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

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Abstract: Long-term care represents one of the largest uninsured financial risks facing the elderly in the United States. To investigate why so little of this risk is privately insured, we develop and calibrate an analytical framework for computing a risk averse consumer's willingness to pay for a long-term care insurance policy. Our main finding is that, given the existence of Medicaid, individuals throughout most of the wealth distribution would be unwilling to pay for private insurance coverage *even if comprehensive, actuarially fair policies were available*. Moreover, we show that the large crowd-out effects of Medicaid are not due to its provision of catastrophic coverage *per* se; rather, they stem from the fact that this catastrophic coverage is structured as a secondary payer, and as such imposes a large implicit tax on the purchase of private policies. This suggests that recent federal and state initiatives to increase demand for private long-term care insurance will be of limited effectiveness as long as Medicaid remains a secondary payer.

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Long-term care is one of the largest uninsured financial risks facing the elderly in the United States today. At $135 billion annually, long-term care expenditures represent over 8.5 percent of total health expenditures *for all* ages, or roughly 1.2 percent of GDP (CBO, 2004). Very little of this expenditure risk is covered by private insurance, which reimburses only 4 percent of long-term care expenditures; by contrast, 35 percent of total health care sector expenditures are covered by private insurance. As a result, out of pocket expenditures account for approximately one-third of annual long-term care spending; this is double the share of expenditures paid for out of pocket in the health care sector as a whole (CBO 2004, National Center for Health Statistics, 2002). Moreover, real expenditures for long-term care are projected to triple over the next 35 years due to rising medical costs and the aging of the baby boomers (CBO, 1999).

There is compelling evidence that the private market for long-term care insurance may not be very efficient. Prices are high: imperfect competition and transaction costs result in prices that are marked up substantially above expected claims, with loads on typical policies about 18 cents on the dollar (Brown and Finkelstein, 2004). Asymmetric information is also a problem in this market (Finkelstein and McGarry, 2003). Indeed, the perception that private market imperfections in general, and high prices in particular, are important limitations to demand has motivated a number of recent policy interventions intended to stimulate private insurance demand. The federal government recently introduced a tax-subsidy to employer-provided long-term care insurance that is as generous as the federal tax subsidy to employer-provided health insurance. State governments are also introducing tax subsidies for private insurance in an attempt to stimulate demand (Wiener et al, 2000).

The presence of Medicaid, the public insurance program for the indigent, also looms large as a consideration for why the private insurance market is so small. Medicaid functions as a payer-of-last resort, covering long-term care expenditures only after the individual has met stringent asset and income tests. It is thus an imperfect – but "free" – substitute for private long-term care insurance. Medicaid currently pays for approximately 35 percent of all long-term care expenses in the U.S. Concerns about rising costs to the Medicaid program and concerns about Medicaid's potentially deleterious effect on

private insurance demand have led several states to experiment with changes to Medicaid eligibility rules in an attempt to stimulate private insurance coverage (Wiener et al, 2000). Unfortunately, we have very little evidence to suggest whether such policies will be effective. While there is evidence that Medicaid has a substantial crowd-out effect in the market for acute private health insurance (e.g., Cutler & Gruber 1996), there has been comparatively little research on the influence of Medicaid on the market for long-term care insurance.[1] Indeed the voluminous empirical literature on the impact of Medicaid on many financial and health outcomes has focused almost entirely on the non-elderly, non-disabled populations (see Gruber forthcoming for review of this literature), despite the fact that total Medicaid expenditures on long-term care are roughly equal to the program's expenditures on the non-elderly, non-disabled.

The central question of this paper is whether eliminating the private market failures in the long-term care insurance market would substantially increase private coverage, or whether the existence of Medicaid fundamentally constrains private insurance demand even in the absence of any private market problems. Of course, we recognize that there are a variety of other factors besides private market failures and public insurance provision – such as individual myopia or the potential to rely on support for one's children – which may limit the market for private long-term care insurance (see Norton 2000 for a comprehensive review of potential explanations). The focus of this paper, however, is to determine whether – even absent these other factors – correcting private market failures could stimulate substantial increases in private insurance coverage or whether the existence of Medicaid as a payer of last resort presents a fundamental impediment to private coverage.

To investigate this, 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. This model takes into account the presence of a Medicaid program that provides care only after one meets stringent asset and income qualifications. We parameterize the model using actuarial data

[1] The most notable exception is the influential work of Pauly (1989, 1990), which shows in a highly stylized theoretical model that long-term care insurance demand will be affected by a Medicaid-type program.

on the distribution of long-term care expenditure risk, current market loads on private insurance policies, and common state Medicaid rules.

We use this utility-based model in two related ways. First, we compute the willingness to pay for a private insurance contract. We define willingness to pay as the dollar-denominated utility gain from following an optimal intertemporal consumption path with private long-term care insurance relative to not having private insurance. The model produces results that are broadly consistent with the empirical patterns of long-term care insurance coverage found in survey data. Specifically, the model indicates that most elderly individuals would not want to purchase existing contracts, that men and women have a similar willingness to pay for coverage despite very different pricing loads, and that willingness to pay rises steeply with assets.

Using this model, we find that even if we "fix the supply side" by offering comprehensive policies at actuarially fair prices, individuals throughout most of the wealth distribution would still not be willing to purchase such policies. We show that this is because the existing structure of Medicaid has a substantial crowd-out effect, even though Medicaid itself is not fully comprehensive and thus leaves most consumers exposed to substantial out-of-pocket expenditure risk prior to becoming eligible for Medicaid.

Second, we explore the reason behind Medicaid's large crowd-out effect on private insurance. We show that individuals would be willing to pay for insurance to "top up" Medicaid (i.e. cover the expenditures that Medicaid does not). Individuals cannot do so, however, because Medicaid is, by law, a secondary payer. In other words, Medicaid requires private insurance to pay first, even if the individual is also eligible for Medicaid, and thus a large part of the premium for a private policy goes to pay for benefits that simply replace benefits that would otherwise have been provided by Medicaid.

We use our utility-based model to compute the magnitude of the "implicit tax" that Medicaid imposes on the purchase of a private insurance policy. Because one's consumption and saving decisions partially determine an individual's eligibility for Medicaid, calculating the implicit tax requires that one calculate optimal consumption paths and Medicaid utilization with and without private insurance. We can then determine the fraction of the benefits paid by the private policy that are duplicative of Medicaid, and thus

exposed to the implicit tax. We find that Medicaid imposes a very large implicit tax on the purchase of private insurance policies. Our results suggest that as long as Medicaid remains a secondary payer, recent state and federal programs designed to increase the size of the private long-term care insurance market are likely to fail to stimulate demand among most of the elderly population.

The rest of the paper is structured as follows. Section one provides background information on the distribution of long-term care risk and on public and private insurance for long-term care expenditures. Section two develops the analytical framework of the paper. Section three describes the base case parameterization of the model. Section four presents the main results of the model. We show that it produces estimates of willingness to pay for private insurance that are broadly consistent with the empirical patterns of long-term care insurance coverage in survey data. We then show that offering actuarially fair policies and offering more comprehensive insurance is not sufficient to generate a positive willingness to pay for most individuals. Both of these findings are robust to numerous alternative modeling assumptions. Section five focuses on our Medicaid results in more detail, and demonstrates that it is the secondary payer nature of Medicaid that gives rise to the large implicit tax on private policies. The final section concludes.

1. Background

1.1 The Distribution of Long-Term Care Utilization Risk

There is considerable variation among the elderly in their long-term care utilization, suggesting that insurance coverage that reduces this variation may produce potentially large welfare gains. By way of illustration, Table 1 provides some summary statistics on the distribution of long-term care utilization for 65-year old men and women. A more detailed discussion of the data and methods used to produce these statistics is provided in Section 3.1

The average risk of nursing home use – the most expensive form of long-term care – is high. A 65 year-old man has a 27 percent chance of entering a nursing home at some future point. The risk is even higher for women; a 65 year-old woman has a 44 percent chance of ever entering a nursing home.

Women who use care also tend to spend a longer time in care than men who use care; for example, men who enter a nursing home spend on average 1.3 years there, while women spend on average 2 years. These utilization differences are partly – but not fully – explained by women's longer longevity.

There is a considerable right-tail to the distribution of nursing home utilization. Of individuals who enter a nursing home, 12 percent of men and 22 percent of women will spend more than 3 years there; one-in-eight women who enter a nursing home will spend more than 5 years there.

Most of this substantial risk is uninsured. As a result, over one third of long-term care expenditures are paid for out of pocket, nearly double the proportion of expenditures in the health sector as a whole that are paid for out of pocket (CBO 2004, National Center for Health Statistics, 2002). The remainder of this section provides some information on private and public insurance coverage for long-term care.

1.2 The Private Market for Long-Term Care Insurance

The private long-term care insurance market is extremely limited along two different dimensions.[2] First, only 10 percent of the elderly have any private long-term care insurance. Second, those who do have private long-term care insurance have policies that cover only a very limited proportion of expected long-term care expenditures. A policy is purchased for a pre-specified annual nominal premium that will continue throughout the individual's lifetime. The typical policy purchased by a 65-year old (roughly the average age of purchase) covers only one-third of the expected present discounted value of long-term care expenditures. The primary factor limiting the comprehensiveness of private long-term care insurance policies is that they specify a fixed and binding daily benefit cap that is the maximum amount of incurred expenditures that will be reimbursed per day in covered care. The average maximum daily benefit on long-term care insurance policies sold in 2000 was about $100 per day; maximum daily benefits are typically constant in nominal terms, and thus declining in real terms over time.

A variety of private market problems may prevent the *supply* of more comprehensive contracts. For example, there is evidence of asymmetric information in this market (Finkelstein and McGarry 2003) and

[2] This section draws heavily on the evidence presented in Brown and Finkelstein (2004). Substantially more detail on the nature of the private insurance market can be found there.

it is well known that asymmetric information may result in insurance rationing. This rationing may well take the form of binding maximum payout caps (see e.g. Young and Browne, 1997). In addition, Cutler (1996) has argued that insurance companies' inability to diversify the substantial inter-temporal aggregate risk of dramatically increased long-term care costs (which cannot be diversified through the traditional insurance approach of pooling idiosyncratic risks) results in the specification of binding dollar daily benefit caps which do not expose the insurance companies to this aggregate risk.

In addition, pricing above expected claims – which may result from imperfect competition, large administrative costs, or asymmetric information – could limit *demand* for more comprehensive contracts. It might also explain the lack of demand for *any* private insurance among the vast majority of the elderly. Brown and Finkelstein (2004) provide evidence of pricing above expected claims. They estimate that the typical policy purchased pays out, on average, only 82 cents in EPDV benefits for every dollar in EPDV premiums; this 18 cent average load is due to a combination of transaction costs and imperfect competition.

1.3 Public Coverage of Long-Term Care Expenditures

The primary source of public funds for long-term care expenditures is Medi*caid*, the public health insurance program for the indigent. Medicaid reimburses approximately 35 percent of long-term care expenditures for the elderly (CBO 2004). While Medi*care,* the public health insurance program for the elderly, provides limited coverage for short-term nursing home stays, its coverage is primarily designed to help beneficiaries recover from acute illnesses rather than to provide for long-term care *per se*. In contrast, Medicare's coverage of home health benefits has evolved to cover genuine long-term care, although Medicare's coverage of home health constitutes only 7 percent of total long-term care expenditures (CBO 2004).

Medicaid, the most important source of public insurance, is a payer-of-last resort. It will cover an individual's long-term care expenditures only after he has exhausted a substantial portion of his financial resources (AARP, 2000). Moreover, Medicaid is a *secondary payer* relative to any private insurance policy. If an individual with private long-term care insurance spends down to sufficiently low income and

assets that he is eligible for Medicaid, the private policy must pay whatever benefits it owes before Medicaid makes any payments. Medicaid thus imposes an implicit tax on private long-term care insurance policies; a portion of the premiums on a private policy cover benefits that are redundant of what Medicaid would otherwise have provided for free.

Medicaid provides incomplete insurance coverage for all but the poorest of individuals. Its income and asset spend-down requirements impose severe restrictions on an individual's ability to engage in optimal consumption smoothing across care states and over time. In particular, when an individual is receiving Medicaid-financed care, they impose very tight restrictions on the resources available for non-care consumption. In addition, these spend-down requirements substantially reduce the wealth out of which the individual can consume if he recovers and exits from care, or that he can bequeath upon death.[3] In order to make it more difficult for individuals to "hide" assets from Medicaid by transferring them to a spouse or children, state Medicaid programs impose a 3 to 5 year look back period on assets (Congressional Research Service, 2002). More generally, the fact that such a large fraction of long-term care expenditures are paid for out of pocket points to limits to individuals' ability to "game" the Medicaid system.

Even so, an imperfect but publicly funded source of long-term care insurance has the potential to substantially reduce demand for private insurance coverage. Pauly (1989, 1990) provides a highly stylized model to demonstrate this theoretical possibility. However, whether Medicaid is, *in practice*, an important factor limiting private insurance coverage is an open question for at least two reasons.

First, evidence from related insurance markets of the effect of public insurance on private insurance demand is mixed. On the one hand, there is evidence that Medicaid has a substantial crowd-out affect on demand for private insurance for acute medical care among working-age individuals (Cutler and Gruber, 1996). On the other hand, there is little evidence that public insurance crowds out demand for private insurance for the elderly. For example, Mitchell et al. (1999) find that the presence of publicly-provided

[3] Recovery from care is not uncommon; for example, Table 1 indicates that almost two-thirds of individuals who enter a nursing home will at some point leave the nursing home alive. This is consistent with other studies (e.g. Dick et al. 1994) that indicate a substantial amount of recovery from nursing home care.

annuities through Social Security is not sufficient to explain the limited demand for private annuities, and Finkelstein (forthcoming) finds that public Medicare coverage for acute medical expenditures for the elderly does not crowd-out private insurance coverage to supplement the gaps in Medicare coverage.

