Highly preliminary and incomplete.
Do not cite or circulate without permission.

Why is the Market for Private Long-Term Care Insurance so Small? The Role of Pricing and Medicaid Crowd-Out

Jeffrey R. Brown
University of Illinois and NBER

Amy Finkelstein
Harvard University and NBER

March 2003

Abstract: Long-term care represents one of the largest uninsured financial risks facing the elderly in the United States, and yet we have virtually no evidence to help explain the extremely limited nature of the private market for long-term care insurance. This paper develops two complementary analytical tools to begin filling this void. First, we develop a framework for assessing the "money's worth" of private long-term care insurance polices. Second, we model the insurance value of a long-term care insurance contract for a risk averse, life-cycle consumer. We implement both models using state-of-the-art actuarial data on long-term care utilization probabilities and comprehensive market data on insurance policy characteristics and premiums. Our results indicate that private long-term care insurance contracts are priced lower than actuarially fair for women and higher for men. For a policy that covers all types of paid care, a 65 year old male can expect to receive 57 to 73 cents in present discounted value of benefits for every dollar paid in expected present value of premiums; by contrast, a 65-year old woman can expect to receive about $1.12 to $1.42 in benefits for every dollar paid in premiums. Our preliminary results suggest that, given these existing market prices and the presence of Medicaid as a payer-of-last-resort, private long-term care insurance is not valued by individuals throughout substantial portions of the wealth distribution. The very presence of Medicaid crowds out private insurance purchase for well over half of households, and significantly reduces the value of private insurance among the rest. In addition, marginal decreases in the "quality" of Medicaid-financed relative to privately financed care substantially increase the value of private long-term care insurance. By contrast, even substantial reductions in premiums – such as those that might be achieved by the new federal tax subsidies for long-term care insurance – would be insufficient to make long-term care insurance attractive to the median individual.

We thank Courtney Coile, John Cutler, Cheryl DeMaio, Robert Gagne, Kathleen McGarry, JaneMarie Mulvey, Dennis O'Brien, Ben Olken, Josh Rauh, and Al Schmitz for helpful comments and discussions. We are especially grateful to Jim Robinson for generously sharing his data on long-term care utilization, and to Norma Coe for exceptional research assistance. We also thank Qian Deng and Chiao-Wen Lin for programming assistance. We are grateful to TIAA-CREF and the Campus Research Board at the University of Illinois at Urban-Champaign for financial support.

1. Introduction

Long-term care represents one of the largest uninsured medical and financial risks facing the current and future elderly in the United States.[1] Annual long-term care expenditures in the U.S. total about $100 billion, or approximately 10 percent of total annual U.S. health expenditures. Despite this, only about 10 percent of elderly individuals in the U.S. have private long-term care insurance coverage, and 40 percent of long-term care expenditures are paid for out of pocket. As the baby boomers age and medical costs continue to rise, the implications of this lack of insurance coverage for consumption and savings decisions, and for the welfare of both the elderly and their children, will only become more pronounced.

A substantial theoretical literature has proposed a variety of potential explanations for the limited size of the private long-term care insurance market. However, there exists very little evidence with which to test or distinguish among alternative theoretical explanations. The lack of evidence makes it difficult to think about how the market will evolve. It also places important limitations on the ability to assess the efficacy of policy interventions. There has been a recent spate of public policies at both the state and federal level designed to encourage the growth of the private long-term care insurance market, including the use of tax subsidies and modifications to Medicaid programs. The extent to which these policies will succeed depends in part on whether they are addressing the underlying cause of the small market.

This paper develops two analytical tools that are then used to produce new evidence on the reasons for the limited size of the private long-term care insurance market and on the likely effects of alternative policy interventions on the market's size. First, we present, what is to our knowledge, the first estimates of the money's worth (MW) of long-term care insurance policies. The money's worth is defined as the ratio of the expected present value of benefits to the expected present value of premiums. To estimate MW, we draw on comprehensive data on the structure of insurance policies and their premiums. We also introduce and utilize detailed actuarial data on transitions across different types of care by age and gender, which allow for a richer model of care utilization than permitted with previously available estimates.

[1] We define long-term care expenditures as the cost of receiving home care or residing in an assisted living facility or a nursing home. We focus solely on long-term care for the elderly, not the chronically disabled non-elderly.

Our results indicate that for typical policies covering all types of paid care and maintained throughout the individual's lifetime, a 65 year old male can expect to receive 57 to 73 cents in present discounted value of benefits for every dollar paid in expected present value of premiums; by contrast, a 65-year old woman can expect to receive about $1.12 to $1.42 in benefits for every dollar paid in premiums**.**

Second, we develop an analytical framework for estimating the utility gains from a long-term care insurance contract. Specifically, we compute the expected lifetime utility that a risk averse consumer, faced with uncertainty about long-term care utilization and mortality, would derive from following an optimal intertemporal consumption plan when he or she has access to an insurance policy. We then compute the amount of wealth that the individual would require, in the absence of long-term care insurance, to achieve this same level of utility. The incremental amount of wealth is our measure of the insurance value of the policy, and is analogous to Equivalent Variation in consumer welfare analysis.

We calculate the insurance value for actual policies, given the structure of the current Medicaid program, the structure of private policy benefits, and premium levels. Our results indicate that a large fraction of 65 year olds, particularly those in the lower part of the wealth distribution, would not receive positive utility from the purchase of a long-term care policy. Indeed, it is only at relatively high levels of wealth and risk aversion that existing policies become desirable. These results suggest that the limited size of the private long-term care insurance market may be consistent with expected utility maximizing behavior for many individuals. This is in stark contrast to the market for annuities where the structure of prices and of public insurance programs appears insufficient to explain the limited size of this important insurance market for the elderly (see e.g. Mitchell et al, 1999).

We then use the analytical framework to investigate the effects on the private insurance value of changes in the money's worth of policies or in the structure of the Medicaid program. Concerns about the effect of high prices and the public Medicaid program on limiting private insurance demand have motivated several recent policy changes at both the federal and state level. Additionally, both pricing and crowd out of private insurance demand by public insurance have featured prominently in investigations of the equilibrium in related insurance markets, such as annuities and health insurance for acute medical expenditures. Looking at the role of these two factors in affecting long-term care insurance demand is therefore a natural starting point.

Our results suggest that pricing is not a major factor in explaining the limited demand for long-term care insurance. For example, even with a money's worth of 1.8 (and thus a subsidy of 45% over actuarially fair prices) the median female does not find a typical private long-term care insurance policy valuable. These findings cast doubt on the efficacy of programs designed to induce demand through tax subsidies. By contrast, we find that the existence of Medicaid as the payer of last resort substantially reduces the value of private insurance, crowding out demand for a large fraction of the wealth distribution, and decreasing its value even among those for whom the contract still delivers positive value. Moreover, marginal increases in the relative "quality" of care paid for by Medicaid versus that paid for by private means substantially reduce the value of private long-term care insurance.

The rest of the paper is structured as follows. Section 2 provides background on the private market for long-term care insurance, and on existing theoretical and empirical work in this area. Section 3 describes the analytical framework we develop for estimating money's worth; Section 4 describes the many data inputs needed to implement the calculation. Section 5 presents our estimates of money's worth for a variety of different policies and individuals. Section 6 develops the analytical framework for calculating the insurance value of these long-term care insurance contracts, and discusses our parameterization of the model. Section 7 presents our preliminary estimates of the insurance value for various types of individuals in population, and examines the potential effects of changing the price structure or the existing Medicaid rules. The final section summarizes our findings and discusses planned extensions.

2. Background on the Long-Term Care Insurance Market

2.1 The nature of the risk and of the insurance market

At almost $100 billion in the year 2000, long-term care expenditures for the elderly in the United States represent almost 10% of total health expenditures for all ages in the United States, or 1% of GDP (US Congress, 2000). Real expenditures are projected to triple by 2040 due to population aging, increased longevity, and real cost growth (Congressional Budget Office, 1999). There is also substantial variability among the elderly in their long-term care expenditures (see e.g. Dick et al. 1994; Kemper & Murtaugh 1991). For example, Dick et al. (1994) estimate that although nearly two-thirds of individuals who reach age 65 will never enter a nursing home, one-quarter of women who do enter a nursing home will spend at least three years there. This suggests that there may be large welfare gains from long-term care insurance.

Yet most long-term care expenditure risk is uninsured. Only about 10 percent of those aged 60 and over had private long-term care insurance coverage in 2000.[2] Most policies provide limited insurance benefits (Cutler, 1996), and public insurance is also limited. As a result, less than 1 percent of long-term care expenditures for the elderly in 2000 were paid by private insurance, and 40 percent were paid for out of pocket (US Congress, 2000). By contrast, in the health sector as a whole, private insurance pays 35% of expenditures and only 17% are paid for out of pocket (National Center for Health Statistics, 2002).

This paper analyzes the individual (non-group) private market for long-term care insurance. About 80% of policies are sold through this market, with the remaining share sold through employer-sponsored plans or life insurance (HIAA 2000b).[3] The private long-term care insurance market first began in the early 1980s (HIAA 2001), and has experienced particularly rapid growth in recent years; since 1994, the annualized in force premiums collected have grown at about 20% per year, from $1.5 billion in 1994 to $5.3 billion in 2001 (LIMRA 2001). The market has traditionally been largely unregulated, although recent regulations have been proposed and enacted in a handful of states to ensure that rates are set to avoid future premium increase (NAIC 2002a, 2002b).

In 2000, the average age of buyers in the individual market was 67 (HIAA 2000a). Coverage rates are roughly comparable for men and women, and increase substantially with asset levels (HIAA 2000a). Insurance policies are sold separately for each insured life rather than jointly covering a couple. We describe the structure of actual insurance policies in detail below when we describe the framework for calculating the Money's Worth of these policies.

2.2 Explanations for the small size of the private-market: theory and existing evidence

[2] Authors' calculation based on 2000 HRS. This is consistent with other estimates (e.g. Cohen, forthcoming).
[3] All subsequent statistics refer to the non-group market.

