,1985) or the potential to rely on support for one's children (as in Pauly,1990). In addition, it is unclear how the private market would be affected by Medicaid reforms, given the evidence of market failures such as asymmetric information (Finkelstein and McGarry, 2006), incomplete commitment in contracting (Finkelstein et al., 2005), and non-diversifiable risks (Cutler, 1996). In light of our findings, we consider the likely consequences of major Medicaid reform an important area for future research.

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Table 1: Descriptive Statistics of Care Utilization for 65 year old, from Robinson Model

Type of Care		Prob Ever Use	Average Age of First Use	Among Users: Average Years in Care	Prob use > 1 year	Prob use > 3 years	Prob use > 5 years	Prob ever leave care alive	Avg # of spells
Nursing Home	Men	0.27	83	1.3	0.33	0.12	0.05	0.65	1.28
	Women	0.44	84	2.0	0.42	0.22	0.12	0.66	1.39
Assisted Living	Men	0.12	82	0.58	0.16	0.04	0.01	0.90	1.18
	Women	0.20	85	0.48	0.13	0.04	0.01	0.93	1.26
Home Health Care	Men	0.29	79	1.9	0.52	0.22	0.09	0.67	1.45
	Women	0.35	81	2.3	0.52	0.28	0.15	0.77	1.68
Any Care	Men	0.40	80	2.9	0.77	0.37	0.17	0.33	1.20
	Women	0.54	82	4.2	0.85	0.53	0.31	0.35	1.27

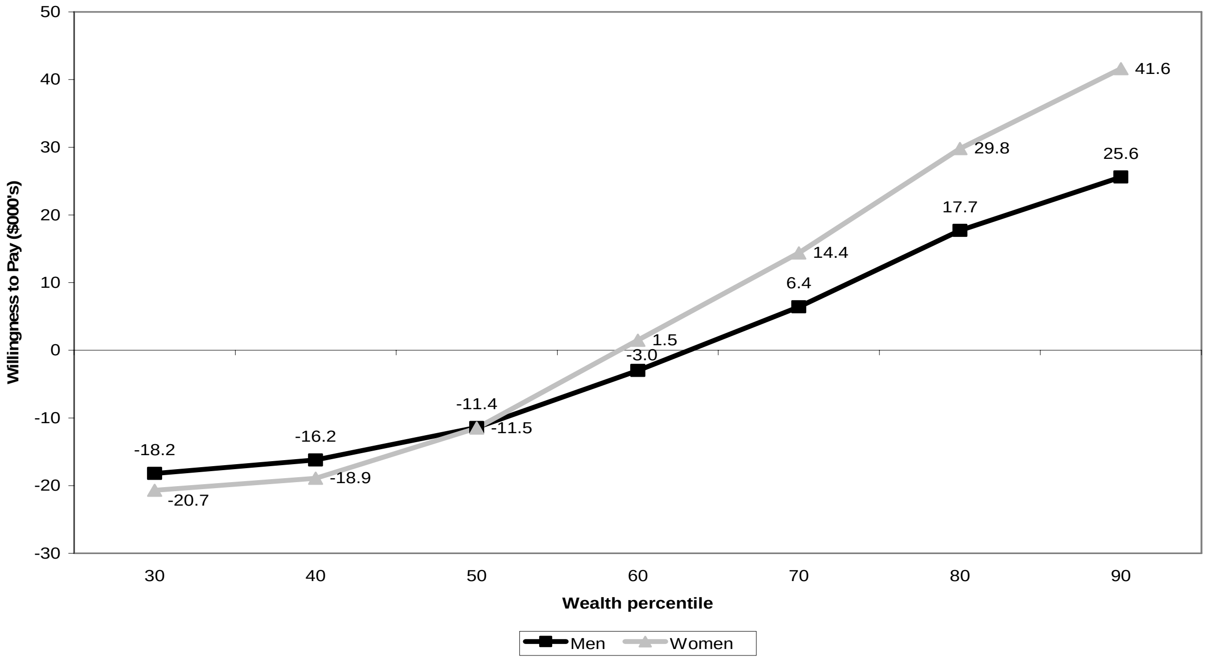
Note: All statistics are for an individual who at 65 is medically eligible to buy private long-term care insurance. Care utilization is defined as care that meets the criteria to be reimbursable by private long-term care insurance. See text for more details.