Second, even if Medicaid does reduce demand for private insurance, it is unclear whether and why it plays a quantitatively important role. For example, the private market failures discussed above – which result in high loads and may also produce insurance rationing – may be substantially more important than Medicaid in understanding the limited demand for private insurance.

2. Analytical Framework

This section describes the analytical framework we develop to investigate the relative role of private market failures and the Medicaid program in explaining the limited size of the private long-term care insurance market. We consider an individual at age 65 who chooses a consumption path to maximize remaining expected lifetime utility subject to a budget constraint and various Medicaid rules. Here we describe how we use this framework to estimate how much a risk-averse life-cycle consumer would be willing to pay, over and above the required premiums, for a long-term care insurance contract that offers a specific set of benefits with a particular load. As will be explained in section 5, this same model will be used to construct our measure of the "implicit tax" that Medicaid imposes on a private policy.

To construct our measure of willingness to pay, we first calculate the maximum expected lifetime utility that can be achieved when the individual purchases a particular long-term care insurance contract. We then "take away" this insurance contract and find the increment to financial wealth such that, when the individual follows their new optimal consumption path, the individual achieves the same level of expected lifetime utility that they had when they were insured.[4]

This approach allows us to put a dollar value on the utility gains from insuring against long-term care

[4] While our base case models a unitary decision maker, an alternative specification described in detail in Appendix B considers the case of a household utility function that models the joint consumption decisions of a husband and wife and calculates the utility gains from having each spouse purchase insurance relative to not purchasing insurance. We find that within-household risk sharing and more generous Medicaid rules for married couples lead to an even lower valuation of private long-term care insurance than in our base case.

expenditure risk. We refer to this as an individual's "willingness to pay" for the insurance above and beyond the required premium payments. It is roughly analogous to an equivalent variation measure in applied welfare analysis, although our measure captures discrete changes in insurance status rather than a marginal price change. A positive value suggests that the ability to purchase the long-term care insurance contract is welfare enhancing , while a negative value indicates that the purchase of the insurance contract would reduce utility. Thus a positive value indicates that we should see the individual buying the policy, and a negative value indicates that we should not see the individual buying the policy. There is a large literature that calculates similar measures of the willingness to pay for annuities (e.g., Kotlikoff & Spivak 1981, Mitchell et al 1999, Davidoff et al., 2003). This present study represents, to our knowledge, the first such analysis of the market for long-term care insurance.

At the core of the model is a 65 year old with a stock of financial wealth and a predetermined stream of annuity payments (e.g., from Social Security) who maximizes expected lifetime utility by choosing an optimal consumption path. This individual faces two sources of future uncertainty: long-term care expenditures and mortality. In particular, in each period the individual may be in one of five possible states of care (s): at home receiving no care, at home receiving paid home health care (denoted "hhc"), in residence at an assisted living facility ("alf"), in residence in a nursing home ("nh"), or death.

When alive, the individual derives utility from real consumption in state *s* at time *t* ($C_{s,t}$). Following Pauly (1989, 1990), we also allow for the possibility that the individual derives 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 an individual's income or wealth. We denote the consumption portion of long-term care expenditures by $F_{s,t}$. While Pauly (1989, 1990) was primary concerned with institutional care, our model also allows for the possibility that some portion of the expenditures spent on home health care (e.g., help with shopping and cooking) also provides direct consumption value.

Our framework also allows us to capture the fact that – for a variety of possible reasons – individuals may get less utility from care paid for by Medicaid than care paid for by private payers, and that this

should increase their willingness to pay for private long-term care insurance. We denote the consumption value of care financed from public payers *relative* to the consumption value of care financed by private players by α_s. Thus $\alpha_s = 1$ when care is paid from private resources and $0 \le \alpha_s \le 1$ when care is paid by Medicaid. A low value of α_s when care is paid for by Medicaid indicates a low consumption value of publicly-funded care relative to privately-funded care.

Utility when alive is denoted U_s where the subscript s denotes the individual's state of care. Thus the individual's utility function while alive is given by: $U_s\left(C_{s,t} + \alpha_s * F_{s,t}\right)$, where $F_{s,t}$ denotes the consumption portion of long-term care expenditures and α_s may vary depending on whether the care is paid for by private or public funds. Note that when the individual receives no care, $F_{s,t}$ is equal to zero, so that utility is defined solely over ordinary consumption. Our model also allows us to consider utility from bequests at death, defined as a function of non-annuitized wealth remaining at the time of death.

The individual's value function $V_{s,t}(W_t; A)$ denotes the individual's maximum expected discounted lifetime utility at period t from following an optimal consumption path, given that the individual is in care state s and period t. W_t is financial wealth at time t, and A is a Tx1 vector of annuity payments, such as from Social Security. Using standard dynamic programming techniques (e.g. Stokey and Lucas, 1989), we are able to define $V_{s,t}(W_t; A)$ recursively in the form of a Bellman equation, discretize the relevant state (financial wealth), and solve for the optimal consumption path iteratively from the final period (T) back to the beginning. Note that $V_{5,t+1}$ is the utility the individual in period t expects if he or she dies in the next period, i.e., a bequest function.

Formally, the recursive Bellman equation is:

$$\underset{C_{s,t}}{Max} V_{s,t}\left(W_t; A\right) = \underset{C_{s,t}}{Max} U_s\left(C_{s,t} + \alpha_s * F_{s,t}\right) + \sum_{\sigma=1}^{5} \frac{q_{t+1}^{s,\sigma}}{\left(1+\rho\right)} V_{\sigma,t+1}\left(W_{t+1}; A\right) \qquad (1)$$

All values are expressed in real terms. ρ is the discount rate. We denote by $q_{t+1}^{s,\sigma}$ 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 define t in

terms of months (rather than years) so that we can generate a richer and more realistic distribution of long-term care stays of various lengths, including relatively short stays. We assume a maximum lifespan of 105 years; therefore T=480.

The individual chooses an optimal consumption path to maximize the value function in equation (1) subject to three constraints: (i) an initial level of non-annuitized financial wealth, W_0, and a given trajectory of annuitized income, A; (ii) a no borrowing constraint (imposed to eliminate the possibility that the individual may die in debt), and (iii) the wealth accumulation equation. In the absence of Medicaid, the wealth accumulation equation is:

$$W_{t+1} = \left(W_t + A_t + \min\left[B_{s,t}, X_{s,t}\right] - C_{s,t} - X_{s,t} - P_{s,t}\right) \cdot \left(1 + r\right) \qquad (2)$$

In other words, wealth next period is simply wealth this period plus inflows (income and insurance payments) minus outflows (consumption, care expenditures, and premium payments) plus interest. As described in Section 1.2, the long-term care insurance policy pays a benefit equal to the lesser of the per-period maximum benefit ($B_{s,t}$) and the actual costs incurred ($X_{s,t}$). It charges a monthly insurance premium of $P_{s,t}$ that is fixed in nominal terms and is paid only in states in which the individual is not receiving benefits. When the individual has no insurance, $B_{s,t}=P_{s,t}=0$. Unconsumed financial wealth accumulates at the real interest rate r.

Constraint (2) shows how financial wealth evolves in a world where the individual is solely responsible for his own care. In practice, however, if an individual is receiving paid care and meets certain state-specified income and asset tests, his care will be paid for by Medicaid. These payments alter the wealth accumulation equation (2) above. Medicaid, as discussed, is a secondary payer that covers care once an individual has met certain income and asset tests. To be eligible for Medicaid reimbursement, the individual must be (i) be receiving care, (ii) meet the asset test (i.e., must have $W_t < \underline{W}$, where $\underline{W}$ is the asset test cutoff), and (iii) meet the income test. The income test requires that the income from the annuity A_t, plus any insurance benefits $\min[B_{s,t}, X_{s,t}]$, minus the actual care expenditures $X_{s,t}$, be less than the co-payment rate, which we denote as $\underline{C}_s$. If a person is eligible, Medicaid pays an amount equal

to $X_{s,t} - (A_t - \underline{C}_s) - \min(B_{s,t}, X_{s,t}) - \max(W_t - \underline{W}, 0)$. In words, Medicaid pays for all expenses ($X_{s,t}$) that are not covered by current income over the disregard level ($A_t - \underline{C}_s$), private insurance ($\min(B_{s,t}, X_{s,t})$), or wealth over the asset test limit ($\max(W_t - \underline{W}, 0)$.

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

$$W_{t+1} = [W_t - \max(W_t - \underline{W}, 0) + (\underline{C}_s - C_t)](1 + r) \qquad (3)$$

In other words, when on Medicaid in period t, wealth carried into period t+1 will be equal to the wealth in period t, minus any wealth that Medicaid rules required be used for period t care ($\max(W_t - \underline{W}, 0)$), plus any saving the individual does out of their income disregard level $(\underline{C}_s - C_t)$.[5] More generous program rules (i.e., higher $\underline{C}_s$ and $\underline{W}$) allow an individual to qualify for Medicaid while retaining a large amount of income and assets.

3. Data and Initial Parameterization

3.1 Estimates of Transition Probabilities Across States of Care ($q_{t+1}^{s,\sigma}$)

In order to compute a risk averse consumer's willingness to pay for a long-term care insurance contract, it is necessary to have extremely rich and detailed data on long-term care utilization. While there exist excellent published studies estimating 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. More importantly, we know of no published studies that characterize the full set of transition probabilities across different types of care. Most long-term care insurance policies cover not only nursing homes, but also assisted living facilities and home health care (HIAA 2000a). We therefore require detailed information on the full distribution of transitions across all of these care states, as well as the states of "no care" and of death. It is important to know the

[5] In practice, there will be little incentive to save out of the income disregard because if the person is in care in period t+1, any such savings would be implicitly taxed away at a 100% rate by the t+1 asset test.

full distribution of expenditures, rather than just the mean or other summary statistics, because a risk averse individual will place a disproportionately high weight on low probability but large loss outcomes.

To meet these requirements, we use a "state of the art" model of transitions across states of care that was developed and provided to us by Jim Robinson, a former member of the Society of Actuaries' long-term care insurance valuation methods task force (Society of Actuaries, 1996).[6] This model uses data from the 1985 National Nursing Home Survey, and the 1982 through 1994 waves of the longitudinal National Long Term Care Survey to produce estimates of age- and gender-specific Markov transition probabilities across the five care states in the model: no care, home care, assisted living, nursing home, or death. The model also produces estimates of the number of hours of skilled home care and unskilled home care provided during a home care episode. The model indicates substantial churning across types of care; for example, we estimate that a man who uses a nursing home has a 55 percent change of also using home health care. This underscores the importance of having a rich source of transition and utilization data.

The Robinson model has a very strong pedigree. Versions of the model have been used by insurance regulators, private insurance companies, state agencies administering public long-term care benefit programs, and the Society of Actuaries LTC Valuation Methods Task Force (Robinson, 2002). We spoke with numerous actuaries in consulting firms, insurance companies, and the Society of Actuaries who confirmed that the model is widely used to price long-term care insurance policies and that it is very highly regarded. Perhaps most importantly, we also independently verified, where direct comparisons are possible, that the model produces estimates that are broadly consistent with other published estimates. Appendix Table A1 summarizes the results of this validation exercise.

To make the estimates relevant for the long-term care insurance purchase decision, the estimates in this paper are based on a version of the model that assumes that the individual is medically eligible for private long-term care insurance at 65. This requires that at age 65 they have no limitations to activities of daily living and not be cognitively impaired (over 98 percent of 65 year olds meet this requirement). It

[6] Readers interested in a more detailed description of the model are encouraged to consult Brown and Finkelstein (2004) and especially Robinson (1996).

also counts care utilization only if this care represents long-term chronic care rather than short-term rehabilitation. Insurance companies define health-related "benefit triggers" for reimbursement eligibility to ensure that the expenditures are for long-term rather than acute care. The vast majority of benefit triggers in private policies require that the individual must either need substantial assistance in performing at least 2 of 6 activities of daily living (ADLs) and assistance must be expected to last at least 90 days, or the individual must require substantial supervision due to severe cognitive impairment (Wiener et al., 2000, LIMRA 2002). These triggers effectively limit nursing home care to the type of care that Medicare (which covers some short-term, acute nursing home care) would not cover. Medicaid imposes similar types of benefit triggers (Congressional Research Service 2002).

The Robinson estimates are designed to be representative of the general population. We use the same estimates when estimating the maximum lifetime utility achievable with and without private insurance, an assumption supported by empirical evidence indicating that care utilization rates for insured individuals are indistinguishable from those for the population at large (Society of Actuaries, 2002; Finkelstein and McGarry, 2003).[7]

3.2 Estimates of Current and Future Long-Term Care Costs

Data on average national daily care costs for nursing homes, assisted living facilities, and home health care $(X_{t,s})$ are taken from Metlife Market Survey national data (MetLife 2002a, MetLife 2002b). These data were collected and used to determine pricing for the new federal long-term care insurance program. The national average daily cost of nursing home care in 2002 is $143 per day for a semi-private room (private rooms are more expensive), and thus already above the typical $100 maximum daily benefit of a private policy. By contrast, care costs for an assisted living facility average only $72 per day. Home health care is by far the least expensive type of care, and accounts for only one-quarter of total long-term care expenditures (US Congress, 2000). We estimate that even a current 90 year old male (female) in

[7] The estimates do not incorporate any projected changes in morbidity or care utilization; this is standard practice for the industry (see e.g. Tillinghast-Towers Perrin, 2002) and for academic research (see e.g. Wiener et al. 1994). It reflects the substantial disagreement in the literature over the *sign* of projected changes in morbidity (compare e.g. Manton et al. 1997 and Manton and Gu 2001 to Lakdawalla et al., 2001) or in care utilization conditional on morbidity (compare e.g. Lakdawalla and Philipson, 2002 to CBO 1999).

home health care would only incur, on average, $30 ($45) per day of insurable home health care costs.