A variety of theoretical explanations have been proposed to explain the limited size of the private long-term care insurance market (see Norton (2000) for an overview). In this paper we focus primarily on two explanations: the role of pricing and the potential crowd-out of demand by public insurance. In the conclusion, we discuss how the analytical framework developed in this paper can be applied to investigate the role of other proposed explanations.

The pricing of long-term care insurance may deter insurance coverage if there is a substantial load on long-term care insurance policies (i.e. a discrepancy between the expected present discounted value of premiums paid and the expected present discounted value of benefits received), perhaps arising from administrative costs or insurance company profits.[4] Concerns about the effects of high prices have motivated the recent introduction of tax subsidies for private long-term care insurance. About one-third of states have introduced state-level tax subsidies for the purchase of both non-group and group private long-term care insurance. At the federal level, the 1996 Health Insurance Portability and Accountability Act (HIPAA) made the tax treatment of private long-term care insurance equivalent to that of private insurance for acute medical care. Perhaps most significantly, employer contributions to employer-provided long-term care insurance plans are now excludable from the taxable income of the employee (Wiener et al. 2000; Cohen and Weinrobe 2000). This same tax exclusion for insurance for acute medical care constitutes the largest single federal tax expenditure (OMB, 1999). While demand for private health insurance is responsive to this subsidy, there is considerable uncertainty about the magnitude of the demand response (see Cutler 2002 or Gruber 1999 for a review of the evidence). The impact of this subsidy for long-term care insurance on the federal budget and on the amount of insurance coverage is therefore potentially enormous but ex ante ambiguous.

Despite this recent public policy attention, we know of no evidence of whether there actually are substantial loads on long-term care insurance policies, or of the effect of changes in these loads on insurance demand. The first part of the paper therefore provides evidence on the pricing of long-term care

[4]If asymmetric information raises the expected care utilization of an insured individual relative to the population, this creates a high load on the insurance for an average individual in the population. However, Finkelstein and McGarry (2003) present evidence that insured individuals do not have higher utilization than uninsured individuals.

insurance policies. However, because risk averse individuals may be willing to pay more than the actuarially fair price for insurance, the existence of a load is not necessarily sufficient to deter insurance demand. To further ascertain the role of pricing, we examine how an individual's utility gain (or loss) from a private long-term care insurance policy varies as we vary market prices, including that variation that might be expected from the recent tax subsidies.

The second explanation that we investigate is the potential that the long-term care insurance provided through the public Medicaid program crowds out demand for private long-term care insurance. Medicaid is an imperfect substitute for private insurance. By requiring a deductible of virtually one's entire assets and income (AARP, 2000), Medicaid imposes a severe restriction on an individual's ability to engage in optimal consumption smoothing across states and over time. It also reduces the wealth out of which the individual can consume (or bequeath upon death). There is also evidence that it may be harder to get nursing home care if Medicaid is paying (Ettner, 1993). However, an imperfect but publicly funded substitute may still crowd-out demand for private insurance (Pauly 1989, 1990). Such concerns have recently motivated several states (including New York and California) to reform their Medicaid programs (Wiener et al. 2000). Again, however, there is little evidence on the extent to which Medicaid crowds out private long-term care insurance demand. Evidence from related insurance markets is mixed. Although there is evidence that Medicaid may have a substantial crowd-out affect on demand for private insurance for acute medical care (Cutler and Gruber, 1996), the presence of publicly provided annuities through Social Security is not sufficient to explain the absence of private annuities. (Mitchell et al., 1999).

Other explanations for the limited size of the private long-term care insurance market include asymmetric information, the presence of the uninsured aggregate risk that the costs of long-term care may drastically increase (Cutler, 1996), and the practice of denying insurance coverage to many observably high risk individuals (Finkelstein and McGarry, 2003). The family is also likely to play a central role in affecting demand for private long-term care insurance, although the sign of its effect is theoretically ambiguous. In the final section of the paper we discuss how we will extend the analytical framework developed in this paper to analyze these other factors in future work.

3. The Money's Worth Framework

To evaluate the pricing of long-term care insurance policies, we estimate the money's worth (MW) of policies. The MW framework is widely used in other insurance markets, such as annuities (see e.g. Friedman and Warshawsky 1988, Mitchell et al. 1999, Finkelstein and Poterba 2002). The present study represents, to our knowledge, its first application to the long-term care insurance market.

The MW is defined as the ratio of the expected present discounted value (EPDV) of benefits to the EPDV of premiums. It is useful to think of one minus the money's worth as the load or "price" of the insurance policy. An actuarially fair policy would have a money's worth of unity.

The money's worth depends on five inputs: the per-period *care costs*, the structure of the policy's *benefit rules*, the per-period *premiums,* the *transition probabilities* used to compute the probability that an individual in care state i this period is in care state j next period, and the *interest rate* that is used to discount future payments. Section four describes the data we use for each of these inputs.

We specify all financial inputs in nominal terms and denote calendar time (t) in monthly increments with purchase occurring at $t=0$. We allow for five states of care, which we index by s: 1) receiving no paid care, 2) receiving paid home care, 3) residing in an assisted living facility, 4) residing in a nursing home, and 5) dead. The middle three states involve long-term care expenditures.

We denote the per-period benefits received from the insurance policy as $\min\{X_{t,s}, B_{t,s,k}\}$, where X denotes per-period care expenditures and B denotes the maximum per-period benefit that the policy will pay. Insurance policies typically reimburse incurred covered expenditures, X, up to a maximum per-period benefit amount B.[5] The typical policy pays the same maximum per-period amount B, usually $100 per day, in any state of care in which they pay benefits. Incurred expenditures X will vary over calendar time t due to medical price inflation, and it will vary with the state of care s.[6] The maximum per-period benefit amount B may also vary with calendar time t as some policies' benefit caps escalate at a pre-

[5] An alternative type of policy, which is less common in the market and which is currently excluded from the analysis is an indemnity policy that pays B whenever the individual is in covered care, regardless of incurred costs.
[6] We denote by X the incurred expenditures *net* of any expenditures that will be covered by a public insurance program that serves as primary payer. See Section 4.4. for more detail.

specified rate such as 3 or 5 percent per year. *B* will also vary with the state of care since the policy will pay in only some of the 5 care states. Finally, *B* may vary with the total number of months that the individual has been in potentially covered care since the start of the policy, which we denote by the index *k*. About three-quarters of policies have deductibles (ranging typically from one to three months) during which benefits are not received;[7] about two-thirds of policies also specify limits to the total number of months for which benefits can be collected; limits of 1-5 years are typical (HIAA 2000a).

We denote the monthly, nominal long-term care insurance premium by $P_{s,k}$ to reflect the fact that premiums will vary with the state of care (*s*) and may also vary with the cumulative number of periods spent in care since purchasing the policy *(k)*; typically, an individual will pay premiums when they are out of care and when they are in covered care but still within the deductible period.[8] Because premiums are constant in nominal terms, they are higher relative to actuarial costs at younger ages.[9] Almost all policies are guaranteed renewable, so that the premiums cannot be raised on an individual should he, for example, experience a change in health. However, premiums can be raised for a class of individuals, such as all those holding a particular type of policy or all those above a certain age (AARP 2002, ACLI 2001), and thus individuals may face some risk of premium increases. Recently, several states have adopted regulations designed to limit the risk of rate increases (NAIC 2002a, 2002b). Lacking any information with which to parameterize the likelihood and magnitude of future rate increases, we assume that premiums remain constant in nominal terms.

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*; death is obviously an absorbing state. We use gender- and age-specific

[7] We assume that the deductible, once satisfied, is never again applicable. In principle, some policies may specify that the deductible must be paid anew for each new episode in care, but we do not observe whether this is the case. In practice, it is unlikely to affect our estimates of MW. Utilization data indicate that only a tiny fraction of care utilization is accounted for by individuals having multiple stays that last for less time than the policy's deductible. We estimate that of the 23 to 53 percent of individuals who would use up their deductible, only 0.07% to 0.55% of their time in care is spent in spells of duration less than or equal to the deductible.
[8] It is unclear in our data whether premiums are waived as soon as the individual enters covered care or only after the deductible is satisfied. However, we ascertained that our MW estimates were virtually identical under either assumption.
[9] This means that long-term care insurance payments have an element of tax-deferred savings, although they do not explicitly build cash value that can be claimed upon forfeiture (as with whole life insurance).

transition probabilities, but for notational simplicity suppress the gender subscript and use calendar time *t* to reflect the aging of the individual; our equations therefore all refer to a particular purchase age. Finally, we denote by i_{t+1} the nominal short-term interest rate used to discount from period t+1 back to period t. We can solve for the expected present value of benefits β based on the following recursive relationship:

$$\beta_{t,s,k} = \underbrace{\min\{X_{t,s}, B_{t,s,k,}\}}_{\text{Benefits Received This Period}} + \underbrace{\sum_{\sigma=1}^{5} q_{t+1}^{s,\sigma} * \frac{\beta_{t+1,\sigma,k+1(s)}}{1+i_{t+1}}}_{\text{Expected PV of Future Benefits}} \tag{1}$$

Equation (1) denotes the expected present value of benefits associated with a policy held by an individual at time *t*, who has received *k* periods of care that potentially qualifies for benefits since purchasing the policy, and who is currently in care state *s*. The benefits she receives this period depend on expenditures and the policy's benefit structure. Looking ahead to the next period, she may be in one of five possible states, each with an associated probability of being in that state ($q_{t+1}^{s,\sigma}$) and a payoff function $\left(\beta_{t+1,\sigma,k+1(s)}\right)$ appropriately discounted. The indicator varies $1(s)$ indicates whether she is currently in a state of care that the policy covers; if so, then for purposes of calculating whether the deductible or benefit period have been used up, she is "credited" in the next period with one more period in covered care.