Table 2: Medicaid: Implicit Tax and Completeness of Coverage

Wealth Percentile	Medicaid share of EPDV Expenditures: No Private Insurance	Medicaid share of EPDV Expenditures: With Private Insurance	Implicit Tax on Private Insurance	Net Load on Private Insurance	WTP for actuarially fair (0 load) policy to top up Medicaid
	(1)	(2)	(3)	(4)	(5)
Panel A: Men					
10th	0.98	0.52	0.998	1.00	0.0
20th	0.89	0.44	0.952	0.98	0.0
30th	0.80	0.41	0.840	0.92	3.3
40th	0.71	0.37	0.737	0.87	9.8
50th	0.60	0.32	0.594	0.80	19.6
60th	0.46	0.26	0.426	0.71	35.2
70th	0.32	0.20	0.272	0.64	51.0
80th	0.17	0.12	0.107	0.55	74.1
90th	0.07	0.05	0.035	0.52	100.9
Panel B: Women					
10th	0.99	0.55	0.999	1.00	0.0
20th	0.93	0.50	0.992	0.99	0.0
30th	0.88	0.46	0.946	0.94	2.3
40th	0.80	0.43	0.854	0.85	11.5
50th	0.72	0.38	0.767	0.75	29.7
60th	0.60	0.33	0.618	0.60	58.3
70th	0.45	0.24	0.470	0.44	86.3
80th	0.24	0.15	0.194	0.15	122.8
90th	0.08	0.06	0.054	0.00	166.3

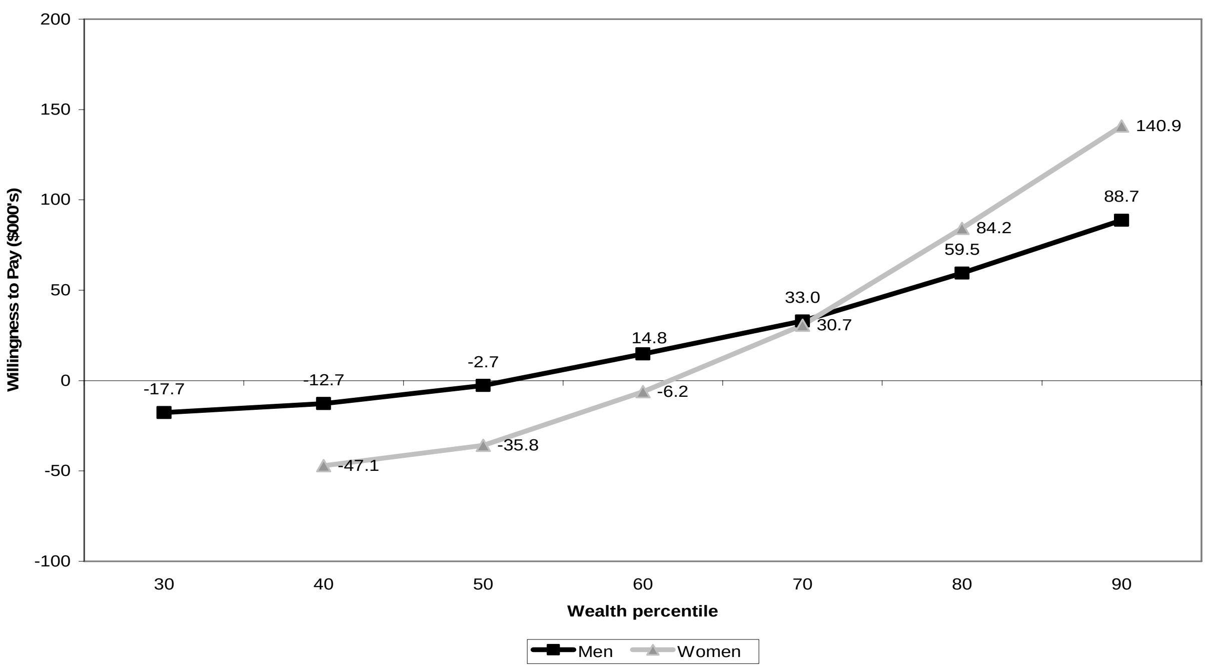
Notes: Private insurance policy in columns (1) - (4) has a $100 daily benefit cap. Implicit tax is the decrease in Medicaid expenditures associated with having private insurance, as a percentage of the private insurance benefits (see equation (3)). Net load is the gross load plus the ratio of the decrease in the EPDV of Medicaid expenditures associated with having private insurance to the EPDV of the premiums of this private policy (see equation (4)). For gross loads, we use the current market loads of 0.50 for men, and -0.058 for women.