We multiply estimated home health care costs by 0.65 to reflect that fact that Medicare reimburses 35 percent of these home health care costs (see Brown and Finkelstein, 2004). Medicare is a *primary payer*, meaning that it will reimburse these home health care expenditures whether or not the individual has private insurance, and therefore the individual will never be exposed to these expenditures.

We project forward the 2002 estimates of long-term care costs based on the general industry and academic consensus that, because the primary cost for all of these types of care is labor inputs, costs will grow at the rate of real wage growth (Wiener et al. 1994, and conversations with industry officials).[8] We use the Wiener et al. (1994) and Abt (2001) assumption of 1.5 percentage point annual real growth in care costs. Given all these parameters, we estimate that the minimum amount of financial wealth needed in the absence of any payer of last resort to be absolutely certain that long-term care expenditures could not completely exhaust one's resources is $1.55 million.[9]

3.3 Initial Medicaid Parameterization

For our base Medicaid parameterization, we choose eligibility rules that are very strict in terms of their income and asset requirements for eligibility.[10] By doing so, we make Medicaid a less attractive substitute for private insurance and bias ourselves against finding a substantial crowd-out effect of Medicaid. Specifically, we use the income and asset disregards for a single individual, rather than the much larger disregards permitted when there is a community-based spouse.[11] We use the modal state rules in 1999 (used by 35 states) which impose a deductible of all but $2,000 of one's assets (i.e. $\underline{W} = \$2000$), and a co-payment of all but $30 per month of one's income (i.e. $(\underline{C}_{alf}, \underline{C}_{nh}) = \$30$) before

[8] The image of an individual in a nursing home hooked up to many machines is in fact a tiny share of the nursing home population. As Wiener et al. (1994) note, "long-term care is extremely labor intensive, and much of it involves hands-on, personal services, where opportunities for substantial gains in productivity are few."

[9] This calculation assumes a 3 percent real interest rate and a 3 percent inflation rate. The $1.55 million represents the amount needed in the extremely 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.

[10] All of the information in this section is from AARP (2000).

[11] In Section 5.3 and Appendix B, where we examine willingness to pay in a household decision-making framework that permits financial risk sharing among family members, we discuss and incorporate the much more generous asset disregards for community based spouses.

Medicaid will cover institutional care costs. These parameters are on the low end of the states' disregards, even for individuals; again, we choose them to bias ourselves against finding that Medicaid is an attractive substitute for private insurance. For home health care, the same asset test applies, but we set the income disregard ($\underline{C}_{hhc}$) considerably higher, at $545 per month, to reflect the fact that the individual is permitted 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, this choice is on the restrictive end of the spectrum.[12]

Our base parameterization thus represents a more restrictive set of Medicaid rules than typically apply. However, in one respect we may be overstating the generosity of Medicaid. Although all states currently provide home care benefits under Medicaid, these benefits are not an entitlement the way that nursing home care is; states set enrollment caps and these may bind. In the sensitivity analysis below, we investigate alternative specifications 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. Our core findings are not sensitive to these alternative specifications.

3.4 Other Initial Parameters

To solve the utility maximization problem (1) subject to the relevant constraints, we assume a constant relative risk aversion (CRRA) utility function. A long line of simulation literature (Hubbard, Skinner, and Zeldes 1995; Engen, Gale, and Uccello 1999; Mitchell et al 1999; Davis, Kubler, and Willen 2002; and Scholz, Seshadri, and Khitatrakun 2003) uses a base case value of 3 for the risk aversion coefficient. However, a substantial consumption literature, summarized in Laibson, Repetto & Tobacman (1998), has found risk aversion levels closer to 1, as did Hurd's (1989) study among the elderly. Given this, we will report most results for risk aversion levels of 1, 2, and 3. Recognizing that still other papers report higher levels of risk aversion (e.g., Barsky et al 1997, Palumbo 1999), we also explore the sensitivity of our results to even higher levels of risk aversion. We assume the real interest rate, discount

[12] As noted in Section 1.3, opportunities to hide assets and "game" the Medicaid system are limited. To the extent that they exist, however, the effective Medicaid rules will be more generous than the statutory ones used here, which again would make Medicaid an even more attractive substitute for private insurance than we allow.

rate, and inflation rate are all equal to 0.03 annually.[13]

We initially examine a private insurance policy that covers all three types of care and offers a constant nominal maximum daily benefit of $100. This is broadly consistent with the typical policy purchased in 2000 (HIAA 2000a). We assume the policy is offered at typical current market loads; these are 0.50 for men and -0.06 for women (Brown and Finkelstein, 2004). These loads indicate that on average, a man (woman) gets back 50 cents ($1.06) in EPDV benefits for every dollar paid in EPDV premiums and correspond to an annual premium of $1,816.

Loads are substantially higher for men than women because long-term care insurance polices are priced on a unisex basis, but women have substantially higher expected utilization. This unisex pricing pattern is not due to any regulatory restrictions.[14] It is ostensibly puzzling why insurance companies would voluntarily offer substantially different loads for men and women; this pricing practice cannot be explained by the within-couple correlation in purchasing (Brown and Finkelstein, 2004). One possible explanation raised by the subsequent results in this paper (see especially Section 5.2) is that once the implicit tax on private insurance levied by Medicaid's secondary payer requirement is taken into account, the effective loads on policies are actually quite similar for men and for women.

For the food and housing consumption value when in facility-based care (i.e. $F_{alf,t}$ and $F_{nh,t}$), we use the monthly amount ($513) 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. Our base case assumes 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.

Finally, we note that our base case is intentionally designed to abstract from the large number of parameters over which there is considerable uncertainty. Therefore, the initial parameterization assumes

[13] These are all fairly standard assumptions in the literature ((Hubbard, Skinner, and Zeldes 1995; Engen, Gale, and Uccello 1999; Mitchell et al 1999; and Davis, Kubler, and Willen 2002).

[14] Indeed, pricing is largely unregulated in this market. Nonetheless, companies price based on very little information – typically age and a few broad health categories – and do not experience rate their policies.

state independent utility $(U_s = U \; \forall \; s)$, no consumption value for home health care ($F_{hhc,t} = 0$), no difference in the consumption value of care provided by public and private payers $(\alpha_s = 1 \; \forall \; s)$, no bequest motives, no role for family members in providing home health care, and no within-household risk sharing. In the sensitivity analysis below, we relax each of these assumptions in turn and conclude that our core findings are not sensitive to these alternative models.

4. Willingness to Pay Results

4.1 Basic Findings

We first present the findings of the model with the parameterization described above, for various points in the wealth distribution. Specifically, we calculate the willingness to pay for 65-year old men and women at each decile in the wealth distribution. Our estimate of the wealth distribution is based on a sample of individuals who are 65 in the 1996, 1998 or 2000 Health and Retirement Survey (HRS).[15] Total wealth is defined as the sum of financial wealth (which excludes housing wealth and any annuitized wealth) and annuitized wealth. Annuitized wealth is defined as the sum of the present discounted value of Social Security benefits and defined benefit pension wealth, which are calculated using the Social Security and pension calculators from Coile & Gruber (2000). All wealth measures are computed on a household basis, and converted to individual wealth levels using an equivalence scale approach.[16] The results are shown for men and for women in Figures 1 and 2 respectively.[17] We report results for three different levels of risk aversion. Table 2 provides the exact numbers underlying the figures. As in all subsequent tables, positive willingness to pay estimates are shaded gray in Table 2.

[15] We are extremely grateful to Courtney Coile and Josh Rauh for their help constructing these estimates in the HRS.
[16] We assume an equivalence scale of 1.25, where 1 implies perfect economies of scale and 2 implies no economies of scale in household consumption. The existing literature (Citro and Michael 1995; Jorgenson and Slesnick 1997) generally finds higher equivalence scales. Our assumption is thus conservative, in that it biases up and individual's "effective wealth" and thus our estimate of willingness to pay for private long-term care insurance.
[17] These figures report results starting at the 30th percentile of the wealth distribution. This is because at lower points in the wealth distribution, the welfare effect of a forced purchase of long-term care is worse than losing all of the individual's limited financial wealth.

According to the model, most individuals throughout the wealth distribution do not have a positive willingness to pay for this long-term care insurance policy at existing prices. This is broadly consistent with the high non-purchase rate (90 percent) among the elderly population found in survey data. For example, at risk aversion of 3, private insurance only becomes attractive at the 70th percentile for men and the 60th percentile for women. Moreover, we ascertained (in results not shown) that the negative willingness to pay in the bottom half of the wealth distribution persists at substantially higher risk aversion levels at well. For example, at the fourth decile, it is not until risk aversion reaches 8 for men and 10 for women that the individual has a positive willingness to pay for the contract; at the fifth decile, risk aversion of 5 is required. At lower levels of risk aversion, the negative willingness to pay extends much farther up the wealth distribution; indeed, with log utility (CRRA = 1), even a male or female at the 90th wealth percentile would find the purchase of the policy welfare reducing.

To get a sense of the willingness to pay estimates, consider the estimate for a male at the 50th percentile of the wealth distribution with risk aversion of 3. He has a willingness to pay (over and above the required premiums) of -$11,412. This means that if the individual were forced to purchase the given policy at existing prices, it would reduce his welfare the same amount as a loss of $11,412 in financial wealth. This is a significant welfare loss, both relative to the individual's total wealth (approximately $222,500) and relative to the expected present discounted value of premiums paid by this individual for this policy (approximately $16,260).

Our results suggest that, given the features of private insurance contracts and the structure of public insurance, most risk-averse life cycle consumers would not be willing to pay for private insurance. We now investigate whether this limited willingness to pay primarily reflects supply-side market failures that could raise the loads and reduce benefit comprehensiveness of the available contracts, or whether it primarily reflects limitations in demand due to the public Medicaid program.

Before proceeding with this analysis, it is worth noting that the basic results of the model presented thus far already suggest a large effect of Medicaid on the demand for private long-term care insurance. First, 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). This suggests that Medicaid is severely curtailing at least the women's demand for private long-term care insurance, because in the absence of Medicaid, we would expect a risk averse individual to be willing to pay something above actuarially fair prices for insurance.

Second, willingness to pay becomes positive for men and women at a given risk aversion level at basically the same point in the wealth distribution. This finding of the model is consistent with the empirical evidence that long-term care insurance coverage rates are comparable for men and for women (Brown and Finkelstein, 2004, HIAA 2000a). Similar coverage rates and willingness to pay might both seem surprising, given that, as discussed, unisex pricing results in substantially higher loads on policies for men than for women. We will show below however that, the structure of Medicaid is an offsetting factor that decreases the willingness to pay for women relative to men. Because their expected lifetime utilization of long-term care is greater, women are even more likely than men to end up on Medicaid with or without private insurance. Thus, we find that the implicit tax Medicaid places on private insurance payments is substantially larger for women than for men.

Finally, the results in Table 2 indicate that willingness to pay rises monotonically with wealth for both men and women. Again, this finding of the model is consistent with the empirical distribution of long-term care insurance coverage, which also rises substantially with wealth (Brown and Finkelstein, 2004, HIAA 2000a). However, in the absence of Medicaid, CRRA utility implies that willingness to pay to insure against a fixed loss distribution should be decreasing with total wealth.[18]

4.2 Correcting Potential Market Failures: How Much Insurance Coverage Can This Stimulate?

There are two aspects of the private insurance contract studied in Table 2 that may be reducing the individual's willingness to pay. First, the $100 daily benefit cap results in an insurance policy that is far from comprehensive. Second, at least for men, there is an enormous load (i.e. markup) on the contract.

[18] The existence of Medicaid suggests that the relationship between willingness to pay and wealth should in fact be an inverted U-shape; those at the low end of the distribution may not find it valuable due to the existence of Medicaid while those at the high end may be able to self insure. We believe this pattern is not observed in empirical survey data simply because the "peak" in insurance value occurs in practice extraordinarily high up in the wealth distribution. For example, we have confirmed that willingness to pay for insurance is still rising with wealth – albeit at a diminishing rate – as total wealth levels as high as $3 million.

As we discussed at the outset, there are a variety of supply-side market failures – such as asymmetric information and imperfect competition – that could be responsible for this limited comprehensiveness and the high loads. We do not specify the particular market failure(s) that may be involved. Rather, we examine the willingness to pay for hypothetical contracts that might be available in the absence of such failures, namely, *actuarially fair* contracts, and *comprehensive* private insurance contracts.

We begin in Table 3 by replicating the analysis in Table 2 of the willingness to pay for policies with a $100 daily benefit, except that we now make the policies actuarially fair. There are two different ways to think about making premiums actuarially fair. Recall that policies are currently priced on a unisex basis, so that they are substantially worse than actuarially fair for men (load of 0.50) but actually slightly better than actuarially fair for women (load of –0.06). One approach is to keep the pricing on a unisex basis but lower the premium so that it is actuarially fair on average. Specifically, we assume – consistent with the existing data – that equal proportions of men and women buy the policy, and thus the premium is lowered from $151 per month (at current loads) to $117 per month so that the average (or unisex) load is 0. Both men and women therefore have their load reduced from current levels; for men it falls from 0.50 to 0.36, for women it falls from –0.06 to –0.36. The resulting willingness to pay is shown in the top panel of Table 3. Of course, compared to the results in Table 2, willingness to pay rises for each individual due to the reduction in loads. However, wiliness to pay remains negative for most individuals. Indeed, even with risk aversion of 3, it is not until the 60th percentile of the wealth distribution that men or women have a positive willingness to pay for long-term care insurance.