A similar recursive relationship can be used to solve for the expected present value of premiums, π :

$$\pi_{t,s,k} = \underbrace{P_{s,k}}_{\text{Premiums Paid this Period}} + \underbrace{\sum_{\sigma=1}^{5} q_{t+1}^{s,\sigma} * \frac{\pi_{t+1,\sigma,k+1(s)}}{1+i_{t+1}}}_{\text{Expected PV of future premiums}} \tag{2}$$

Based on actual practice, we assume that an individual may only buy a long-term care insurance policy when they are out of care (s=1). We use equations (1) and (2) to solve recursively for the MW at the time of purchase, given by:

$$\mathrm{MW}_{0,1,0} = \frac{\beta_{0,1,0}}{\pi_{0,1,0}} \tag{3}$$

We solve these recursive relationships by imposing the terminal condition that everyone is dead at time (effectively, age) T (i.e., $\pi_{T,s,k} = \beta_{T,s,k} = 0$) and solving backwards. We assume a maximum age of 105.

4. Data

4.1 The Structure of Premiums and Benefits in Actual Policies: the Weiss data

We purchased data on premiums and benefit structures for non-group long-term care insurance policies in 2002. These data are collected by Weiss Ratings, Inc, a company that sells information to consumers on the financial stability of insurance companies and the pricing of insurance products. The information on long-term care insurance contracts comes from their annual survey of all known long-term care insurance companies in the United States. In 2002, 29 of the 132 companies surveyed responded with data. Importantly, the responding companies include all of the top five sellers of long-term care insurance policies; these companies alone accounted for about two-thirds of industry-wide sales (LIMRA, 2002). As a result, we believe that the data provide a fairly comprehensive picture of the pricing of available long-term care insurance policies. As is typical in the industry, all of the policies in our data (and in the market generally) insure individuals, not couples.

Policies can vary on a large number of dimensions. To present comparable prices across companies, Weiss asks the companies to report premiums for several common policy "scenarios." They ask for prices for all ages for which the policy is available, and they ask for the company's standard rate.[10] Prices are not reported by gender because, despite large differences in expected costs and the absence of regulatory restrictions, insurance companies do not offer different prices by gender (Society of Actuaries, 2003).[11] Premiums also tend not to vary them across different regions of the country.

Table 1 summarizes the four policy scenarios for which Weiss collects premium information. We label these Scenarios 1 through 4 in order of increasing benefit generosity. All policies pay a $100 daily benefit, which is a common benefit in the industry, and all cover facility care (i.e. nursing home care and

[10] Long-term care policies are typically priced based on age and one of three broad, health-related rate categories: preferred, standard or extra-risk (ALCI, 2001). Standard rates are by far the most common; in proprietary data of all policy sales from 1997 – 2001 of one of the largest long-term care insurance companies, about two-thirds of policies sold are rated standard risk.
[11] One explanation for the lack of gender-based pricing in long-term care insurance is that there is substantial within-couple correlation in ownership. Finkelstein & McGarry (2003) report that while 10% of individuals in the 1995 AHEAD own long-term care insurance, 60% of the spouses of individuals with long-term care insurance also have long-term care insurance. There is a broader puzzle of why, in many insurance markets, insurance companies do not use many observable and relevant characteristics in pricing insurance, despite an absence of regulatory restrictions.

assisted living facilities). They differ in terms of whether they cover home health care (scenario 1 does not but all others do), the amount of the deductible, and the length of the benefit period; we confirmed that the scenarios are representative of purchased policies.[12] We refer to Scenario 1 policies as "facility only" policies because they only cover care in facilities (i.e. assisted living and nursing home care).

Long-term care insurance policies specify health conditions (known as "benefit triggers") that must be satisfied in order for the individual to be eligible to receive benefits for care covered by the policy or to have one's time in care count toward satisfying the deductible (known as the "elimination period"). In order to hold the benefit triggers constant, we restrict the sample to the over three-quarters of policies in the data that are "tax qualified"; these are policies that use the benefit triggers that HIPPA requires in order for the policy to be eligible for federal tax benefits. Most non-group policies currently sold use these benefit triggers (LIMRA, 2002), which we describe in more detail in section 4.2.

Table 2 presents descriptive information on annual median premiums and samples size in 2002 for each of the four scenarios in the Weiss data at a variety of ages.[13] We report results separately for two types of policies that are very common in both the Weiss data and among purchased policies: constant nominal benefits, and benefits that escalate at a nominal rate of 5% per year, compounded; about 40% of purchased policies have some sort of nominal benefit escalation (HIAA 2000a).

For a medium-generosity policy, such as a Scenario 2 policy covering all types of care with a 60-day deductible, a 4-year benefit period, and a $100 maximum daily benefit, a 65-year old would pay about $1,200 annually for a policy with constant nominal benefits. The same policy costs nearly $2,100 if the maximum daily benefit escalates at a nominal rate of 5% per year. It costs about half as much if the policy covers only facility care with a 90-day deductible and a 2-year benefit period (Scenario 1). Premiums rise sharply with age, with approximately a ten-fold premium increase from age 50 to age 85.

4.2 Transition probabilities across care states: the Robinson data

---

[12] Information about common purchases is based on Society of Actuaries (2002), HIAA (2000a), and authors' calculations based on proprietary micro data on policy sales described above.

[13] Weiss requests information on three policy scenarios, with the third defined as *either* Scenario 3 or Scenario 4 (the company selects). The smaller number of respondents for these last two scenarios therefore reflects the survey format, rather than anything about the relative availability of these scenarios in different companies.

We require age- and gender-specific monthly transition probabilities across the five states of care described above. Because individuals tend to be denied non-group long-term care insurance policies if they have any limitations to activities of daily living (ADLs) or any cognitive impairment at the time of purchase (Murtaugh et al. 1995, Finkelstein and McGarry 2003), we also require estimates of these transition probabilities for individuals whose health status at the time of purchase is good enough to be eligible for insurance. Finally, it is necessary to have *joint* estimates of the probability of transitioning to a certain care state *and* meeting the health requirements ("benefit triggers") required for the individual to be eligible to receive reimbursement for long-term care expenditures. All of the policies we study are "tax-qualified" and therefore have the same benefit triggers: 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).

To meet these requirements, this paper therefore makes use of a "state of the art" model of health and institutional transitions that was developed and provided to us by Jim Robinson, FSA, MAAA, PhD and former chair of the Society of Actuaries' long-term care insurance valuation methods task force (Society of Actuaries, 1996). The model has two components.[14] The first uses data from the 1982, 1984, 1989 and 1994 National Long Term Care Surveys to estimate transition probabilities across seven different health states, defined by the number of ADLs and IADLs, the presence or absence of cognitive impairment, and death. The transition model is based on a Continuous-Time Markov Chain that allows the transition rates to vary with the sex and the age of the individual. The second component uses the 1985 National Nursing Home Survey to estimate the probability that individuals are in each of the five care states (no care, home care, assisted living, nursing home, or death) as a function of age, gender, health status, and the length of time in the health status. Together, this information can be combined to produce transition probabilities across care states. The model also produces estimates of the number of hours of skilled home care and unskilled home care provided during a home care episode, conditional on age and gender.

[14] Readers interested in a more detailed description of the model are encouraged to consult Robinson (1996).

The model produces estimates that are representative for the entire population, not just insured individuals. Our estimates will therefore reflect the MW or insurance value of a long-term care insurance policy for a typical individual in the population. Interestingly, utilization rates for insured individuals seem comparable, or if anything slightly lower, than the utilization rates for the population at large (Society of Actuaries (2002), Finkelstein & McGarry (2003)).

The Robinson model has several extremely attractive features for our purposes. First, to our knowledge it provides the only available estimates of age- and gender-specific transition probabilities across *all* relevant states of care. There have been many published studies estimating nursing home utilization only (e.g. Dick et al 1994, Kemper and Murtaugh 1991, Society of Actuaries (1992)); however, they are not often estimated separately by gender, and it is rare that they specify the complete distribution of nursing home stays (as opposed to summary statistics), which will be particularly important when we calculate insurance values below. More importantly, we know of no other estimates of transition probabilities that also include home care and assisted living facilities;[15] this is critical for identifying whether a person who exits from one form of care transitions to no care or to another form of care.

Second, as discussed, because the model is designed for (and has been used for) pricing actual long-term care insurance policies, it provides information not just on the transitions across care states but also across the number of ADLs and the presence of cognitive impairment, thus allowing us to match the HIPPA-defined benefit triggers and identify care episodes that are benefit eligible. It also allows us to restrict the sample at the time of purchase to those who are healthy enough to be eligible for insurance. We know of no published data that make such distinctions.

Third, care was taken to make the estimates accurate on anything important to the pricing of the policies; for example, because the distribution of short vs. long stays (rather than just the average) will affect the pricing of policies with deductibles, the 1985 NNHS was used to adjust the distribution of stays so that the model produces admission rates and length of stays similar to those found in the 1985 NNHS.

[15] Robinson estimates assisted living use with question on the 1994 Community Questionnaire that asks whether the place of residence is part of a building/community intended for older, retired, or disabled persons.

Finally, the model has a very strong pedigree. Numerous actuaries in consulting firms, long-term care insurance companies, and the Society of Actuaries confirmed that the Robinson model has been widely used by insurance companies or their consultants to price long-term care insurance policies and that it is well regarded. Robinson (2002) notes that 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.

We also independently verified that the Robinson estimates model produces estimates that are broadly consistent with published estimates, where comparable.[16] For example, life expectancy in the Robinson model, conditional at reaching 65, is 15.3 years for men and 18.5 years for women; this is within 1 and 6 months respectively of the life expectancy estimates of the Office of the Chief Actuary of the Social Security Administration for individuals who are 65 in 2000 (Social Security Administration, 2002). Table 3 compares summary statistics from the Robinson estimates of nursing home utilization to published estimates of the same statistics.[17] The Robinson estimates tend to match the published estimates quite closely on a number of dimensions including probability of nursing home use, age of first nursing home use, expected length of stay, and probability of very long stays. The Robinson estimates of the probability of a very short stay, however, are somewhat higher than other published estimates.