Figure 1: Willingness to Pay for Private LTC Insurance
($100 daily benefit, market loads)



Notes: Willingness to pay for private insurance for deciles below the 3rd are worse than losing all financial wealth and are not reported here. The financial wealth deciles (and fraction of financial wealth annuitized at that point) are, respectively: 1. $58.5k (98%). 2. $93.4k (91%). 3. $126.9k (82%). 4. $169.9k (70%). 5. $222.6k (60%). 6. $292.8k (52%). 7. 385.5k (41%). 8. $526k (35%). 9. 789.5k (26%). The market loads are 0.50 for men, -0.06 for women; loads are defined as 1 – (EPDV benefits / EPDV premiums).

Figure 2: Willingness to Pay for Private LTC Insurance
(Comprehensive benefits, zero load)



Notes: Willingness to pay for private insurance for deciles below the 3rd for men and 4th for women are worse than losing all financial wealth and are not reported here. The wealth deciles are the same as for figure 1. Load is defined as 1 – (EPDV benefits / EPDV premiums).

Methodological Appendix

(Per the suggestion of the Editor, this appendix is intended to be an on-line appendix).

Our model considers a 65-year old individual who chooses an optimal consumption path to maximize expected discounted lifetime utility. The per-period utility function is defined on a monthly basis, with a maximum lifespan of 105, resulting in 480 periods denoted by t. In each month, the individual may be in one of five possible states of care, denoted by s: (1) at home receiving no care, (2) at home receiving paid home health care, (3) in residence at an assisted living facility, (4) in residence in a nursing home, or (5) dead. The cumulative probability of being in each state of care s at time t is denoted $Q_{t,s}$. Utility is a function of ordinary consumption $C_{s,t}$ as well as the consumption value (if any) derived from long-term care expenditures $F_{s,t}$. The individual discounts future utility at the monthly time preference rate ρ.

The general model also permits the consumption value of long-term care expenditures to vary depending on whether they are paid by Medicaid or by private insurance. We capture this difference in consumption value through the parameter α_s. In particular, if $\alpha_s=1$, the assumption is that the consumption value of care is the same whether paid for by Medicaid or from private insurance. In contrast, $\alpha_s>1$ would be consistent with a model in which private insurance allows one to purchase higher quality care, which thus provides higher consumption value. Although the baseline model assumes $\alpha_s=1$, we discuss results for $\alpha_s>1$ in section 6.2.

The consumer's utility function is therefore:

$$U\left(C_{s,t} + I_{s,t}^{M} \cdot F_{s,t} + \left(1 - I_{s,t}^{M}\right) \cdot \alpha_s \cdot F_{s,t}\right)$$

where $I_{s,t}^{M}$ is an indicator variable for whether or not the person is receiving Medicaid while in state s in period t. We assume that the utility function exhibits constant relative risk aversion, such that:

$$U\left(C_{s,t} + I_{s,t}^{M} \cdot F_{s,t} + \left(1 - I_{s,t}^{M}\right) \cdot \alpha_s \cdot F_{s,t}\right) = \frac{\left(C_{s,t} + I_{s,t}^{M} \cdot F_{s,t} + \left(1 - I_{s,t}^{M}\right) \cdot \alpha_s \cdot F_{s,t}\right)^{(1-\gamma)} - 1}{1-\gamma}$$