Panel B of Table 3 shows the results when we instead make the results actuarially fair separately by gender. Thus both men and women face a 0 load. Of course, for women, willingness to pay goes down, since the current market loads used to calculate willingness to pay in Table 2 are actually better than actuarially fair for women (i.e. –0.06 rather than 0). We therefore focus on the more interesting results for men. Here, we have reduced the load substantially – from 50 cents on the dollar to 0 – thus cutting monthly premiums in half from $151 to 76. Now the median male is just willing to pay for private insurance, but only at risk aversion of 3, and the value is quite low.

The 50 cent reduction in load needed to get the median male with risk aversion of 3 willing to pay for a typical private policy is substantially greater than what public policy is likely to accomplish. By way of comparison, we estimate that, even under generous assumptions, the recently-introduced federal tax subsidies for employer-provided long-term care insurance (Wiener et al., 2000) could only reduce the load on the policy to 0.17 for men and -0.76 for women.[19] At these loads, willingness to pay remains negative for both the median male and female, even at risk aversion 3.

Of course, although we have made the policies actuarially fair in Table 3, they provide very little insurance. Because of the $100 daily benefit cap, the policy covers only about 45 percent of the expected present discounted value of long-term care expenditures. This is because at the expected age of entry into care (see Table 1), $100 is only two-thirds of daily assisted living facility costs and one-third of daily nursing home costs.[20] Since the value of an insurance contract stems from its ability to improve consumption smoothing by reducing uncertainty, the limited coverage offered by the policy studied may not provide enough consumption smoothing to be welfare enhancing, especially given above-actuarially fair pricing. An important question therefore is whether individuals would be willing to pay for more comprehensive contracts if they were made available. Table 4 therefore repeats the analysis in Table 3 for actuarially fair policies with no daily benefit cap. These "uncapped" policies offer comprehensive, full insurance. Again, Panel A shows the results when the policies are actuarially fair on average, while Panel B shows the results when the policies are actuarially fair for each gender.

The results are striking and represent a key finding of our paper: *even if we eliminate all potential market failures and make fully comprehensive policies available at actuarially fair prices, most individuals would still be unwilling to pay for these policies*. For example, Panel B shows that when policies are made actuarially fair by gender, willingness to pay for an actuarially fair comprehensive policy is not positive, even with risk aversion of 3, for men until the 60th percentile and for women until

[19] This assumes that the employer pays all of the premiums, that the incidence of the subsidy is fully on the employee, a 15.3 percent payroll tax, and that the median individual has a marginal tax rate of 27.5 percent.
[20] Nonetheless, it is slightly *more* comprehensive than typical policies bought in 2002 which tend to have similar daily benefit levels but also some deductibles and limited benefit durations that further reduce the comprehensiveness to about one-third (Brown and Finkelstein, 2004).

the 70th percentile; at risk aversion of 1, willingness to pay does not become positive for either men or women until the 90th percentile.

At actuarially fair premiums, not only are most individuals not willing to pay for an uncapped full insurance policy, but they are less willing to pay for an uncapped policy than for a more limited (capped) policy. For example, we find that for the median female with risk aversion 3, willingness to pay is not only negative at all positive daily benefit levels, but it decreases monotonically in the benefit level (results not shown); it is thus highest (although still negative) at the smallest daily benefit level and lowest for an uncapped policy. Similarly, while the results in Table 3 Panel B indicate that at a 0 load the median male with risk aversion 3 has a positive willingness to pay for a $100 daily benefit policy, we find that a load of 0 can only induce a positive willingness to pay for this individual for policies with less than a $125 nominal daily benefit cap. Moreover, at 0 load, the preferred policy (where willingness to pay peaks) is a $55 per day constant nominal benefit cap; such a policy covers less than one-third of expected present discounted value of expenditures (results not shown).

The intuition for our finding that the median individual prefers smaller to larger benefit policies, even at actuarially fair prices is that Medicaid reduces the value of larger benefit policies relative to smaller benefit policies because a larger policy provides coverage for expenditures that are mot likely to be redundant of what Medicaid would have otherwise covered.[21] In other words, conditional on being eligible for the benefits offered by a comprehensive (uncapped) policy but not by a limited (capped) policy, the individual has to have substantial long-term care expenditures; but it is precisely in such catastrophic cases that Medicaid will provide coverage. By contrast, a limited private insurance policy is more likely than a comprehensive policy to offer benefits that, in the absence of this policy, would be paid for out of pocket rather than by Medicaid. For example, even a $25 constant nominal daily benefit would be sufficient to cover all of a 65-year old man's home health care expenditures for the first 15 years of the policy. It is unlikely that the these expenditures alone would qualify a median-wealth individual for

[21] In Section 5 we provide a way of quantifying the redundancy of private insurance benefits for Medicaid benefits and explore this in more depth.

Medicaid, and three-quarters of the 65-year old men who incur home health care expenditures in the first 15 years will incur no other long-term care expenditures during that time. Thus a limited policy can provide valuable consumption smoothing in some states, without substantially substituting for "free" Medicaid coverage in cases where the individual's expenditures are catastrophic.

4.3 Sensitivity Analysis

We investigated the sensitivity of our core results to alternative modeling assumptions. Given the nature of our findings, our primary concern is whether reasonable alternative modeling assumptions could substantially increase the willingness to pay for a private insurance policy and thus overturn either our finding in Table 2 that most individuals do not want to buy existing insurance contracts at existing prices, or our finding in Table 4 that most individuals are not willing to pay for comprehensive, actuarially fair policies.[22]

We therefore concentrate, in turn, on three factors that the base case model does not account for and that might serve to increase willingness to pay for private insurance. First, we consider the possibility that individuals may view being in an institution as worse than residing in a home. To allow for this possibility, we allow for state-dependent utility where the marginal utility of consumption is lower in a nursing home than in home care. We also allowed for the possibility that the provision of home care might provide some direct consumption value (which is not in our base case). Second, we consider the possibility that Medicaid may be a less attractive substitute for privately funded care than we have modeled it; for example, the quality of Medicaid-funded care may be lower than care provided by privately funded providers, or individuals may feel some stigma associated with receiving Medicaid.[23]

Our final set of alternative specifications considers several different ways that other family members may increase willingness to pay for long-term care insurance. These include: the presence of bequest

[22] We are therefore not interested in exploring extensions to the model here that would simply strengthen our findings. For example, we do not explore how willingness to pay would change if we incorporate the presence of uninsured aggregate risk – such as the risk that public insurance may become more generous over time (thus making one's private insurance benefits redundant), or that long-term care costs will rise substantially more than expected – because this would serve only to further lower the willingness to pay for private contracts (Cutler, 1996).

[23] Empirically, the evidence on whether Medicaid patients receive lower quality care is mixed. See for example Nyman (1988a), Nyman (1988b), and Ettner (1993).

motives, the possibility that family members may provide an *in-kind substitute* for private insurance through the provision of unpaid care, the possibility that family members may provide a *financial substitute* for private insurance, and the possibility that individuals receive substantial *dis*utility from family provided care (i.e. aversion to "being a burden"). In addition, the utility consequences of Medicaid's asset and income tests could be more important to an individual entering long-term care if he is concerned about the resources available to his community-based spouse. To investigate this possibility, we develop and calibrate a household decision-making model and incorporate the joint distribution of the two spouse's long-term care utilization.

Appendix B provides a detailed description of the modeling approaches taken in each alternative specification as well as their effect on willingness to pay. Overall, we find that our results are remarkably robust to all of these alternative specifications. In short, we continue to find that the welfare gains from purchasing private insurance are limited to the upper end of the wealth distribution.

5. Understanding the Results: the Role of Medicaid

The above results suggest that Medicaid has a substantial depressive effect on demand for private long-term care insurance. Should we be concerned about such a crowd out effect? After all, if Medicaid is efficiently providing comprehensive insurance to individuals, then simply substituting public for private provision of care might not have a first order welfare effect on individuals.

In this section, however, we demonstrate that Medicaid in fact is a poor substitute for comprehensive insurance for most households, because Medicaid does not allow most individuals to fully smooth their consumption shocks. Moreover, we show that the current structure of Medicaid as secondary payer is particularly inefficient, and that it is possible for Medicaid to provide catastrophic coverage without imposing such large implicit taxes on private insurance contracts by altering its secondary payer structure.

5.1 What are the Implications of Medicaid Crowd-out for Total Insurance Coverage?

If Medicaid is itself a reasonably comprehensive or "good" insurance product, its crowd-out effect on private insurance coverage would not be important for *total* (public plus private) insurance coverage. In

fact, however, Medicaid is far from a comprehensive insurance product. As discussed in Section 1.3, Medicaid requires a deductible of virtually all one's entire assets and income. It thus imposes a severe restriction on an individual's ability to engage in optimal consumption smoothing across states of care and over time. In addition, for individuals who recover and exit from care, the substantial reduction in wealth that Medicaid imposes limits the consumption opportunities available for the rest of their life.

Table 5 provides two simple ways of illustrating the incomplete nature of the insurance provided by Medicaid. To conserve space, all results are shown for risk aversion of 3, although the results are qualitatively similar at other levels of risk aversion. The first column shows the proportion of the expected present discounted value of long-term care expenditures covered by Medicaid when an individual follows his or her optimal intertemporal consumption path in the absence of private long-term care insurance. The proportion of expenditures covered by Medicaid declines rapidly with wealth. For example, for men at the 1st decile in the wealth distribution, Medicaid covers 98 percent of their EPDV of long-term care expenditures, compared to 60 percent at the 5th decile and 7 percent at the 9th decile. The results for women show a similar pattern.

The second column reports how much an individual would be willing to pay for an actuarially fair policy that covers the expenditure risk that is not already covered by Medicaid. In other words, it is the willingness to pay for a fairly priced contract when there is no implicit Medicaid tax on the benefits. The results suggest that the vast majority of the wealth distribution would be willing to purchase such a policy. For example, for the median male (female), the welfare gain associated with buying such a policy is equivalent to an increase in their total financial wealth of nearly $20,000 ($30,000). Only in the bottom two deciles would individuals not have substantial gains from the ability to purchase such a policy.

These results indicate that there is a considerable net welfare cost from the risk not insured by the existing Medicaid program. The Medicaid program is providing insurance that is substantially inferior to what a comprehensive policy would provide, and yet existence of Medicaid makes private insurance undesirable. The net result is a reduction in overall insurance coverage.

5.2 Why does Medicaid Crowd-out Private Insurance Coverage?

Two aspects of the design of Medicaid can limit demand for private insurance: its provision of catastrophic coverage and its provision of this coverage as a secondary payer. By providing catastrophic coverage as a payer of last resort, Medicaid effectively provides a consumption floor below which individuals cannot fall. It thus reduces the risk exposure faced by an individual, and therefore the marginal utility from (and hence willingness to pay for) additional private insurance. However, our results indicate that the provision of catastrophic coverage *per se* is not sufficient to eliminate individuals' demand for private insurance throughout most of the wealth distribution. The results in Table 5 indicate that – even given the existence of this catastrophic coverage – individuals are willing to pay for actuarially fair insurance to cover the expenditures not covered by Medicaid. Moreover, in results not shown, we estimate that even if men had to face current market loads of 0.5 (rather than actuarially fair prices) for this supplemental coverage, the median male would still have a positive willingness to pay for this supplemental coverage of close to $13,000. Since current market loads for women are better than actuarially fair, the results in Table 5 indicate that the median woman would also have a large willingness to pay for such a private supplemental policy at current market loads.

Individuals are not able to purchase such a policy, however, because Medicaid is by law a *secondary payer* when the individual has private insurance. Specifically, the Center for Medicare & Medicaid Services policy states "the Medicaid program by law is intended to be the payer of last resort; that is, all other available third party resources must meet their legal obligation to pay claims before the Medicaid program pays for the care of an individual eligible for Medicaid. Examples … include … long-term care insurance."[24] In other words, if an individual has private insurance, the private policy pays first, even if the individual's asset and income levels make him otherwise eligible for Medicaid. In this situation, Medicaid will only pay for any expenditures not reimbursed by the private policy. As a result, some private insurance benefits are *redundant* of what Medicaid would have paid for if the individual did not have private insurance.

[24] Information take from Center for Medicare and Medicaid services website (www.cms.hhs.gove/medicaid/tpl/default.asp) on May 5, 2005.

Table 6 illustrates the impact of Medicaid's secondary payer status on private insurance policies for an individual with risk aversion of 3. Columns 1 and 2 show, respectively, the share of long-term care expenditures paid for by Medicaid when the individual does not have private insurance and when the individuals has a private insurance policy with a $100 daily benefit cap. Medicaid expenditures with and without private insurance are calculated assuming that the individual follows his or her optimal consumption path in each case, which in turn affects when the individual will satisfy Medicaid's income and asset disregards. The results show a substantial decrease in Medicaid expenditures associated with having a private insurance policy, reflecting the fact that expenditures that would have previously been paid for by Medicaid are now reimbursed by the private insurance policy. For example, for the median male or female, the share of long-term care expenditures paid for by Medicaid when the individual does not have private insurance is double the share when the individual does have private insurance.

Medicaid's provision of catastrophic coverage as a secondary payer thus imposes an implicit tax on private insurance policies; Column 3 reports estimates of this implicit tax. We define this implicit tax as the percentage of EPDV benefits from the private policy that are redundant of benefits that Medicaid would otherwise have paid; in other words, it is the difference between the gross and net benefits from the private policy, as a percentage of the gross benefits. The implicit tax associated with Medicaid 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 for both men and women. In other words, almost all of the benefits from a private policy are simply substitutes for benefits that the individual would otherwise have received from Medicaid. Given this, it is not surprising that these individuals would not want to purchase private insurance. Even for the median male (female), three-fifths (three-quarters) of the expected present discounted value of expenditures from the private long-term care insurance policy are redundant of expenditures that Medicaid would have otherwise covered; in other words, only two-fifths (one-quarter) of the private policy's expenditures represent *net* insurance benefits. The implicit tax declines with

wealth, as wealthier individuals' expenditures are less likely to be eligible for Medicaid coverage.[25]

Another way to conceptualize the implicit tax is to frame it in terms of the "net load" of a private policy. Up until this point, we have referred to the "load" of a policy as one minus the ratio of the expected present value of benefits to the expected present value of premiums. This load is an accurate measure of the load from the perspective of the insurance company because the company is required to make these payments irrespective of whether these benefits are redundant of what Medicaid would otherwise have paid. However, from the individual's perspective, this "gross load" measure does not include the large implicit tax that Medicaid imposes on the purchase of a private policy, and thus it understates the effective, or net, load that individuals face.