We therefore believe these data represent the best available source for our purposes. It is, however, important note a few potential limitations. First, while the transition probabilities are dependent upon past *health* experience, they do not also depend on lagged *care* experience. It is possible that habit formation in tastes or inertia might produce duration dependence. While this is not a problem for computing the money's worth of a policy, the lack of duration dependence could bias our estimates of insurance value since we will miss the longest spells of care.[18] Second, these data represent estimates for individuals of a

---

[16] In making these comparisons, we estimated a version of the Robinson model that did *not* require that individuals meet the benefit trigger in order to be counted as in care and did *not* require that individuals start out in a health-eligible condition. This was done to be comparable to published estimates that do not make either distinction.

[17] We report many "unisex" estimates from the Robinson model in order to make comparisons to published unisex estimates; in all of the work below we always use gender-specific estimates.

[18] The transition probabilities also ignore any distinction between initial entry into care, and any subsequent re-entry.

particular age at a particular point in time (between 1982 and 1994), and thus they do not take account of potential changes in mortality and morbidity. Tillinghast-Towers Perrin (2002), as well as conversations with actuaries, indicates that this is standard industry practice. This may reflect the disagreement in the literature over both projections for future morbidity and projections for changes in care usage.[19] Our estimates are therefore based on the assumption of no changes in morbidity or care utilization.[20]

Table 4 presents some summary statistics on care utilization in the Robinson model for 65-year old men and women. The statistics assume the individual is out of care at age 65 and counts care utilization only if benefit triggers are satisfied. A 65-year old man has a 27% chance of ever using nursing home care, a 12% chance of ever using an assisted living facility, and a 29% chance of ever using home care. The probability of ever using any type of care rises with survival, especially for nursing care; a 65 year old man who survives until age 90 has a 59% chance of using nursing home care at some point in his life.

There is substantial correlation in types of care use; a man who uses a nursing home has a 58% chance of also using home health care. Almost two-thirds of individuals who use a nursing home will at some point exit to a state other than death; this is consistent with other studies (e.g. Dick et al. 1994) that indicate a substantial amount of recovery from nursing home care. On the other hand, we find that about half of individuals who use a nursing home will ultimately die in a nursing home (results not shown).

The probability of using any type of care is substantially higher for women than for men. This does not appear driven solely by longevity differences; for example, among individuals who survive until age 80, women are more likely to have used care prior to age 80 than men. Conditional on using a given type of care, the average time spent in this care is also longer for women than for men, and the right tail of the time-in-care distribution is also thicker for women than men. Interestingly, despite higher utilization, women on average first use each type of care later than men; for example, the average age of first nursing

[19] For disagreement over the direction of changes in future morbidity, compare e.g. Manton et al. 1997 and Manton & Gu 2001 to Lakdawalla et al. (2001). Uncertainty about future care utilization depends not only on the effects of changes in morbidity on care utilization but also on other factors that may change care utilization conditional on morbidity, such as potential decrease in the supply of unpaid care as more adult women enter the labor force (Lawkawalla & Philipson 2002).

[20] This is analogous to the approach taken by Wiener et al. (1994) who also assume no changes in morbidity in their baseline set of assumptions in the Brookings-ICF Long-Term Care Financing Model.

home entry (among users) is 83 for men and 85 for women. This is important in calculating MW and insurance value since these depend not only on the amount (and distribution) of care used, but also on the timing of that care, with care in later periods being more heavily discounted.

4.3 Costs of care in each care state

We use Metlife Market Survey data to estimate current average daily care costs in nursing homes, assisted living facilities, and at home (MetLife 2002a, MetLife 2002b). These data were collected to determine pricing for the new federal employee long-term care insurance program, and were in fact used for that purpose. The survey covers all 50 states and the District of Columbia; although the data indicate substantial variation in costs across geographic areas, long-term care insurance policies are not priced differently across geographic areas and we therefore use national averages for our estimates of current care costs. The national average daily cost of nursing home care in 2002 is $143 per day ($4,290 per month) for a semi-private room (private rooms are more expensive) and therefore substantially exceeds the typical $100 daily benefit cap. By contrast, care costs for an assisted living facility are on average less than a $100 benefit cap, at $72 per day ($2,160 per month).

Home health care is a substantially smaller share of total care costs than facility care (i.e., a nursing home or assisted living facility) and accounts for only one-quarter of total long-term care expenditures (US Congress, 2000). According to MetLife (2002a), the cost of home health care is $17 per hour for unskilled (non-RN) care and $38 per hour for skilled (RN) care. We combine these hourly cost estimates with age- and gender-specific estimates from the Robinson model of the average number of hours of each type of home care used by those in home health care, and thus derive age- and gender-specific estimates of monthly home care costs. For example, a 65 year old male (female) in home care will have on average $11.30 ($17.50) per day of home health care costs, considerably below the maximum daily benefit amount. Even a 90 year old male (female) in home health care would only have, on average, $30 ($45) per day of home health care costs.[21]

[21] As discussed in Section 4.4, 40% of these home health care expenditures would be covered by Medicare.

Since an individual who buys a long-term care insurance policy in 2002 may receive benefits 30 years hence, it is important that we account for projected real cost growth. There is a general consensus that care costs will grow at the rate of real wage growth, since the primary cost for all of these types of care is the labor input (Wiener et al. 1994, and conversations with industry officials).[22] In our base case, we therefore follow the assumptions of Wiener et al. (1994) and Abt (2001) of a baseline assumption of 1.5 percentage point annual real growth in care costs (i.e. wages). With this real cost growth, and given information on expected inflation described in Section 4.5 below, it would take 9 years and 7 months before the average daily cost of an assisted living facility exceeds the $100 nominal benefit cap. If a 65 year old male (female) purchased the policy in 2002, their expected home health care costs if they go into home heath care would not exceed the $100 nominal daily benefit for 33 years and 9 months (32 years). In the sensitivity analysis, we examine how sensitive MW estimates are to alternative assumptions about the expected annual rate of real cost growth, from the 0.75% "lower bound" assumption of Abt (2001) to the 3.0% estimate of (Mulvey and Li, 2002) which is close to the 2.6% estimate by CBO (1999).

4.4 Accounting for public insurance coverage

Two public insurance programs cover long-term care expenditures. Medicaid, the public health insurance program for the indigent, is the *secondary payer* when an individual has long-term care insurance. It therefore does not affect estimation of MW. We discuss it at length in Sections 6 and 7 when we investigate the insurance value of private long-tem care insurance contracts; the role of Medicaid as a payer-of-last-resort is obviously crucial to consider in estimating insurance value.

Medicare is the public health insurance program for the elderly and is the *primary payer* for long-term care insurance expenses. Thus any care that is Medicare eligible will not be reimbursed by private insurance and is not included when calculating the expected benefits from a long-term care insurance policy. Medicare pays for 16% of institutional care (specifically, nursing home care), and 30% of home health care, for the elderly (U.S. Congress, 2000). However, very little of Medicare-covered nursing

[22] 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."

home expenditures would be otherwise eligible for private long-term care insurance benefits. We therefore do not incorporate Medicare's nursing home benefits into our MW calculation.[23] Medicare coverage for home health care, by contrast, pays for services that would otherwise be eligible for private insurance coverage. If the health-related criteria for Medicare eligibility are met, Medicare will reimburse both skilled and unskilled home health care up to 35 hours per week for an essentially unlimited period of time. These health-related Medicare-eligibility criteria are more stringent than those for "tax qualified" private insurance (see e.g. Bishop and Skwara, 1993, GAO 1996, US Congress 2000). We therefore assume that all Medicare home health care payments are for home health care that meets the private policy benefit triggers. Since 75% of total home health care expenditures are for expenditures that meet the private policy benefit triggers (authors' calculation based on Robinson model), this implies that, since Medicare pays 30% of all home health care costs and only pays home health care costs that meet the private benefit triggers, it will pay for 40% of home health care costs eligible for private insurance reimbursement. We therefore multiply estimated home health care expenditures each period by 0.6 to reflect that portion that is eligible for private insurance reimbursement.[24]

4.5 Expectations of interest rates and inflation

To discount nominal benefits and premiums received in the future, we make two alternative assumptions about the term structure of nominal interest rates (i.e. i_t). In our base case estimates, we use the term structure on yields of U.S. Treasury Strips. Because many insurance companies invest the premiums in a slightly riskier portfolio, we examine the sensitivity of our results by also using the term structure for BAA rated corporate bonds. Because the pricing survey data is primarily from March, we used term structure data from Bloomberg on March 1 (or the nearest trading day). In order to estimate

[23] This assumption was corroborated by conversations with individuals at private insurance companies. Medicare will cover nursing home stays *only* if: (1) they are stays in skilled nursing home days and (2) follow within 30 days a hospital discharge. They will also only cover up to 100 days per spell of illness and, beyond 20 days (a shorter time period than the policy deductible for all but one of our scenarios) require a co-payment of $96 in 1998 (Urban Institute 1999), which is approximately equal to the $100 benefit cap. Finally, the criteria for Medicare result in coverage for stays that are often recovery from acute illness; by contrast, as discussed, long-term care insurance benefit triggers require that there be little likelihood of recovery within 90 days (US Congress, 2000).

[24] If we assume Medicare reimburses 30% or 50%, the MW estimates varied by only about 2 cents for men and 4 cents for women. This reflects the low proportion of total costs that are home health care costs.

inflation expectations on the same date (used to convert our real cost growth assumption into nominal terms), we used the difference in the yields on nominal U.S. treasury securities and TIPS at two different durations, and imputed the forward inflation spot rates using the expectations hypothesis.[25]

5. Empirical Findings: MW results

5.1 Basic Results

Table 5 shows MW for a 65 year old in 2002 based on median premiums for each policy scenario, for men and women separately. The top panel of the table shows the results using our base case assumptions: the Treasury term structure of interest rates, real cost growth of 1.5% per year, and all companies in the Weiss data. The results indicate that MW are substantially higher for women than for men, which is unsurprising given that men and women face the same prices but men have substantially lower expected utilization. Money's Worth also tend to be substantially higher for policies that cover facility care only (scenario 1), than for the policies that cover all three kinds of care (scenarios 2 –4).