The consumer's constrained dynamic optimization problem is therefore:

$$\underset{C_{s,t}}{Max}\sum_{t=1}^{480}\sum_{s=1}^{5}\frac{Q_{s,t}}{(1+\rho)^{t}}\cdot U\left(C_{s,t}+I_{s,t}^{M}\cdot F_{s,t}+\left(1-I_{s,t}^{M}\right)\cdot\alpha_{s}\cdot F_{s,t}\right)$$

subject to

$$\begin{aligned}&(Ai)\ W_0 \text{ is given} && \text{(A1)}\\ &(Aii)\ W_t \geq 0\ \forall\ t\\ &(Aiii)\ W_{t+1}=[W_t+A_t+\min[B_{s,t},X_{s,t}]-C_{s,t}-X_{s,t}-P_{s,t}](1+r) \quad \text{if } I_{s,t}^{M}=0\\ &(Aiv)\ W_{t+1}=[W_t-\max(W_t-\underline{W},0)+(\underline{C}_s-C_t)](1+r) \quad \text{if } I_{s,t}^{M}=1\end{aligned}$$

where W_0 is pre-determined financial wealth at 65, A_t denotes annuity income, $B_{s,t}$ denotes the daily benefit cap on the private insurance payments, $X_{s,t}$ denotes long-term care expenditures, $P_{s,t}$ denotes the premium on the private insurance policy, and r is the monthly real rate of interest.

To be eligible for Medicaid (i.e. $I_{s,t}^{M}=1$), the individual must:

(i) Be receiving care, i.e., $s\in\{2,3,4\}$

(ii) Meet the asset test, i.e., $W_t < \underline{W}$

(iii) Meet the income test: $A_t + \min[B_{s,t}, X_{s,t}] + r*W_{t-1} - X_{s,t} < \underline{C}_s$

Where $\underline{W}$ is the asset eligibility threshold and $\underline{C}_s$ is the income eligibility threshold for care state *s*. Note that Medicaid eligibility at any given point in time is thus endogenous to consumption choices.

The solution to the constrained dynamic optimization problem (A1) involves the choice of a consumption plan at time 0, with the consumer's knowledge that he will be able to choose a new plan at time 1, and so on, until the final period. To solve this stochastic dynamic decision problem, we employ stochastic dynamic programming methods, as discussed in Blanchard & Fischer (1989) which reduce the multi-period problem to a sequence of simpler two-period decision problems. We begin by introducing a value function $V_{s,t}(W_t; A)$ for state *s* and time *t* that represents the present discounted value of expected utility evaluated along the optimal consumption path. This value depends on financial wealth (W_t), annuity income (A_t), and state of care (s) in which the individual finds himself, all at the start of period t.

The value function satisfies the recursive Bellman equation:

$$\underset{C_{s,t}}{Max} V_{s,t}(W_t; A) = \underset{C_{s,t}}{Max} U_s\left(C_{s,t} + I^M_{s,t} \cdot F_{s,t} + \left(1 - I^M_{s,t}\right) \cdot \alpha_s \cdot F_{s,t}\right) + \sum_{\sigma=1}^{5} \frac{q^{s,\sigma}_{t+1}}{(1+\rho)} V_{\sigma,t+1}(W_{t+1}; A)$$

where $q^{s,\sigma}_{t+1}$ the conditional probability that an individual who is in care state *s* at time *t* is in care state σ at time t+1.

We solve this problem using standard dynamic programming techniques (e.g. Stokey and Lucas, 1989). We begin by solving for the last period's problem at age 105, which produces a matrix of optimal consumption decisions, one for each combination of discrete value of wealth and state of care. We discretize wealth quite finely, down to $10 increments at low levels of wealth, and gradually rising at higher levels of wealth, but never exceeding 0.2% of starting wealth. (Thus for example, for the median household, for whom initial financial wealth is approximately $89,000, the maximum distance between two points on the financial wealth grid is $130.) In the final period of life, age 105, all remaining wealth is consumed, which maps into a value function matrix that is N_w x N_s, where N_w is the number of discrete wealth points evaluated on the grid (for a median wealth household, N_w is over 1,400) and $N_s = 4$ (assuming no bequest motives, only 4 of the 5 states of the world have value).

For each element in the state spaces, we continue to solve the model backwards, collecting separate decision rules and value functions for every month-by-care-state combination back to age 65. Given our discretization methods and the number of periods and states in the problem, a single set of parameters involves solving our model for approximately 3.5 million discrete points. This is implemented using a program written for Gauss.

References

Blanchard, Olivier and Stanley Fischer. 1989. "Lectures in Macroeconomics." MIT Press, Cambridge MA.

Stokey, Nancy and Robert Lucas. 1989. Recursive methods in economic dynamics. Harvard University Press, Cambridge MA.