In the net load calculation, we replace the expected present value of total benefits paid by the private policy with the expected present value of just those benefits that are not duplicative of Medicaid.[26] In other words, any benefits paid by the private policy that simply replace what Medicaid would have paid had the person not insured are not counted as benefits from the individuals' perspective. As with the implicit tax calculation, the net load depends not only on the individual's wealth and long-term care risk but also on his behavioral response to having insurance. As the individual changes his consumption path in response to having insurance, this affects his asset and income spend down and thus when he will be eligible for Medicaid.

Framing the results as a "net load" helps to shed additional light on several of the results reported in Section 4 about who would and would not be willing to purchase private policies. As shown in column 4 of Table 6, these net loads are much higher than gross loads, and increase as wealth decreases. From this perspective, it is easy to see why individuals in the lower three-quarters of the wealth distribution would not wish to purchase such a policy. Indeed, even if policies were actuarially fair on a gross load basis, the

[25] In results not shown, we find that the implicit tax rates are even larger at lower risk aversion levels. This is because at lower levels of risk aversion, the individual is relatively less concerned about consumption smoothing, and therefore is more willing to spend down their own assets quickly in order to qualify for Medicaid. As a result, Medicaid covers a larger fraction of their total long-term care expenditures.

[26] $$\text{Net Load} = 1 - \frac{\text{EPDV(Benefits) - (Mcaid Expend w/o Private Insurance - Mcaid Expend with Private Insurance)}}{\text{EPDV(Premiums)}}$$

net loads that include the implicit tax are substantial. This is precisely why, even at prices that are lower than actuarially fair from the company's perspective, so few women wish to purchase private insurance.

In addition, these results help shed light on the interesting finding that men and women in our model value insurance similarly, despite having such different loads. Women face much higher implicit tax rates from Medicaid than men do at any point in the wealth distribution. This is simply because women have much higher expected long-term care expenditures than do men, and thus, for any given level of wealth, have a much higher proportion of their expenditures covered by Medicaid. As a result, the fraction of private insurance benefits that end up being duplicative of Medicaid is higher for women than for men. As a result of these higher implicit taxes, the net loads for men and women are much more similar than the gross loads. Specifically, whereas the gross loads are 0.50 for men and -0.06 for women, we estimate that the median male faces a net load of 0.80, while the median female faces a net load of 0.75. From this perspective, the lack of significant gender-based differences in purchase patterns is more easily understood.

It is also worth noting that the implicit Medicaid tax is higher on an uncapped policy than on a policy with a $100 daily benefit. This is why we found that the willingness to pay for more comprehensive policies (see Section 4.2) was more negative than their willingness to pay for less comprehensive policies.

5.3 The Implicit Tax and Public Policy Interventions

As previously noted, both the federal and state governments have been using tax policy and changes to Medicaid rules in an attempt to stimulate private insurance demand. What do the results of this model suggest about the efficacy of such approaches?

Tax subsidies of the magnitude being implemented may simply be too small to offset the enormous net load that arises due to the implicit Medicaid tax. Earlier, we discussed that even generous estimates of the impact of the recently-enacted federal tax subsidy for long-term care insurance on prices would be insufficient to get the median individual to purchase private insurance, even though this would reduce the (gross) load from 0.50 to 0.17 for men and from -0.06 to -0.76 for women. The explanation lies in the fact even with these subsidies, we estimate that the *net* loads are still 0.67 for men and 0.59 for women at the

median of the wealth distribution. In fact, we estimate that the median male is not willing to purchase private insurance until the gross load is approximately 0.03, at which point the net load is approximately 0.60.

Similarly, we find that reforms to Medicaid are unlikely to have a large impact if the reforms do not alter the fact that Medicaid is a secondary payer. For example, we explored the effect on willingness to pay of the type of Medicaid reform that was enacted by several states, including New York and California, in the early 1990s to increase demand for private insurance (Wiener et al., 2000). These reforms essentially raised the asset disregard ($\underline{W}$) *if and only if* the individual has bought a qualifying private long-term care insurance policy. To illustrate the effect of such a policy, we report in Table 7 the willingness to pay if the asset disregard is increased from $2,000 if the individual does not have private insurance to $20,000 if the individual does have private insurance. To put these numbers in perspective, $20,000 is slightly more than EPDV of benefits from a private policy for a woman, and more than double that for a man; it also represents an increase in the asset disregard from buying private insurance that is considerably more generous than the state reforms (Wiener et al., 2000).

Our results suggest that even this large reform has little effect on willingness to pay for private long-term care insurance policies. While the effect goes in the expected direction, namely that such a reform makes the private insurance policy slightly more attractive, the increase in the willingness to pay is insufficiently small to have much effect on overall insurance purchases. There are very few combinations of wealth and risk aversion where such a policy is sufficient to switch a person's willingness to pay from negative to positive. In results not reported, we have allowed the asset test floor for those with insurance to go as high as $40,000 (versus the $20,000 reported in Table 7), and found that the marginal effect of such changes on WTP is very small. In short, our model suggests that such a policy change is unlikely to have a significant effect on overall purchase patterns. Consistent with these results, only a handful of private insurance policies have been sold to individuals through these state-run reform programs (Wiener et al., 2000).

The basic reason for the small effect is that even with this more generous asset test for individuals who purchase insurance, Medicaid is still serving as secondary payer. As such, it continues to impose a large implicit tax on purchases of private insurance. For example, recall that for a female at the median of the wealth distribution, the net load under the standard Medicaid rules is 0.75. Under this reform in which the Medicaid system has a more generous asset test for those who buy insurance, the net load declines, but only to 0.68. As such, this individual is still better off relying on "free" Medicaid than purchasing a private policy that is duplicative of Medicaid's benefits.

However, it is possible to design Medicaid reforms to reduce the large implicit tax on private insurance without reducing Medicaid's function of providing a consumption floor in the face of large expenditure shocks. Specifically, if Medicaid were structured to provide coverage as a *primary* payer relative to the private policy, then individuals who purchased the private policy would no longer have to pay the implicit tax. That is, they would not have to "waste" a large fraction of the purchase price of the policy on benefits that they would have otherwise received from Medicaid. An alternative approach to eliminating the implicit tax that is based on this same concept would be to offer individuals who purchase an uncapped private insurance contract a refundable tax credit equal to the expected present discounted value of their long-term care expenditures. Our results suggest that individuals throughout most of the wealth distribution would experience significant utility gains from such reforms.

Of course, such alternative designs do not come without potential costs. For example, changing Medicaid from a secondary to a primary payer with respect to private insurance would actually *increase* Medicaid expenditures since, by definition, Medicaid would now cover all expenditures for Medicaid-eligible individuals, whether or not they had private insurance. The upper bound on this increase in expenditures is capped at the current total expenditures of private long-term care insurance, which are currently only 4 percent of total long-term care expenditures.[27] Similarly, allowing individuals to get their expected Medicaid expenditures "refunded" if they purchase comprehensive private insurance may

[27] The actual increase in expenditures is likely to be lower since individuals with private insurance are disproportionately wealthy and therefore have lower than average Medicaid expenditures with or without private insurance.

result in the lower risk individuals selecting out of the social insurance system. While the "optimal" design of Medicaid is a topic well beyond the scope of the current paper, our findings raise the possibility that restructuring the Medicaid program could substantially reduce Medicaid's crowd out effect on private insurance demand without reducing the public provision of catastrophic coverage for those who choose not to purchase private policies. We consider analysis of the optimal design of Medicaid an important area for further research.

6. Conclusions

This paper has presented the first careful examination of the relative role played by the public Medicaid program and potential private market failures in contributing to the limited size of the private long-term care insurance market. To do so, we developed an analytical framework for estimating a risk averse individual's willingness to pay for a long-term care insurance contract. We calibrated the model using detailed actuarial data on long-term care expenditure risk and the current structure of the public Medicaid program and existing private insurance policies. Our model produces results that are broadly consistent with the empirical patterns in survey data in terms of the limited fraction of the elderly who buy insurance, and the patterns of coverage by gender and by wealth.

Our main finding is that, given the presence of Medicaid, individuals throughout most of the wealth distribution prefer not to purchase private insurance *even if it is available at actuarially fair prices*. Thus even if we eliminate potential supply-side market failures so that comprehensive insurance policies are available at actuarially fair prices, most individuals would still not want to buy these policies given the existing Medicaid program.

Our findings underscore the fundamental role played by Medicaid in limiting demand for private insurance. Furthermore, we show that since Medicaid itself provides far from comprehensive insurance, reliance on public insurance alone leaves most individuals exposed to substantial out-of-pocket expenditure risk. Moreover, we estimate that the large crowd-out effect of Medicaid stems not from its role as a payer of last resort *per se*, but rather from the fact that it is a *secondary payer* if the individual also has private insurance and therefore imposes a large implicit tax on private insurance policies.

Elimination of Medicaid's secondary payer status would eliminate this large implicit tax, without reducing the catastrophic insurance coverage provided by Medicaid.

REFERENCES

Abt Associates. 2001."Financing long-term care for the baby boom generation." HSRE Working Paper 8.

AARP. 2000. "Medicaid Financial Eligibility for Older People: State variations in access to home and community-based waiver and nursing home services." April.

Barksy, Robert. B, Miles S. Kimball, F. Thomas Juster, and Matthew D. Shapiro. 1997. "Preference Parameters and Behavioral Heterogeneity: An Experimental Approach in the Health and Retirement Study." *Quarterly Journal of Economics* 112 (1), May.

Brown, Jeffrey R. and James M. Poterba, "Joint Life Annuities and Annuity Demand by Married Couples," *Journal of Risk and Insurance*, Vo. 67, No. 4, December 2000, 527 - 553.

Brown, Jeffrey R. and Amy Finkelstein. 2004. "High Prices, Limited Benefits: New Evidence from Long-Term Care Insurance." Unpublished mimeo.

Citro, Constance F. and Robert T. Michael, 1995, *Measuring Poverty: A New Approach*, National Academy Press: Washington, D.C.

Coile, Courtney and Jonathan Gruber 2000. "Social Security Incentives for Retirement." NBER working paper 7651. April.

Congressional Budget Office. 2004. "Financing Log-Term Care for the Elderly." April

Congressional Budget Office. 1999. "Projections on expenditures for long-term care services for the elderly." March.

Congressional Research Service. 2002. "Medicaid: Eligibility for the Aged and Disabled."

Cutler, David and Jonathan Gruber. 1996. "Does Public Insurance Crowd Out Private Insurance?" *Quarterly Journal of Economics*.

Cutler, David. 1996. "Why Don't Markets Insure Long-Term Risk?" Mimeo.

Davidoff, Tom, Jeffrey R. Brown and Peter A. Diamond. 2003. "Annuities and Individual Welfare." NBER Working Paper #9714. May.

Davis, Steven J., Felix Kubler, and Paul Willen, "Borrowing Costs and the Demand for Equity Over the Life Cycle," NBER Working Paper #9331

Dick, Andrew, Alan Garber and Thomas MaCurdy. 1994. Forecasting Nursing Home Utilization of Elderly Americans. In David Wise (ed) Studies in the Economics of Aging.

Engen, Eric M., William G. Gale and Cori R. Uccello, 1999, "The Adequacy of Retirement Saving," Brookings Papers on Economic Activity, 2, 65-165

Ettner, Susan. 1993. "Do Elderly Medicaid Patients Experience Reduced Access to Nursing Home Care?" *Journal of Health Economics*, 11: 259-280.

Evans, William and W. Kip Viscusi. 1991. "Estimation of State-Dependent Utility Functions Using Survey Data." *Review of Economics and Statistics* 73:1. pp. 94 – 104

Finkelstein, Amy. Forthcoming. "The interaction of partial public insurance programs and residual private insurance markets: evidence from the U.S. Medicare Program." *Journal of Health Economics.*

Finkelstein, Amy and Kathleen McGarry. 2003. Private Information and Its Effect on Market Equilibrium: New Evidence from Long-Term Care Insurance. NBER WP 9957.

Gruber, Jonathan. Forthcoming. "Medicaid" in Moffit, Robert (ed.) Means Tested Transfer Programs in the United States.

Health Insurance Association of America (HIAA). 2000a. Who buys LTC insurance in 2000?

Health Insurance Association of America (HIAA) 2000b. LTC insurance in 1997 – 1998.

Health Insurance Association of America (HIAA). 2001. Who buys long-term care insurance in the workplace? A study of employer long-term care insurance plans 2000-2001.

Hubbard, Glenn, Jonathan Skinner, and Stephen Zeldes. 1995. "Precautionary Savings and Social Insurance." *Journal of Political Economy* vol 103, iss 2, pp. 360-99.

Hurd, Michael D. 1989. "Mortality Risk and Bequests." *Econometrica* 57 (4) 779-813.

Institute of Medicine. 2001. Improving the quality of long-term care. National Academy Press.

Jorgenson, Dale W. and Daniel T. Slesnick, "Aggregate Consumer Behavior and Household Equivalence Scales," in Dale W. Jorgenson, ed., Welfare Volume 2: Measuring Social Welfare. The MIT Press. 1997. 219 - 251.

Jousten, Alain. 2001. "Life-Cycle Modeling of Bequests and Their Impact on Annuity Valuation." Journal of Public Economics v79, n1 (January): 149-77

Kaplan, Richard. 2004. "Cracking the Conundrum: Toward a Rational Financing of Long-Term Care." *University of Illinois Law Review* forthcoming.