For a 65-year old male in 2002, the MW for policies that cover all three kinds of care ranges from 0.57 to 0.73, depending on the policy details; the median MW is about 0.66. This indicates that for every dollar in expected present discounted value of premiums paid, the individual will receive in expectation, only 66 cents in expected benefits. This estimate is substantially lower than the MW estimate for a private annuity for a 65-year old man, which is about 0.85 (Brown, et al, 2002).

For a 65-year old woman, in contrast, MW for policies that cover all three types of care range from 1.12 to 1.42 depending on the policy; the median MW is about 1.3. This indicates that prices are below actuarially fair for women. The fact that – despite MW greater than 1 (i.e. negative risk premiums) – only about 10% of elderly women have long-term care insurance is prima facie evidence that something other than the pricing of insurance policies is reducing the demand for private long-term care insurance. We explore this more formally when we estimate the insurance value of these contracts in section 7 below.

[25] See Sack (2000) and Shen & Corning (2001) for a discussion of using this yield differential as a measure of expected inflation, including the effect of liquidity differences.

There is no clear pattern of MW across policies of different benefit comprehensiveness. On the one hand, except for Scenario 4, there is a clear pattern of MW increasing as the comprehensiveness of the policy decreases from Scenario 3 through Scenario 1.[26] On the other hand, we find that – for a given scenario (again except for Scenario 4) – the MW is *higher* for policies with escalating (i.e. larger) benefits than policies with constant nominal benefits. There is therefore only mixed support for the prediction of asymmetric information theory that – due either to adverse selection or moral hazard – higher risk individuals should purchase more comprehensive insurance (see e.g. Chiappori (2000), Chiappori and Salanie (2000)). If this were true, more comprehensive policies should be priced higher to reflect the higher risk pool and therefore, from the perspective of a given individual in the population, MW should be lower on more comprehensive policies. The lack of these clear pricing patterns is consistent with the utilization-based evidence in Finkelstein and McGarry (2003) who find no evidence that higher risk individuals do purchase more comprehensive insurance.

Given that about 55% of buyers are women (HIAA 2000a), the average MW across men and women is above 1 for all policies with escalating benefits and for the facility only constant nominal benefits policy. While this might appear inconsistent with insurance companies making non-negative profits, the MW calculations were all done under the assumption that an individual who buys a policy continues to pay premiums as long as he is alive and is not receiving benefits. In practice, about 7 percent of policies each year lapse due to failure to pay the regularly scheduled premiums within the time required (Society of Actuaries, 2002). This results in cancellation of the policy and forfeiture of any benefits.[27]

The bottom panel of Table 5 therefore estimates the MW assuming that the individual faces the average probability of lapsing each year.[28] We assume individuals will only lapse on their policy

[26] The "outlier" results for Scenario 4 may be an artifact of the changing set of companies that offer various policies. When we limit the sample to the companies who offer Scenario 4 and other scenarios, scenario 4 always has a lower MW than the other scenarios.

[27] Less than 3 percent of the policies in our 2002 data provide any sort of limited coverage for care costs if the individual lapses on his premium payments.

[28] We use information from Society of Actuaries (2002) on average lapse rates for non-group policies for the first 13 years since purchase, and assume the lapse rate is constant after 13 years; lapse rates tend to follow a U-Shaped

payments if they are not in any of the care states that are potentially covered by their policy; we treat lapsing as adding to the probability of transitioning to the state of death and proportionally transitions to the other four states.

The results indicate that the MW is substantially lower (and now always below 1) when individuals face the typical "risk" of lapsing, than for individuals who regularly pay their premiums. For example, for policies that cover all three types of care, MW now range from 0.35 to 0.44 for men, and from 0.69 to 0.78 for women. Allow for policies to lapse reduces MW because in the beginning years of the policy expected premium payments are substantially higher than expected benefits; on average, it is only after 15 to 20 years that individuals begin receiving benefits.

This raises the interesting question of why lapses occur, an area that we will consider in future research. Possible explanations include the arrival of positive health information, negative income shocks, or possibly "non-rational" behavior. Lacking more information about the reason, we ignore the possibility of rational or non-rational policy lapses in estimating the insurance value below; with greater understanding of the reasons for lapsing, it would be possible to incorporate this into the analysis.

Table 6 examines how MW varies with age between age 50 and age 80.[29] Except at very low ages and constant nominal benefits policies, there is a general pattern of MW declining with age. This is consistent with the individual's private information about his risk type increasing with age. As private information increases, we would expect the pool of the insured to become more adversely selected (i.e. higher risk relative to the general population). Hence, MW from the perspective of a typical individual in the *population* would look lower at higher ages than at younger ages since at higher ages policies are priced for insured individuals who are higher risk relative to the population than they are at younger ages.

5.2 Sensitivity analysis

Table 7 reports an analysis of the sensitivity of the "base case" MW estimates for a 65 year old to various alternative assumptions. While the *level* of MW varies with the assumptions in the expected

---

pattern with higher lapse rates in early and late durations. The Society of Actuaries (2002) estimates may overstate lapse rates as terminations whose reason is unknown (and therefore might be due to death) are counted as a lapse.

[29] Because Table 2 indicates that few firms in the data report prices for age 85, we do not estimate MW for this age.

direction, the basic patterns across policies and gender remain. When the higher corporate terms structure is used to discount premiums and benefits instead of the Treasury term structure, the MW decreases because premium payments begin immediately while benefits do not begin, on average, for another 15 to 20 years. The MW decreases more for women than for men, since women on average enter care later than men (see Table 4). Higher real cost growth results in higher MW, but the effect is small for policies that pay a constant benefit; this reflects the fact that cost growth above the benefit cap does not affect MW. Similarly, lower real cost growth lowers MW only slightly for constant nominal benefit policies, with essentially no effect on facility only policies (where expenditures are initially already close to the $100 nominal benefit cap). Assumptions about cost growth have a larger effect on policies with escalating nominal benefits, since cost growth may occur in the range where the benefit cap is not binding.

Given the large documented price dispersion in other insurance markets (Dahlby & West 1986, Mitchell, et al 1989, Brown & Goolsbee 2002), Table 5 also shows estimates of MW for the sample of policies offered by the top five companies.[30] MW are slightly lower for these top five companies. This is consistent with the findings of Doerpinghaus and Gustavson (1999) who explore cross-sectional variation in long-term care insurance prices and find that larger companies tend to offer higher prices.

6. A Framework for Assessing the Insurance Value of Long-Term Care Contracts

The money's worth framework used above is useful for determining the implicit price of a long-term care insurance contract. In order to understand the demand for long-term care contracts, however, one must also know something about how the policy is valued by risk-averse consumers, who are typically willing to pay more than the actuarially fair price for an insurance contract. To measure this, we compare the utility of a risk averse life cycle consumer is a world with and without long-term care insurance.

We use this framework to address two main questions. First, does it make sense for anyone to buy long-term care insurance? In other words, is there a puzzle – as in the market for annuities – about why so

[30] We are reluctant to estimate MW for the highest and lowest premiums since, given the complexity of policies, it is difficult – even with our sample of observably homogenous products – to reject the possibility that small unobserved product differences drive pricing differences rather than pure price dispersion. For illustration, however, under the base case assumptions, MW ranges for a 65-year old male scenario 2 policy with constant nominal benefits from 0.40 to 0.80; for women, the comparable range is 0.69 to 1.36.

few people buy long-term care insurance? Or is it the case that most individuals would not find long-term care insurance welfare enhancing? Second, which aspects of the structure of private and public insurance policies play a large role in affecting the value of the private insurance contract?

6.1 Analytical framework

We consider an individual who purchases a long-term care insurance contract at age 65.[31] We assume that this individual chooses a consumption path to maximize remaining expected lifetime utility, subject to constraints imposed by the consumer's budget as well as various contract and/or public policy features, including the presence of publicly provided care (i.e., Medicaid). We first calculate the maximum expected lifetime utility that can be achieved when the individual purchases a particular long-term care insurance contract, and holds onto it for life (i.e., no lapsing). We then "take away" the insurance 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. This incremental amount of financial wealth provides a dollar metric of the utility gain (or loss) from the purchase of an insurance contract; we refer to it throughout as the "insurance value" of the long-term care insurance contract. 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 individual would find the purchase of the insurance contract welfare reducing. There is a large literature that calculates similar measures of the welfare gain associated with access to annuities (e.g., Kotlikoff & Spivak 1981, Friedman & Warshawsky 1988, Mitchell et al 1999, Brown 2001, Davidoff, et al, 2002). This present study, to our knowledge, represents the first such analysis of the market for long-term care insurance.

The individual in our model faces two sources of uncertainty: long-term care expenditures and mortality risk. In the four living states (no care, paid home care, assisted living facility, and nursing home care) utility is a function of real consumption. For now, we assume no utility from bequests. The individual's value function $V_{s,t}(W_t; A)$ denotes the value of the individual's maximum expected discounted lifetime utility at period t that arises from following an optimal consumption path, given that

[31] All utility calculations are for an individual. We leave the extension to couples for future work.

the individual is in state s (of the four possible living states). W_t is financial wealth at time t, and A is a vector of the annuity payments for each period, such as from Social Security or defined benefit private pensions. Using standard dynamic programming techniques (e.g. Stokey and Lucas, 1989), we define $V_{s,t}(W_t; A)$ recursively in the form of a Bellman equation, discretize the relevant state spaces, and solve for the optimal consumption path iteratively from the final period (T) back to the beginning. In the terminal period, T, it is assumed that, given the absence of a bequest motive, the individual consumes all remaining wealth. The recursive Bellman equation is:

$$\underset{C_{s,t}}{Max}\, V_{s,t}\left(W_t; A\right) = \underset{C_{s,t}}{Max}\, U_s\left(C_{s,t} + F_{s,t}^m\right) + \sum_{\sigma=1}^{4} \frac{q_{t+1}^{s,\sigma}}{\left(1+\rho\right)} V_{\sigma,t+1}\left(W_{t+1}\right) \qquad (4)$$

In contrast to the nominal Money's Worth notation presented earlier, all values in these utility equations are expressed in real terms. U_s is the utility function for state s, $C_{s,t}$ represents planned consumption in state s in period t. $F_{s,t}^m$ represent the food and housing consumption that the individual receives from institutional care (i.e. an assisted living facility or a nursing home); $F_{s,t}^m$ is therefore 0 when the individual is residing in the community with or without home care. The superscript *m* allows us to vary the amount of food and housing consumption provided by institutional care when that care is paid for by private resources compared to when it is paid for by Medicaid; we discuss this in more detail below.[32] As in section 3, t is defined in months, we assume a maximum lifespan, T, of 105 years, and $q_{t+1}^{s,\sigma}$ is the probability of transitioning from state s in period t to state σ in period t+1. ρ is the discount rate.