Kemper, Peter and Christopher Murtaugh. 1991. Lifetime use of nursing home care." *New England Journal of Medicine* 324: 595-600.

Kotlikoff Laurence and Avia Spivak. 1981. The Family as an Incomplete Annuities Market. *Journal of Political Economy* 89(2):372-391.

Lakdawalla, Darius, Jay Bhattacharya, and Dana Goldman. 2001. "Are the young becoming more disabled?" NBER Working Paper 8247.

Lakdawalla, Darius and Tomas Philipson. 2002. "The rise of old-age longevity and the market for long-term care." *American Economic Review* Vol 92, Number 1 pp. 295-306.

Laibson, David, Andrea Repetto and Jeremy Tobacman. 1998. "Self Control and Saving for Retirement." *Brookings Papers on Economic Activities.*

Manton, Kenneth, Larry Corder and Eric Stallard. 1997. "Chronic disability trends in the elderly United States populations: 1982 – 1994." *Proceedings of the National Academy of Sciences* Vol 94, pp.2593-2598. March.

Manton, Kenneth and XiLiang Gu. 2001. "Changes in the prevalence of chronic disability in the United States black and nonblack population above age 65 from 1982 to 1999." *Proceedings of the National Academy of Sciences*, Vol 98, no 11, pp. 6354-6359, May.

MetLife Mature Market Institute. 2002a. "MetLife Market Survey of Nursing Home and Home Care Costs 2002."

MetLife Mature Market Institute. 2002b. "MetLife Survey of Assisted Living Costs 2002"

Mitchell, Olivia S., James M. Poterba, Mark Warshawsky, and Jeffrey R. Brown. 1999. New Evidence on the money's worth of individual annuities. *American Economic Review*, 89(December), pp.1299-1318.

Murtaugh, Christopher, Peter Kemper, Brenda Spillman, and Barbara Carlso. 1997. "Amount, distribution, and timing of lifetime nursing home use." *Medical Care* (35): 3 pp. 204-218.

National Center for Health Statistics, 2002. Health, United States, 2002 with Chartbook on Trends in the Health of Americans. Hyattsville, Maryland: 2002.

Nyman, John. 1988a. "Excess Demand, the percentage of Medicaid Patients, and the Quality of Nursing Home Care." *Journal of Human Resources*, Vol. 23. No 1. pp.76-92

Nyman, John. 1988b. "The Marginal Cost of Nursing Home Care: New York, 1983." *Journal of Health Economics* Vol 7, No 4. pp.393-412.

Norton, Edward. 2000. "Long-term Care." In AJ Culyer and JP Newhouse (eds) Handbook of Health Economics, vol 1, ch 17. Elsevier Science.

Pauly, Mark. 1989. Optimal Public Subsidies of Nursing Home Insurance in the United States. *The Geneva Papers on Risk and Insurance* Vol 14, No 50, pp.3-10.

Pauly, Mark. 1990. The Rational Nonpurchase of Long-Term-Care Insurance. *Journal of Political Economy* 98(1): 153-168.

Palumbo, Michael G. 1999, "Uncertain Medical Expenses and Precautionary Saving Near the End of the Life Cycle" *The Review of Economic Studies*, Vol. 66, No. 2. (Apr., 1999), pp. 395-421.

Robinson, James. 1996. "A Long-Term Care Status Transition Model," presented at the 1996 Bowles Symposium on the Old-Age Crisis: Actuarial Opportunities. Georgia State University, September.

Robinson, James. 2002. "A long-term care status transition model." Mimeo, University of Wisconsin, Madison.

Scholz, John Karl, Ananth Seshadri and Surachai Khitatrakun. 2003. "Are Americans Saving 'Optimally' for Retirement?" University of Wisconsin working paper.

Society of Actuaries. 1992. "Report of the long-term-care experience committee: 1985 national nursing home survey utilization data." *Transactions of the Society of Actuaries*, 1988-89-90 Reports. pp.101-164.

Society of Actuaries. 1996. "Long-term care insurance valuation methods; society of actuaries long-term care insurance valuation methods task force." *Transactions of the Society of Actuaries*, 1995. vol 47. pp.599-773.

Society of Actuaries. 2002. "Long-term care experience committee InterCompany Study 1984-1999." http://www.soa.org/sections/intercompany_study.pdf.

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

Stone, Julie Lynn. 2002. "Medicaid: Eligibility for the Aged and Disabled." CRS Report for Congress RL31413. July 5.

Tillinghast - Towers Perrin. 2002. 2002 Pricing Methodology Survey. August.

United States Congress, Committee on Ways and Means (2000). Green Book 2000: Background Material on Programs Under the Jurisdiction of the Committee on Ways and Means, Washington DC: GPO.

Viscui, W. Kip and William Evans. 1990. "Utility Functions That Depend on Health Status: Estimates and Economic Implications." *American Economic Review* 80(3): 353-374.

Wiener, Joshua, Laurel Hixon Illston, and Raymond Hanley. 1994. Sharing the burden: strategies for public and private long-term care insurance. The Brookings Institution, Washington DC.

Wiener, Joshua, Jane Tilly and Susan Goldenson. 2000. "Federal and state initiatives to jump start the market for private long-term care insurance." *The ElderLaw Journal* 8(1): 57-99.

Young, Virginia R. and Mark J. Browne. 1997. "Explaining Insurance Policy Provisions via Adverse Selection." *The Geneva Papers on Risk and Insurance Theory* 22: 121-134.

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

				Duration of Use (Among Users)				Exit and reentry (among users)	
Type of Care		Prob Ever Use	Average Age of First Use (Among Users)	Average Years Spent in Care	Prob use more than 1 year	Prob use more than 3 years	Prob use more than 5 years	Prob ever exit to non-death state	Avg # of spells
Nursing Home (NH)	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 Facility (ALF)	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 (HHC)	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 (NH, ALF, or HHC)	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 based on an individual who at 65 is medically eligible to buy private long-term care insurance (i.e. has no limitations to activities of daily living and is not cognitively impaired). Care utilization is measured as care utilization by individuals who satisfy the health-related benefit triggers required for care costs to be reimbursable by insurance contracts. See Section 3.1 for further details.

Table 2: Willingness to pay for policy with $100 maximum daily benefit at current market loads

Wealth Percentile	Total Wealth	Percent Annuitized	Men Risk Aversion 1	Men Risk Aversion 2	Men Risk Aversion 3	Women Risk Aversion 1	Women Risk Aversion 2	Women Risk Aversion 3
10th	58,450	98	*	*	*	*	*	*
20th	93,415	91	*	*	*	*	*	*
30th	126,875	82	-17.4	-18.0	-18.2	-19.6	-20.3	-20.7
40th	169,905	70	-17.2	-17.1	-16.2	-19.1	-19.2	-18.9
50th	222,570	60	-16.2	-14.5	-11.4	-17.3	-15.4	-11.5
60th	292,780	52	-14.6	-10.8	-3.0	-14.2	-8.9	1.5
70th	385,460	41	-13.4	-6.5	6.4	-11.4	-1.3	14.4
80th	525,955	35	-10.9	0.2	17.7	-6.3	9.9	29.8
90th	789,475	26	-8.2	6.8	25.6	-0.1	21.0	41.6

* Denotes disutility from policy exceeds value of starting financial wealth

Notes: All willingness to pay estimates are in thousands of dollars. Positive willingness to pay results are shaded gray. Table reports a 65 year old's willingness to pay for a policy that covers all three types of care, has an unlimited benefit period, and pays a (constant nominal) maximum daily benefit of $100. The load on the policy is 0.50 for men and –0.058 for women (providing both with an equal monthly premium of $151). All other assumptions are described in the text.

Table 3: Willingness to pay for a $100 maximum daily benefit at actuarially fair premiums

Wealth Percentile	Men Risk Aversion			Women Risk Aversion		
	1	2	3	1	2	3
Panel A: Actuarially fair on average (0 Load on average. Load = 0.36 (men), -0.36 (women)						
10th	*	*	*	*	*	*
20th	*	*	*	*	*	*
30th	-13.4	-13.7	-13.8	-15.2	-15.7	-16.1
40th	-12.7	-12.3	-11.0	-14.3	-13.9	-13.5
50th	-11.6	-9.5	-6.1	-12.3	-10.0	-5.6
60th	-9.9	-5.7	2.6	-9.1	-3.3	7.3
70th	-8.6	-1.3	11.8	-6.3	4.1	20.0
80th	-6.0	5.4	22.9	-1.1	15.1	34.9
90th	-3.2	12.0	30.6	5.0	26.1	46.6
Panel B: Actuarially fair by gender (Load = 0 for both men and women)						
10th	*	*	*	*	*	*
20th	*	*	*	*	*	*
30th	-8.0	-8.1	-7.9	-20.7	-21.4	-21.8
40th	-7.0	-6.2	-4.4	-20.4	-20.6	-20.3
50th	-5.7	-3.2	0.8	-18.6	-16.9	-13.1
60th	-3.9	0.9	9.7	-15.6	-10.4	0.02
70th	-2.4	5.2	18.5	-12.8	-2.7	12. 9
80th	0.2	11.9	29.3	-7.7	8.5	28.4
90th	3.1	18.6	36.9	-1.5	19.7	40.3

* Denotes disutility from policy exceeds value of starting financial wealth

Notes: All willingness to pay estimates are in thousands of dollars. Positive willingness to pay results are shaded gray. In panel A, the average (or unisex) load is 0; it is 0.36 for men and -0.36 for women. In Panel B, the gender-specific load is 0. Otherwise, all parameters are as specified in the notes to Table 2.

Table 4: Willingness to pay for an uncapped policy at actuarially fair premiums

Wealth Percentile	Men Risk Aversion			Women Risk Aversion		
	1	2	3	1	2	3
Panel A: Actuarially fair on average (Load = 0.36 (men), -0.36 (women)						
10th	*	*	*	*	*	*
20th	*	*	*	*	*	*
30th	*	*	*	*	*	*
40th	-27.7	-28.0	-27.2	-30.4	-31.0	-31.2
50th	-25.9	-23.6	-18.6	-26.2	-22.5	-15.6
60th	-22.8	-16.0	-2.4	-19.3	-7.0	15.4
70th	-20.1	-7.2	16.4	-12.3	12.2	51.8
80th	-14.7	7.0	43.4	-0.1	41.0	103.3
90th	-7.9	25.1	72.9	15.9	78.6	158.2
Panel B: Actuarially fair by gender (Load = 0 for both men and women)						
10th	*	*	*	*	*	*
20th	*	*	*	*	*	*
30th	-16.8	-17.4	-17.7	*	*	*
40th	-15.5	-14.6	-12.7	-44.2	-46.1	-47.1
50th	-13.1	-9.2	-2.7	-41.1	-39.7	-35.8
60th	-9.6	-1.2	14.8	-34.6	-24.8	-6.2
70th	-6.6	7.8	33.0	-27.7	-5.7	30.7
80th	-1.1	22.1	59.5	-15.7	23.6	84.2
90th	6.0	40.3	88.7	0.6	61.7	140.9

* Denotes disutility from policy exceeds value of starting financial wealth

Notes: All willingness to pay estimates are in thousands of dollars. Positive willingness to pay results are shaded gray. Private policies have an unlimited daily benefit. In panel A, the average (or unisex) load is 0; it is 0.36 for men and -0.36 for women. In Panel B, the gender-specific load is 0. Otherwise, all parameters are as specified in the notes to Table 2.

Table 5: How Complete is Medicaid Coverage?

Wealth Percentile	Men		Women	
	Share of EPDV of LTC Expenditures Paid By Medicaid (No Private Insurance)	WTP for Act Fair Insurance to Cover Expenditures Not Covered by Medicaid	Share of EPDV of LTC Expenditures Paid By Medicaid (No Private Insurance)	WTP for Act. Fair Insurance to Cover Expenditures Not Covered by Medicaid
10th	0.98	0.0	0.99	0.0
20th	0.88	0.0	0.93	0.0
30th	0.80	3.3	0.88	2.3
40th	0.71	9.8	0.80	11.5
50th	0.60	19.6	0.72	29.3
60th	0.46	35.2	0.56	58.3
70th	0.32	51.0	0.45	86.3
80th	0.17	74.1	0.24	122.8
90th	0.07	100.9	0.08	166.3

Note: All estimates are for risk aversion of 3. WTP is in thousands of dollars. For all calculations, the EPDV of total long-term care expenditures is $43,750 for women, and 17,510 for men.

Table 6: Medicaid's Implicit Tax on a policy with a $100 daily benefit cap

Wealth Percentile	Share of EPDV of Expenditures Paid by Medicaid		Implicit Tax on Private Insurance	Net Load on Private Insurance
	No Private Insurance	With Private Insurance		
	(1)	(2)	(3)	(4)
Panel A: Men				
10th	0.98	0.52	0.998	1.00
20th	0.88	0.44	0.952	0.98
30th	0.80	0.41	0.840	0.92
40th	0.71	0.37	0.737	0.87
50th	0.60	0.32	0.594	0.80
60th	0.46	0.26	0.426	0.71
70th	0.32	0.20	0.272	0.64
80th	0.17	0.12	0.107	0.55
90th	0.07	0.05	0.036	0.52
Panel B: Women				
10th	0.99	0.55	0.999	1.00
20th	0.93	0.50	0.993	0.99
30th	0.88	0.46	0.946	0.94
40th	0.80	0.43	0.855	0.85
50th	0.72	0.38	0.767	0.75
60th	0.56	0.33	0.617	0.59
70th	0.45	0.24	0.470	0.44
80th	0.24	0.15	0.194	0.15
90th	0.08	0.06	0.054	-0.003

Note: All estimates are for risk aversion of 3. Estimate for private insurance always pertain to a policy with a $100 daily benefit cap. Implicit tax on private insurance is the percentage of long-term care insurance benefits that are redundant of Medicaid; it is defined as the decrease in Medicaid expenditures associated with having private insurance, as a percentage of the private insurance benefits. Net load is equal to the gross load (for which we take current market loads) 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. For all calculations, the EPDV of total long-term care expenditures is $43,750 for women, and 17,510 for men. The EPDV of benefits (premiums) from a private policy for women are approximately $19,110 ($18,030) and for men are $8,130 ($16,260), corresponding to gross loads on private policies of 0.5 for men and –0.058 for women.