The individual chooses an optimal consumption path 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

[32] Although the literature frequently assumes that the individual does not receive direct utility from *acute* medical expenditures (see e.g. Hubbard, Skinner and Zeldes, 1995), in the case of *institutional* medical care, it is unrealistic to assume that the individual receives *no* utility from these expenditures, given that part of them cover food and shelter that would otherwise have to be funded out of income and wealth were the person living in the community. We therefore follow Pauly (1990) in assuming that some portion of institutional care expenditures directly enter the individual's utility function.

accumulation equation. In the absence of Medicaid the wealth accumulation equation is:

$$W_{t+1} = (W_t + A_t + \min[B_{s,t}, X_{s,t}] - C_{s,t} - X_{s,t} - P_{s,t})*(1+r) \quad (5)$$

The notation is the same as that in Section 3, except that values here are reported in real, rather than nominal, terms. The long-term care insurance policy pays a benefit equal to the lesser of the benefit cap ($B_{s,t}$) and the actual costs incurred ($X_{s,t}$). It charges an insurance premium of $P_{s,t}$. We assume that once an individual purchases a LTC policy, they hold it until death. When the individual has no insurance, $B_{s,t}=P_{s,t}=0$. Unconsumed financial wealth accumulates at the real interest rate r.

6.2 Modeling the Effect of Medicaid

Constraint (5) 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. In 2000, Medicaid paid for 44% of institutional care and 18% of home care (US Congress, 2000). We therefore incorporate these payments into the consumer's constrained optimization problem.

In a typical state in 1999, Medicaid required a deductible of all but $2,000 of one's assets, and a co-payment for institutional care of all but $30 per month of one's income (AARP, 2000).[33] We will refer to these values as $\underline{W}$ and $\underline{C}$, respectively. To be eligible for Medicaid reimbursement, the individual must be (i) be receiving care, (ii) meet the asset test (i.e., must have $W_t < \underline{W}$), 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 $\underline{C}$.[34] If a person is eligible, Medicaid pays an amount equal to $X_{s,t} - A_t - \min(B_{s,t}, X_{s,t}) - \max(W_t - \underline{W}, 0) + \underline{C}$.

In other words, Medicaid pays for actual expenses ($X_{s,t}$) and provides a maintenance allowance of $\underline{C}$, but offsets all other income (specifically any annuity income and any payments from the LTC insurance

[33] Slightly more income and assets are "disregarded" if the individual has a community-based spouse.
[34] While the Medicaid income test has a much higher threshold than $\underline{C}$, the disregard for long-term care, given the implicit 100% tax rate on income above $\underline{C}$ in the case of LTC expenditures, $\underline{C}$ becomes the relevant test.

contract) as well as an assets in excess of $\underline{W}$, dollar for dollar. Note that even when on Medicaid, the individual is able to consume more than $\underline{C}$ if they wish to consume out of wealth to reduce it even further below $\underline{W}$. By incorporating Medicaid payments into equation (5), we find the wealth accumulation equation for individuals on Medicaid:

$$(5^{M}) \qquad W_{t+1} = \left(W_t - C_t - \max(W_t - \underline{W}, 0) + \underline{C}\right) * \left(1 + r\right)$$

In addition to the role of $\underline{C}$ and $\underline{W}$, we believe that, following Pauly (1990), a potentially important parameter to describe the Medicaid program is the relative quality of care provided by Medicaid versus privately financed care. Anecdotally, there is a belief that Medicaid patients receive lower quality nursing home care than privately-funded patients. Indeed, several studies have found that nursing homes with a higher percentage of Medicaid residents are poorer quality (see Institute of Medicine, 2001 for a review).[35] To parameterize this, we allow our "food and housing" value of facility-based care, $F_{s,t}^{m}$ to differ depending on the source of financing (Medicaid vs. private sources.) In this way, we can determine how sensitive the value of private insurance is to the relative "quality differential" between care provided by private resources, and care paid for by the Medicaid program.

While there is considerable variation across states in the Medicaid program, all states offer comprehensive nursing home coverage for individuals who meet the income and asset tests.[36] Some states are beginning to cover assisted living facilities, but this is still the exception rather than the rule. There is also substantial variation in the amount of home health care provided by Medicaid. Many Medicaid programs have caps on home care enrollment and home care expenditures that result in long wait lists and limited coverage (AARP 2000, US Congress 2000). In practice, an individual in need of home care or assisted living, who meets the Medicaid income and asset requirements, may receive Medicaid assistance in a nursing home, go without care (presumably with negative health and utility

---

[35] Ettner (1993) and Cutler & Sheiner (1994) also provide evidence that it may be harder for individuals who are covered by Medicaid to get into a nursing home, particularly if reimbursement rates are low relative to private market prices.

[36] For a much more detailed analysis of Medicaid's coverage rules for LTC, we refer the reader to Kaplan (2004). Much of the following paragraph is drawn from this work.

consequences), or perhaps pay for a small amount of care themselves. To abstract from these issues, in our model, we assume that a Medicaid eligible individual needing long-term care transfers to a facility covered by Medicaid, and thus receives utility from the food and housing component, $F_{s,t}^{m}$.[37]

6.3 Parameterization

To solve the utility maximization problem (4) subject to the relevant constraints, we must parameterize each of the variables in the above equations. We assume a constant relative risk aversion utility function that is invariant to the state of care.[38] We report results for a coefficient of relative risk aversion of 1, 2, and 3.[39] We assume the real interest rate, discount rate, and inflation rate are all set equal to 0.03 annually.[40] For the transition probabilities $q_{t+1}^{s,\sigma}$, we use the age- and gender-specific transition probabilities used in calculation the MW above and described in Section 4.2.[41] For the food and housing consumption value when in facility-based care, we use the monthly amount ($514) that the Supplemental Security Income (SSI) program pays to a single, elderly individual in 2000 (US Congress, 2000). We choose this value since SSI is designed to provide a minimum subsistence level of food and housing.

There are also a large number of parameters concerning that structure of public insurance, long-term care insurance contracts and pricing that we vary in our analysis. Here we describe our base case

---

[37] Our approach is also consistent with Medicaid's allowance for a larger community based living allowance when it pays for home health care. So that the transition probabilities aggregate properly, we continue to use the transition probabilities of the state in which the person began the period.

[38] State-dependent utility (i.e., allowing the utility function to differ across states of care) can be easily incorporated into the analysis. Because we have been unable to find any useful guides for how to parameterize such differences, we currently assume that utility is not state-dependent.

[39] Risk aversion of one corresponds to log utility, a value that has found some support in empirical studies that have estimated relative risk aversion from household consumption patterns (see e..g. Laibson, Repetto and Tobacman, 1998). However, recent survey evidence suggests higher values are appropriate (Barsky, et al, 1997).

[40] A 3% expected inflation rate is consistent with the average from 1926 through today, although a bit higher than the expected inflation rates implied by the current differential between real and nominal government bonds. A 3% real rate of return assumption based on recent yields on TIPS. We set the discount rate equal to the interest rate.

[41] As noted above, these transition probabilities treat the individual as out of care if he is in care but does not meet the health-related benefit triggers required for benefit eligibility. They therefore ignore long-term care expenditures that would not satisfy the benefit triggers. For perspective, the probability of ever using nursing home care is, for men, 27% for *covered* care compared to 30% for any nursing home care; for women, these numbers are 44% and 47% respectively. For home health care – not surprisingly – the differences are greater. For example, 29% of 65 year old men will ever use covered home health care, whereas 40% will ever use any home health care; the numbers for women are 35% and 70% respectively. Of course, it should be remembered that home health care is only one-quarter of total long-term care expenditures (US Congress, 2000).

assumptions for these parameters, which are chosen to be typical of real-world parameters. As in the MW analysis, we assume that Medicare reimburses 40% of home health care. We set the Medicaid parameters $\underline{C}$ and $\underline{W}$ to their modal values across the states, which are $30 and $2,000 respectively (AARP 2000). Lacking any clear guidance, we start with the assumption that the quality of care provided by Medicaid $(F_{s,t}^{medicaid})$ is the same as the quality of care provided by private resources $(F_{s,t}^{private})$.

For our LTC policy, we start with a policy that covers all three types of care, has no deductible, an unlimited benefit period, and offers a (constant nominal) maximum daily benefit of $100 (or $3000 per month). This corresponds to Scenario 4 in the Weiss data with constant nominal benefits. We assume – as with all of the policies in the Weiss data – that the monthly premium is also fixed in nominal terms (hence declining in real terms). For the monthly premium we use the premium that would correspond to a money's worth of the policy of 0.65 for men and 1.25 for women, figures that that are roughly comparable to typical gender-specific MW calculated in Section 5. Finally, for the base case we assume that long-term care costs grow at a rate of 1.5% per year faster than inflation.

7. Results: The Insurance Value of Long-Term Care Contracts[42]

7.1 Who Should Buy LTCI? Results by Wealth and Risk Aversion

Under these base case assumptions, we compute the insurance value for men and for women at nine different points in the wealth distribution. These correspond to the 10th through 90th deciles of the wealth distribution according to data from the first wave of the Health and Retirement Survey (HRS), as calculated by Mitchell & Moore (1998). Total wealth is defined as the sum of financial wealth (excluding housing), Social Security wealth, and pension wealth. We divide wealth into annuitized (Social Security and defined benefit pension wealth) and non-annuitized components and compute the gender-specific, actuarially fair real monthly annuity associated with the annuitized component. We parameterize W_0, or

[42] The results in this section are highly preliminary. In particular, the absolute numbers reported will change as we refine our base case assumptions concerning the distribution of financial and annuitized wealth using more recent data. We believe, however, that the qualitative patterns in the results will remain largely unchanged.

financial wealth, as the sum of financial assets and assets in defined contribution plans.[43] As one moves up the wealth distribution, total wealth rises while the fraction that is annuitized typically declines.