Table 7: WTP if Medicaid Asset Disregard Increases from $2,000 to $20,000 *if* Buy Private Insurance

Wealth Percentile	Men Risk Aversion			Women Risk Aversion		
	1	2	3	1	2	3
10th	*	*	*	*	*	*
20th	*	*	*	*	*	*
30th	-17.4	-17.8	-18.0	-19.5	-20.0	-20.3
40th	-17.0	-16.6	-15.3	-18.6	-18.1	-17.1
50th	-15.8	-13.3	-8.8	-16.3	-12.8	-6.4
60th	-14.0	-8.7	2.8	-12.7	-4.2	
70th	-12.5	-3.0		-9.2	6.5	
80th	-9.7			-3.3		
90th	-6.4			4.0		

* Denotes disutility from policy exceeds value of starting financial wealth

Notes: All willingness to pay estimates are in thousands of dollars. Cells where willingness to pay was already positive at original asset disregard in Table 2 are blocked out, since they are not of interest. Positive willingness to pay results are shaded gray. All results are for a $100 daily benefit policy at current market loads. Aside from changes to asset disregard noted in the Table, all parameters are as specified in Table 2.

Figure 1: Willingness to Pay: 65 Year old Male
Current Market Loads; $ 100 Daily Benefit

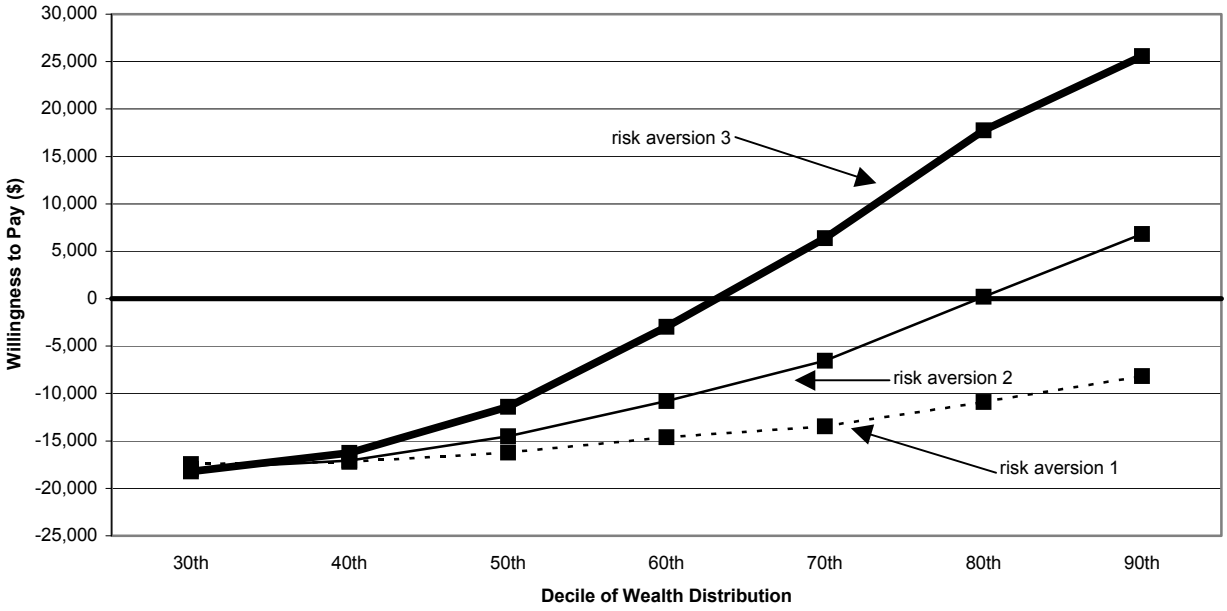
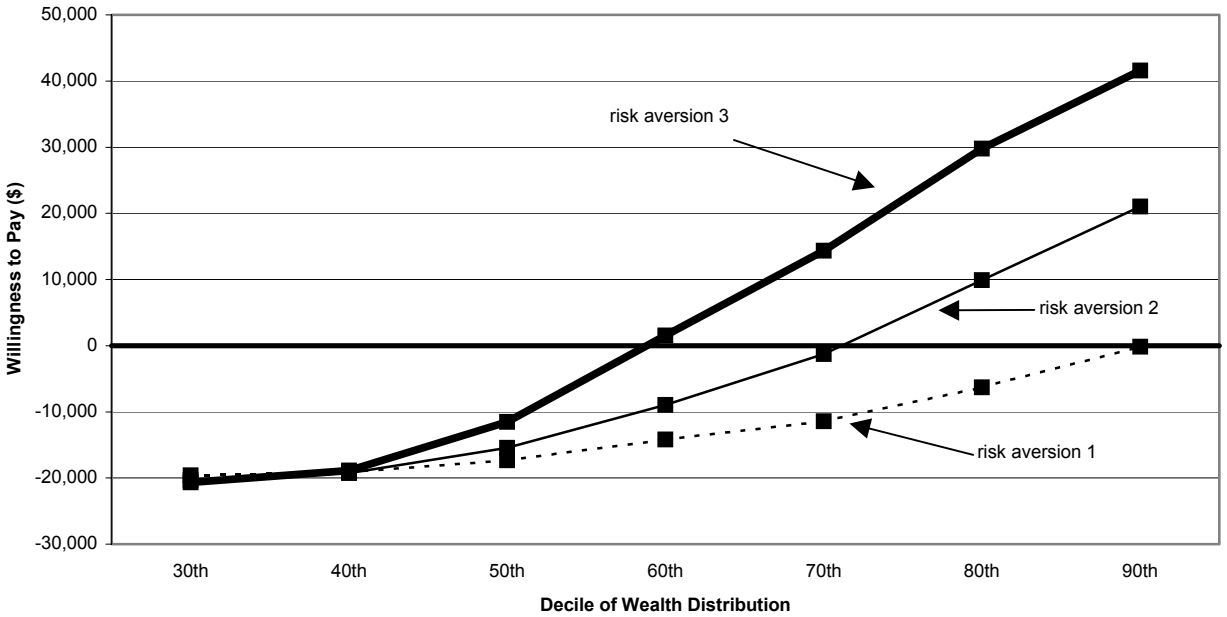


Figure 2: Willingness to Pay: 65 Year old Female
Current Market Loads; $100 Daily Benefit



Appendix Table A1: Comparison of nursing home (NH) utilization estimates: Robinson model and other published studies (65 year old).

Model	Data Sources	Probability of ever entering a nursing home			Average age of first entry into nursing home (conditional on entry)			Expected time in nursing home (conditional on entry)	% of those who enter nursing home who spend more than	
		Male	Female	Unisex	Male	Female	Unisex	Unisex	1 year (Unisex)	5 years (unisex)
Robinson Model	NLTCS (1982, 1984, 1989 and 1994) and NNHS (1985)	0.30	0.48	0.39	83 (median)	84 (median)	83 (mean)	1.8 years	40%	11%
Dick et al (1994)	NLTCS (1982, and 1984) and NNHS (1985)			0.35	81 (median)	84 (median)		1.8 years	40%	12%
Kemper and Murtaugh (1991)	1986 National Mortality Followback Survey	0.33	0.52	0.43			83 (mean)		55%	21%
Murtaugh et al. (1997)	1985 NNHS			0.39				2.7 years	51%	20%
Wiener at al.	NLTCS (1982, 1984) and NNHS (1985)			0.49				2.2 years	45%	14%

Note: All estimates for Robinson model are based on a version that estimates care utilization without regard to whether the care satisfies policy benefit triggers and without regard to the health condition of the individual at age 65. This is done to make the Robinson estimates comparable to published estimates that do not make these restrictions. The Robinson estimates used in the analysis in the paper, however, do incorporate these important restrictions.

Appendix B
Estimating Willingness to Pay Under Alternative Modeling Assumptions

In this section, we provide the results of the sensitivity analysis described in Section 5.3. To conserve space, we present only a subset of the results for these alternative specifications. Specifically, we show the sensitivity of the base case results at the 30th, 50th, 70th and 90th percentiles of the wealth distribution and at risk aversion of 3 for both men and women; results for other risk aversion levels are similar.

Table B1 reports the willingness to pay under these alternative specifications for a policy with a $100 maximum daily benefit and current market loads. Table B2 reports the willingness to pay under these alternative specifications for an uncapped, actuarially fair policy.

Overall, we find that our results are remarkably robust to all of these alternative specifications. Indeed, despite our attempt to focus on alternative specifications that might increase willingness to pay for private long-term care insurance, in several cases we find that willingness to pay is *lower* under the alternative specifications. Moreover, in general the specifications that increase willingness to pay do not have a quantitatively large effect. We now discuss each of the alternative specifications and the results in Tables 6 and 7 in detail.

B.1 Utility from home health care

The first set of alternative specifications investigate the possibility that individuals may view being in an institution as worse than residing at home. The results are summarized in rows 2 and 3 of Tables 6 and 7. The first approach we take – shown in row 2 – is to allow for state dependent utility. Following the findings of the empirical work of Viscusi and Evans (1990) and Evans and Viscusi (1991) we assume that both the level of utility and the marginal utility of consumption decrease as health declines (i.e. are lower in an institution than when at home). In particular, we report results for the case in which $U_{alf} = U_{nh} = 0.5 \cdot U_{nocare} = 0.5 \cdot U_{hhc}$.

A second approach – shown in row 3 – is to allow for the provision of home care to provide direct consumption value, which is not included in our base case. To investigate the maximum effect this might have on willingness to pay, we show the willingness to pay for private insurance when every dollar of expenditures on home health care $(X_{hhc,t})$ provides a dollar of consumption value.

Neither specification alters our core finding that most people do not want to pay for either existing policies (Table 6) or uncapped actuarially fair policies (Table 7). Indeed, both alternative specifications *lower* willingness to pay relative to the base case. In the case of state dependent utility, this is because the marginal utility of consumption has declined in the major state of care (namely institutional) to which insurance allows you to transfer consumption.[28] In the case of allowing consumption value from home health care, willingness to pay decreases in part because allowing individuals to get consumption value from home health care expenditures provides something of a consumption floor while in home care, thus effectively making the individual less risk averse. In addition, when the person places no value on the consumption of care, then their consumption while on Medicaid is effectively limited to the amount permitted by the income disregard, which may interfere with optimal consumption smoothing across states of care. However, if the individual also gets utility from the consumption of care, then Medicaid's constraints on consumption in home care are essentially less binding, making such smoothing easier.

B.2 Medicaid-covered care may be very unattractive relative to privately funded care

Our second major set of specification tests concerns the potential that Medicaid may be a less attractive substitute for privately funded care than we have modeled it. There are several reasons why

[28] As an alternative approach to modeling state dependent utility, we tried *increasing* the marginal utility of consumption in institutional care while simultaneously decreasing the level of utility when in institutional care. This increases willingness to pay relative to the base case; however the magnitude of the effect is again quite small, and therefore does not alter our fundamental findings.

Medicaid-funded care may be considerably less appealing than privately funded care. First, as noted above, Medicaid coverage of home health 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.[29] Second, the quality of care provided by Medicaid-funded providers may be lower than care provided by privately funded providers, thus reducing the consumption value of care for Medicaid-funded care recipients. Finally, individuals may feel some stigma associated with receiving Medicaid which reduces the consumption value from any care received.

We allow for these various possibilities in a reduced form way by allowing the consumption value from long-term care expenditures to differ based on whether this care is paid for by private payers (out of pocket or private insurance) or by Medicaid. To maximize the potential effect that this could have on willingness to pay for private insurance, we begin by allowing the individual to get consumption value equal to the *full* extent of home health care expenditures (both unskilled and skilled), plus our base case assumption that care from assisted living and nursing homes of $545 per month (i.e. the case already shown in row 3 of Tables 6 and 7). We then show results for cutting these consumption values in half only when care is paid for by Medicaid (i.e., $\alpha_s = 0.5$). We show two separate cases, corresponding to only home health care quality being lower when on Medicaid (row 4 of Tables 6 and 7) and all three types of care quality being lower while on Medicaid (row 5 of Tables 6 and 7).

The results indicate that, not surprisingly, reducing the quality of care provided by Medicaid increases willingness to pay (i.e. compare rows 4 and 5 to row 3). However, for the specifications shown, the core findings remain. Indeed, in results not reported, we find that even if we reduce the consumption value of home health care to *zero* if paid for by Medicaid – to capture the fact that individuals in need of home health care may be substantially worse off if there only source of funding is Medicaid – we still find that most of the wealth distribution is unwilling to purchase private insurance and prefers more limited policies to more comprehensive policies.