Table 8 reports the results. The first major result to notice is that in the lower half of the wealth distribution, including the median consumer, the insurance value from the long-term care insurance policy is negative. The median individual should therefore not find it optimal to buy the long-term care insurance contract. This is in stark contrast to simulation results for annuities; these suggest that all risk averse consumers should find the annuity contract valuable (Mitchell et al. 1999, Davidoff et al. 2002) and create a puzzle of why, in practice, individuals tend not to annuitize.

The second key result from Table 8 is that it is only at combinations of high risk aversion *and* high total wealth that the private LTC insurance contract delivers a positive insurance value.[44] With log utility (CRRA=1), even a male in the 90th percentile of the wealth distribution would find the purchase of a long-term care contract welfare reducing. At higher levels of risk aversion, private insurance becomes attractive at lower points in the wealth distribution. Among men with risk aversion of 2, private insurance becomes attractive somewhere around the 80th percentile.

This pattern of the insurance value rising with wealth is consistent with survey evidence on long-term care insurance holdings rising with wealth (HIAA 2000a; authors' calculations in 1998 HRS). However, we might have expected the relationship between insurance value (and the probability of purchasing a private long-term care insurance contract) and wealth to 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 of the wealth distribution may be able to "self-insure." There are two possible reasons for why we do not see this pattern in Table 8 or in survey data. First, we may not have gone high enough in the wealth

[43] In future drafts, we intend to calculate the wealth distribution for 65 year olds with more recent HRS data. We also plan to scale household wealth by an appropriate equivalence scale parameter since we are looking at the optimization problem of an individual, and some of household wealth will be allocated to the spouse.

[44] The insurance value tends to rise with wealth deciles. It also tends to fall with risk aversion below the median wealth and to rise with risk aversion above median wealth. Below the median, individuals tend to find LTC insurance welfare reducing, because they are more likely to end up on Medicaid anyway, in which case the benefits of the LTC policy are implicitly taxed away at a 100% marginal rate. As such, the effect of the LTCI policy is to take away money in healthy states, potentially interfering with the individual's ability to optimally smooth consumption. Stated differently, more risk averse individuals will place a higher insurance value on Medicaid, which is a "better" product for these low income individuals than private insurance.

distribution for self-insurance to be a good substitute for private insurance. Second, in practice, the composition of wealth between annuitized and non-annuitized wealth may also matter.[45]

We therefore examined the relationship between total wealth and the value of insurance, holding fixed at 69 percent the fraction of wealth annuitized (which is the fraction annuitized for our median household). Figure 1 plots the pattern of insurance value with respect to total wealth, holding fraction of wealth annuitized constant. It reveals the expected inverted U-shaped pattern. The value of LTC insurance reaches a peak at around $1.3 million in total wealth, and then declines steadily thereafter.

Finally, Table 8 allows some initial comparisons of the insurance value for men and women. There is a general (though not universal) trend that women are more likely to place a higher value on insurance than men at the higher end of the wealth distribution, and a lower value on insurance than men at lower points in the wealth distribution. Several offsetting factors are at work. The MW of the policy is higher for women than men, thus increasing the insurance value for women relative to men, all else equal. However, because women tend to have spells later in life (when costs have increased in real terms and are therefore more likely to be below the constant nominal daily benefit cap), a lower fraction of their total expenditure risk is covered by the policy, thus decreasing the policy's insurance value for women relative to men. In addition, because their expected lifetime utilization of long-term care is greater, women at the low end of the wealth distribution are even more likely to end up on Medicaid with or without private insurance, and thus the implicit tax Medicaid places on private insurance payments should further decrease the insurance value for women relative to men. Finally, the riskiness of the care expenditure distribution differs for women and men, thus affecting their relative insurance values.

[45] Holding total wealth constant for our median male, as we vary the fraction annuitized, the insurance value of LTC insurance exhibits a non-monotonic pattern, peaking around 80% of total wealth annuitized. There are numerous reasons to expect the composition to matter. Annuitized wealth itself has insurance value against mortality risk, and this insurance value may interact with the value of LTC insurance. Also, unlike financial wealth, annuitized wealth cannot be easily re-allocated across time. Finally, Medicaid eligibility rules treat non-annuitized assets and annuitized assets differently, with the former being subject to the asset test and the latter subject to the income test. We plan to explore these wealth/annuity interactions in more detail in a future version of this paper. This also highlights the more general point that cross-partial effects maybe important in understanding variations in insurance value across individuals, and we plan on exploring these more in further versions.

7.2 The Effect of Pricing: Would Tax Subsidies Help?

The above results reflect the value of a long-term care insurance contract given "real-world" parameters for pricing, the structure of public insurance, and features of the private insurance contract. To understand the relative contribution of these three components in explaining the limited size of the private insurance market, we examine the effect on insurance values of varying each component separately.

Table 9 shows how our estimates of the insurance value of the long term care insurance policy changes when we vary MW between 0.2 (such that the premium is 5 times its actuarially value) to 1.8 (such that the premium is only 55 percent of its actuarial value). As a benchmark, the bolded rows show the insurance value at approximate current MW levels (0.65 for men, 0.125 for women). We report results for males and females, at the 50th and 90th percentiles in the wealth distribution.

As expected, the value of the policy is an increasing function of the money's worth. More interestingly, the results indicate that – for women – it is nearly impossible to induce demand for the median consumer through pricing. Even with a money's worth of 1.8 (and thus a subsidy of 45% over the actuarially fair price), the median female never finds the private policy valuable. For the median male, the policy is only ever valuable at above-actuarially fair prices for the most risk averse (risk aversion coefficient of 3). In results not shown, we find that the MW must be 0.96 or higher for the median male with risk aversion of 3 to want to buy long-term care insurance.

Given these results, it is not surprising that the effect of tax subsidies to private long-term care insurance are limited. To calculate an upper bound on the potential effect of the federal tax subsidies to employer provided insurance described above, we assume that employers will pay all of the premiums and that the incidence of the subsidy is fully on the worker. The tax subsidy therefore reduces the after-tax premium by: $\left(\left(1-\tau_{income}-t_{employee\ payroll}\right)/\left(1+\tau_{employer\ payroll}\right)\right)$ (see e.g. Gruber and Poterba, 1994).[46]

Table 10 shows the change in insurance value associated with this maximal decrease in money's

[46] Of course, the effect of a tax subsidy to employer-provided insurance may have different effects than to non-group insurance. Many of the state tax subsidies subsidize non-group premiums (Wiener et al. 2000), but their impact will be even lower since state tax rates are considerably below federal tax rates. This exercise can therefore be thought of as an extreme upper bound on the potential effect of state tax subsidies to the non-group market.

worth that the tax subsidy could accomplish relative to the baseline of 0.65 for men and 1.25 for women. We report results for men and for women, at both the median and 90th percentile of wealth. We also report results for three different federal marginal tax rates (τ_{income}) of 15%, 27.5% and 39.1%. We assume a payroll tax of 7.65% on both the employee and employer.

For the median female the tax subsidy induces demand only at the highest level of risk aversion and the highest tax subsidy (producing a MW of 2.53). For the median male, the tax subsidy similarly does not induce demand for risk aversion of less than 3. Moreover, these results assume the maximal possible impact of the tax subsidy (i.e. full incidence on the employee and the employer pays the entire premium). At the 90th percentile, we find that tax subsidies largely serve to make an already attractive policy more attractive.[47] The limited impact of the tax subsidy on insurance values is understandable, given that it serves only to reduce the premium paid when the individual is out of care. It has no effect on the benefit level; most of the value of the insurance contracts arises from its ability to improve consumption smoothing, something that is largely unaffected by the change in premiums.

One net, the results suggest that tax subsidies are unlikely to be an effective way to induce demand for a large fraction of the population. Moreover, the presence of negative insurance values for risk averse consumers at below-actuarially fair prices indicates that something other than pricing is deterring insurance demand. We now turn to consider the role of public insurance in crowding out private demand.

7.3 Does Public Insurance Crowd-Out Private Insurance?

By serving as a "payer of last resort", Medicaid may substantially reduce the demand for private long-term care insurance since it eliminates the risk that an individual will exhaust his resources, and be in need of care that he is unable to pay for (see e.g. Pauly 1990). A natural starting point for determining the effect of Medicaid is therefore to investigate the insurance value of private contracts in the complete absence of a Medicaid program. In the absence of any payer of last resort, a lack of private insurance and/or sufficient wealth means that an individual faces the risk that in some states of the world he will

---

[47] We plan on looking at intermediate wealth levels in future versions.

simply run out of money and hence run consumption down to zero; if this results in infinite disutility (as is the case with CRRA utility), then a private insurance contract that eliminates this possibility is "infinitely valuable." Thus in a world without any payer of last resort, any individual for whom the distribution of long-term care insurance risk raises the possibility of exhausting all of his resources should want to buy existing long-term care insurance contracts.

Our estimates from the Robinson model reveal, that, given the distribution of long-term care expenditure risk, one has to go extremely high in the wealth distribution before individuals have sufficient wealth for it to be feasible (even if still undesirable) to self insure. Simulating the care experience of 100,000 men and 100,000 women with our parameters for costs, cost growth and interest rates, we found that the worst individual outcome exceeded $1.07 million in present value at the age of 65 for a woman, and $950,000 for man. Thus in a world without Medicaid, any individuals below this wealth level would receive a positive utility gain from purchasing the existing private long-term care insurance contract.