B.3 Presence of family members

Our final set of specification tests concerns the role that the family may play in affecting willingness to pay for insurance. Here, we consider several ways that the family may increase willingness to pay for long-term care insurance. We begin by examining the role of bequest motives. Bequest motives provide an individual with another reason to value the protection of wealth offered by long-term care insurance besides the reason in the base case that the insurance protects wealth that can be used to finance future consumption by that individual. Because there no consensus in the literature on how to model bequests, and even less on how to parameterize the bequest function, we examine how our results are affected by two alternative bequest specifications. The first specification uses constant relative risk aversion utility function over wealth remaining at death, using the same risk aversion coefficient for bequests as for consumption. The second specification uses a linear bequest motive, so that the individual is not risk averse over the size of his bequest.[30] Specifically, we define the utility of the bequest as $U_5(W_t) = W_t$; this is a substantially stronger bequest motive than that estimated empirically by Hurd (1989).[31]

The results, shown in rows 6 and 7 of Tables 6 and 7, indicate that a bequest motive increases willingness to pay for insurance, but that the effect is quantitatively small. This is because bequest motives have several offsetting effects on the willingness to pay for long-term care insurance. On the one hand, if an individual is risk averse with respect to bequest size, the presence of bequest motives should increase the willingness to pay for long-term care insurance which reduces the volatility of bequests. On the other hand, in the presence of positive load factors (such as those that we estimate for men), the

[29] Indeed, in a survey of long-term care insurance purchasers, over half of those surveyed rank "freedom to choose" one's type of care as a very important reason for buying the policy (HIAA 2000a).

[30] Jousten (2001) discusses the use of linear bequest motives in a life-cycle model.

[31] Hurd (1989), in a model of consumption that excludes housing wealth, estimates the coefficient on the linear bequest motive to be approximately $5x10^{-7}$, but statistically insignificant.

purchase of a long-term care insurance policy actually reduces the expected discounted value of resources available for consumption and bequests, thus reducing the willingness to pay for private insurance when there is a bequest motive relative to when there is not. Finally, as shown by Hurd (1986) and Jousten (2001), the presence of a bequest motive changes the shape of the optimal consumption path and thus affects the desirability of insuring against expenditure risk.

In addition to bequest motives, the family may also affect willingness to pay for insurance by providing a substitute for private long-term care insurance, either through the direct provision of unpaid care or through informal financial risk sharing among family members (i.e. a financial substitute for private insurance) (Kotlikoff and Spivak, 1981; Pauly 1990). We consider each in turn.

In results not shown, we confirm that allowing family members to provide unpaid home health care in lieu of formal paid care lowers willingness to pay for private long-term care insurance that covers the remaining risk of institutional care expenditures. This is because the family care provision reduces the total expenditure risk facing the individual by removing variation in home health care expenditures. This analysis assumes that the individual was indifferent to receiving home health care from a family member or from a formal employee. If instead the individual receives substantial *dis*utility from family provided care (e.g., aversion to "being a burden"), this could increase the value of private insurance.

To investigate this, we examine an extreme case that is most likely to increase the willingness to pay for private insurance. We assume that members of the family will provide all home health care that is not reimbursed by private insurance (i.e. would be paid for out of pocket or by Medicaid). We further assume that the individual receives lower utility from family-provided care than if the care is provided by formal employees. Thus we assume that the individual gets utility from home health care consumption equal to home health care expenditures (i.e. as examined in row 3) *only if* that care is financed by private insurance. The results are shown in Row 8 of Tables 6 and 7. Comparing these results to those in row 3 (where there is consumption value from home health care and no issue of not wanting to be a burden), we see that the willingness to pay for long-term care insurance does increase. However, it still remains lower than the base case in which there is no consumption value from home health care.

To allow for *financial* risk sharing among family members, we estimate willingness to pay in a model where household decision-making is modeled under the assumption that a husband and wife maximize a joint utility function. It is possible that the household may have a substantially higher willingness to pay for private insurance than a unitary decision maker because the utility consequences of Medicaid's asset and income tests may be more onerous if one spouse continues to reside in the community. Offsetting this, however, are two factors. First, in practice, Medicaid rules allow a community-based spouse to retain substantially more assets and income, thus effectively making Medicaid a better substitute for private insurance than in the case of single individuals; for example, in 2000, all states allowed the community-based spouse to keep at least $16,824 in assets when an individual enters a nursing home in addition to the $2,000 allowed for the institutionalized individual (Stone 2002).[32] Second, as shown by Kotlikoff and Spivak, spouses who share a joint budget constraint can partially substitute for formal insurance markets by informally insuring one another, thus making private insurance less attractive. As shown in Table B3, our results indicate that these latter two factors dominate, and that the net effect of allowing for within household financial risk sharing is to further *lower* the willingness to pay for private insurance. For example, at risk aversion of 3, the combined willingness to pay for our base case private contracts ($100 daily benefit at existing market loads) covering both the husband and the wife at the median of the wealth distribution is estimated to be approximately -$42,898. The finding that within-household risk sharing lowers the willingness to pay for private insurance is consistent with the findings of Brown and Poterba (2001), who find that the willingness to pay for life annuities is substantially lower when modeled in this way than when modeled using a unitary decision

[32] $16,824 was the federal minimum in 2000, and 12 states used this minimum level. We choose the lower end of the range to be conservative. Even this low end understates the generosity of Medicaid rules since community-based spouses are allowed to keep an unlimited resource in the house (Congressional Research Service, 2002). Our estimates are therefore biased toward finding a higher willingness to pay for long-term care insurance.

maker. At the 90th percentile, the couple does find the joint purchase of the policies welfare enhancing, with a willingness to pay of $12,587. It is worth noting, however, that this is still significantly less than the willingness to pay for either product separately in our model of a unitary decision maker (table 2). In the second row of table 8, we also report results for uncapped, actuarially fair policies and find similar patterns. At least as high as the 70th percentile, couples would not wish to purchase private LTCI. At the 90th, such a purchase is welfare enhancing, although still less so than in the unitary model.

We now discuss the precise modeling of the household-decision maker model whose results are shown in Table B3. When using a joint household decision making framework, Hurd (1999) shows that optimal consumption depends on the structure of the household utility function, and highlights the absence of an agreed-upon framework for modeling joint decisions by couples. We use a model that is a natural extension of our model of a unitary decision maker, and follows closely the model used by Kotlikoff and Spivak (1981) and Brown and Poterba (2000) to analyze the gains from annuitization for married individuals. Specifically, we assume that the household utility function is simply the equally weighted sum of two spousal sub-utility functions:

$$U_{s,\sigma}^{couple}\left(C_{t,s}^{m}, C_{t,\sigma}^{f}, F_{t,s}^{m}, F_{t,\sigma}^{f}\right) = U_{s}^{m}\left(C_{t,s}^{m}, F_{t,s}^{m}\right) + U_{\sigma}^{f}\left(C_{t,\sigma}^{f}, F_{t,\sigma}^{f}\right)$$

where superscripts m and f denote the male and the female in the household, s subscripts the husband's care stat, and σ the wife's care state. We further assume that $U^m=U^f$, i.e., that the functional form of the sub-utility functions are both CRRA utility functions with the same risk aversion coefficient.

The assumption of equal weighting and identical functions (e.g., same risk aversion for husband and wife) of the two sub-utility functions implies that couples will always try to divide household consumption equally when both spouses are alive. Following Kolikof and Spivak, we assume no economies of scale in consumption so that $1 of household consumption divided equally between the spouses results in $C_t^m = C_t^f = .5$. The exception is that consumption from care $F_{s,t}$ enters into the utility function only of the spouse receiving care. If, for example, the husband is in care where $F_{s,t}>0$, and the wife is at home receiving no care, then the household will optimally allocate all household consumption to the wife until she reaches a consumption level $C_t^f = F_{s,t}$, and then above this level, the spouses will evenly share any remaining consumption. When one spouse dies, the utility function of the couple reverts to that of the surviving spouse.

Because there are 5 states of care for each spouse, there are now effectively 25 states of care for the couple, and thus the Bellman equation (equation 1) must sum over all 25 possible transitions across states of care. The wealth accumulation equations with and without Medicaid (equations 2 and 3) are the same, except that all variables now refer to expenditures for the entire household. For example, $X_{s,\sigma,t}$ refers to total long-term care expenditures for the couple. Moreover, the Medicaid asset and income requirements ($\underline{C}_{s,\sigma}$ and $\underline{W}_{s,\sigma}$) will now vary depending on the care state of both spouses.

For the household model, Medicaid's rules depend on the joint care status of the husband and wife. If only one spouse is receiving Medicaid, the non-Medicaid spouse is permitted to keep an additional $2000 per month in income and $16,000 of financial wealth, over and above the amounts allowed in the case of a single individual. As such, the couple has an effective $\underline{W}$ of $18,000 and an effective $\underline{C}$ of $2,030 if one spouse is institutionalized and the other is receiving no care. If both spouses are receiving Medicaid, the effective asset and income limits are simply the sum of the two separate individual limits.

For this joint-decision making model, we use the wealth distribution constructed from the sample of married households with at least one spouse age 65 in the 1996, 1998 or 2000 Health and Retirement Survey (HRS). We consider the willingness to pay for the couple to have both of them insured. Empirically this seems to relevant case since empirically within-couple ownership is highly correlated; although only 10 percent of the elderly have long-term care insurance, 60 percent of individuals whose spouses have long-term care insurance also have this insurance (Finkelstein and McGarry, 2003).

Table B2: Sensitivity analysis of results in Table 2: Policy has $100 maximum daily benefit and current market loads (risk aversion 3)

Specification	Insurance Value for Men				Insurance Value for Women			
	Pctile 30	Pctile 50	Pctile 70	Pctile 90	Pctile 30	Pctile 50	Pctile 70	Pctile 90
1. Base Case	**-18.2**	**-11.4**	**6.4**	**25.6**	**-20.7**	**-11.7**	**14.7**	**41.6**
2. State dependent utility[1]	-18.3	-12.1	4.5	24.5	-20.8	-12.5	10.2	37.2
3. Consumption value from HHC[2]	-19.9	-19.8	-11.7	4.4	-21.2	-19.3	-6.5	24.3
4. Consumption value from Medicaid-funded HHC is half that from privately-funded HHC[4]	-19.1	-18.4	-9.7	5.8	-20.6	-17.7	-3.7	26.0
5. Above + consumption value of Medicaid-funded institutional care is also half that from privately-funded care[5]	-18.4	-13.0	1.3	18.4	-19.7	-10.3	13.9	38.8
6. CRRA Bequest Motive	-18.1	-10.9	7.3	26.1	-20.6	-11.1	15.4	41.8
7. Linear Bequest Motive	-18.2	-10.0	7.2	43.6	-20.7	-8.5	14.8	51.1
8. Do not want to be a burden on family members[3]	-18.5	-17.0	-7.7	7.3	-18.6	-12.7	4.1	32.0

Notes: All willingness to pay estimates are in thousands of dollars Cases where willingness to pay is positive are shaded gray. All results are for risk aversion 3. Otherwise, all parameters are as specified in notes to Table 2 except as indicated in the left hand column. Base case results are in **bold.**

[1] $U_{alf} = U_{nh} = 0.5 * U_s \forall s \neq alf, nh$

[2] $F_{hhc,t} = X_{hhc,t}$

[3] $F_{hhc,t} = X_{hhc,t}$ for expenditures paid by private insurance; $F_{hhc,t} = 0$ otherwise. See text for further details.

[4] $F_{hhc,t} = X_{hhc,t}$; $\alpha_{hhc} = 0.5$; $\alpha_{alf} = \alpha_{nh} = 1$

[5] $F_{hhc,t} = X_{hhc,t}$; $\alpha_{hhc} = 0.5$; $\alpha_{alf} = \alpha_{nh} = 0.5$

Table B3: Sensitivity analysis of results in Table 4: Policy in uncapped and is priced actuarially fairly (risk aversion 3)

Alternative Specification	Insurance Value for Men				Insurance Value for Women			
	Pctile 30	Pctile 50	Pctile 70	Pctile 90	Pctile 30	Pctile 50	Pctile 70	Pctile 90
1. Base Case	**-17.7**	**-2.7**	**33.0**	**88.7**	*	**-35.8**	**30.7**	**141.9**
2. State dependent utility	-18.6	-7.5	20.1	68.6	*	-41.2	9.1	107.1
3. Consumption Value from HHC	-19.7	-12.5	11.6	67.6	*	-45.3	-1.2	107.6
4. Consumption value from Medicaid-funded HHC is half that from privately-funded HHC	-18.9	-11.0	13.7	69.0	*	-43.9	1.7	109.0
5. Above + consumption value of Medicaid-funded institutional care is also half that from privately-funded care	-14.3	10.6	56.0	110.9	*	-14.8	75.9	177.1
6. CRRA Bequest Motive	-17.6	-2.0	35.2	90.9	*	-35.0	33.6	144.4
7. Linear Bequest Motive	-17.7	-2.7	34.0	108.4	*	-35.8	31.1	150.6
8. Do not want to be a burden on family members	-18.3	-9.4	16.4	71.1	*	-39.7	10.8	116.3

* Denotes disutility from policy exceeds value of starting financial wealth

Notes: All willingness to pay estimates are in thousands of dollars. Policy is actuarially fair (on a gender-specific basis) and uncapped. Cases where willingness to pay is positive are shaded gray. All results are for risk aversion 3. Left hand side corresponds to specification described in Table 6. See notes to Table 6 for more detail. Otherwise, all parameters are as specified in notes to Table 4. Base case results are in **bold.**

Table B4: Sensitivity analysis using a household joint decision making model

Wealth Percentile	Total Wealth	Percent Annuitized	Household Willingness to Pay For	
			$100 Daily Benefit at Current Market Loads	Uncapped Benefits at Actuarially Fair Prices
30th	150,835	78	*	*
50th	265,735	59	-42.9	-73.8
70th	457,185	37	-31.5	-51.1
90th	933,866	29	12.6	63.7

* Denotes disutility from policy exceeds value of starting financial wealth

Notes: Results are shown for coefficient of relative risk aversion of 3. All WTP measures are for the couple's willingness to simultaneously purchase a policy to cover the husband, and an additional policy to cover the wife. Actuarially fair policies have a zero load on each policy. The wealth distribution is constructed from the sample of married households with at least one spouse age 65 in the 1996, 1998 or 2000 Health and Retirement Survey (HRS). All results are for risk aversion 3. Willingness to pay estimates are in thousands of dollars; cases where willingness to pay is positive are shaded gray. See Appendix B for more details on the model and parameterization.