By contrast, the results in Table 8 indicate that, in the presence of the existing Medicaid program, long-term care insurance is never valued for individuals with total wealth of $250,000 or less (i.e. the median or lower) and at some levels of risk aversion is not valued as high as the 90th decile (over $750,000 in total wealth). Thus the very presence of Medicaid appears to crowd out private insurance purchases for well over half of households. Moreover, even for those that still find long-term care insurance valuable, the presence of Medicaid significantly reduces the insurance value of private long-term care insurance contracts since, without private insurance, Medicaid mitigates the need for large savings for self insurance and helps to avoid states of extremely low consumption. For example, at $5 million in total wealth (assuming 20% is annuitized), the value of insurance is about $10,000 lower for men with risk aversion of 2 in the presence of Medicaid than without Medicaid. These findings are consistent with the theoretical work of Pauly (1989) suggesting that the existence of Medicaid could in principle crowd-out demand very far up the wealth distribution. Our results suggest that, in practice, Medicaid does indeed have a substantial crowd out effect.

Of course, the complete elimination of Medicaid (and any other payer of last resort) may not be a realistic alternative since, even in the absence of a Medicaid program, we suspect that many individuals would have some other source of "last resort" funding for care, such as family or charity. It is therefore also of interest to investigate, conditional on some type of Medicaid program existing, which policy parameters have the largest effect on the value of private insurance. In principle, we can vary three parameters of Medicaid: 1) Medicaid "quality," 2) the level of the asset disregard ($\underline{W}$), and 3) the level of the monthly maintenance allowance for consumption above and beyond care provision ($\underline{C}$). For now, we have just varied Medicaid quality, which we measure as the ratio of "food and housing" consumption when in Medicaid-financed care to food and housing consumption in privately-funded institutional care ($F_{s,t}^{medicaid} / F_{s,t}^{private}$).[48]

Table 11 reports results for a male in a median wealth household.[49] As expected (see e.g. Pauly 1990), decreases in the relative quality of care provided by Medicaid increase the value of private insurance contracts. Our estimates suggest that this effect is potentially quite large, especially at higher levels of risk aversion. For example, for a male with risk aversion of 3, reducing Medicaid quality from 1 (so that consumption value is the same regardless of the payment source) to 0 (so that one gets no consumption value from care when on Medicaid) increases the value of private insurance from -$8,768 to +$81,529. For this same individual, Medicaid would have to be less than half the quality of private pay care for the purchase of private insurance to be worthwhile. The quality of care provided by Medicaid may be influenced by policy variables such as the Medicaid reimbursement rate for care (relative to private payers). Our findings therefore suggest that estimates of the relative quality of care received by Medicaid-financed patients relative to privately-financed patients may be an important parameter in empirical explorations of the variation in long-term care insurance coverage rates over time and across states.

Two factors contribute to the large effect of "Medicaid quality" on private insurance value. First, Medicaid provides a lower consumption value when it is lower quality. Second, and more importantly, as

---

[48] Specifically, we keep the food and housing consumption equal to $514 dollars for privately provided care, and multiply it by the fraction listed under "Medicaid Quality" in Table 11 when the person is receiving care paid for by Medicaid.

[49] We plan on looking at the results for women and for higher points in the wealth distribution in future versions.

Medicaid quality decreases, Medicaid imposes increasingly severe constraints on an individual's ability to smooth consumption across states and time. For example, suppose an individual with fixed lifetime resources had a lifetime utility function that led to them being happiest if they could have equal consumption across all states and time. If this equal consumption level is above the level that can be sustained when receiving Medicaid (i.e., is above the sum of $\underline{C}$, $F_{s,t}^{m}$ and any small amount of consumption out of remaining wealth that is capped at $\underline{W}$), then the individual will not be able to equate expected marginal utility across Medicaid and non-Medicaid states. The more important it is to an individual to smooth consumption (i.e., the higher their level of relative risk aversion / the lower their substitution elasticity), the less attractive Medicaid is as a substitute for private insurance.

In addition to impairing consumption smoothing, Medicaid also places a 100% implicit tax on private resources (including privately purchased insurance) through the income and asset tests. As we decrease $\underline{W}$ or $\underline{C}$, this implicit tax increases and thus the value of private insurance should increase.[50] Preliminary results based on varying $\underline{C}$ within the range allowed by different states ($30 to $75 according to AARP, 2000) suggest a small effect on insurance values, but "out of sample" variation may have substantially larger effects. We plan on investigating the effect of larger changes in $\underline{W}$ or $\underline{C}$ in future versions.

Concerns about Medicaid crowd-out have motivated several large states – including New York and California – to allow individuals who purchase a private long-term care policy to qualify for Medicaid while retaining substantially more assets than they otherwise would be allowed (Wiener et al. 2000). For example, the California program allow individuals who purchase "qualified" private long-term care insurance policies to be eligible for Medicaid coverage of care not covered by their policy while maintaining assets equal to the existing asset disregards plus an increase equivalent to the dollar amount of benefits that the private policy has paid. This effectively increases $\underline{W}$ for individuals with private long-term care insurance policies; we plan on investigating the effect of these and alternative policies in

[50] The effect on insurance value will presumably be even greater in the presence of bequest motives.

future versions. This will provide important information on whether it is possible to redesign Medicaid to substantially reduce its crowd-out effect without substantially eliminating its role as a payer of last resort.

Finally, although Medicaid is the most likely public source of crowd-out of private insurance demand it is also possible that Medicare – by serving as a primary payer for 40% of home health care that would otherwise be covered by private insurance – affects the insurance value of private policies by changing the amount of uninsured risk. To investigate this, we ran simulations varying the fraction of privately insurable home health care covered by Medicare from 0 percent through 100 percent (actuarially adjusting the premium to maintain the same money's worth). These simulations (which we do not report in the interest of space) suggest that small changes to the fraction of home care covered by Medicare do not have a major effect on insurance valuation. We plan on looking at how making Medicare a primary payer for a substantial component of facility care expenditures that would otherwise be covered by private insurance would affect the value of private insurance policies.

7.4 The Structure of Private Insurance Policy Benefits

In this section, we begin to explore a third potential explanation for the low insurance value of private long-term care insurance policies: the limited benefits provided by the policies. In particular, in addition to deductibles and limits to the number of days one can collect benefits, policies specify (often binding) daily benefit caps; all of the policies in our data and simulations have a $100 daily benefit cap that limits the effective amount of insurance in the policy, and even more so over time as costs rise.

By limiting the amount of insurance and leaving considerable uninsured expenditure risk, these policy features may substantially reduce the insurance value of existing long-term care insurance contracts and thus contribute to the limited size of the private insurance market (Cutler, 1996). This raises the question of why the contracts are designed in this manner. A variety of market failures could be responsible. For example, asymmetric information can result in the quantity of insurance sold in equilibrium restricted relative to the first best. Alternatively, Cutler (1996) argues that these caps are in place to reduce insurance companies' exposure to the aggregate risk of drastic increases in the real cost of long-term care over the 30+ year life of the policy; because such risk is not idiosyncratic, insurers cannot diversify it through the typical insurance mechanism of pooling idiosyncratic risk faced by different individuals.

As a preliminary exploration of these issues, Table 12 compares the insurance value of a policy with $100 daily benefit cap to a policy with cap, actuarially adjusting the premium to maintain the same money's worth. The results are interesting. In general, removing the cap tends to increase the absolute value of the positive or negative insurance value. In other words, if an individual finds the policy with a $100 maximum daily benefit welfare-enhancing, they generally find the policy with no daily benefit cap even more welfare enhancing. If, on the other hand, they do not value the insurance at $100 per day, then they value the uncapped policy even less. One way to think about these results is that a long-term care policy transfers money from states in which the person is out of care, to states in which the person is in care. Removing the benefit cap does this to an even greater degree. As such, if a person is made better or worse off by these transfers, then increasing the size of these transfers tends to exacerbate this tendency.

For example, if a person would prefer to use their private wealth to pay for consumption when healthy and then rely on Medicaid when sick, they will not value a policy that transfers wealth from healthy to sick states. Uncapping benefits makes these transfers even larger, by charging a higher premium when healthy, and transferring those resources to a state in which the individual is in care. This suggests that the effect of Medicaid on the demand for insurance is interesting not only in its own right, but also because of the way it interacts with other potential explanations for lack of insurance purchases. In future versions, we plan on investigating how the insurance value of the capped and uncapped policy changes when we incorporate uncertainty about the rate of care cost growth into the analysis.

8. Conclusions and Future Directions

This paper has presented what is to our knowledge the first evidence of the money's worth of private long-term care insurance contracts and the insurance value of these contracts. To do so, we developed two complementary analytical tools for estimating the money's worth of, and the utility gains from, long-term care insurance contracts. We apply these tools to comprehensive data on industry-wide prices for a range of insurance policies and individuals. We also introduced and utilized extremely rich and detailed actuarial data on the transitions across different types of long-term care.

Our findings indicate that, for individuals who buy and hold a long-term care insurance policy, prices are below actuarially fair for women and above actuarially fair for men. The money's worth of the contract declines substantially, however, when the probability that the individual will lapse on his policy premiums are taken into account. This suggests that further work would be useful in understanding the reasons behind the high rate of policy lapsing in this (and other) insurance markets. The money's worth does not vary in any systematic pattern with the amount of coverage provided by the contract, but we do find evidence that the money's worth tends to decline with the age at which the policy is purchased.

Our estimates of the insurance value of these long-term care insurance policies suggest that a substantial portion of 65 year olds, particularly those in the lower part of the wealth distribution, do not find these policies welfare-enhancing, given existing prices and the structure of the public Medicaid insurance program. Our analysis suggests that the existence of Medicaid crowds out demand for a large fraction of the wealth distribution, and substantially reduces the insurance value of private long-term care insurance contracts for the rest. Decreases in the relative "quality" of care paid for by Medicaid compared to that paid for by private resources can have a large positive effect on the value of private contracts. By contrast, the pricing of these contracts does not appear to be a major factor in explaining the limited demand for private insurance.

These findings are relevant to recent public policies designed to stimulate demand for private insurance through large tax subsidies at both the federal and state level, and to reforms to state Medicaid program design. Our results suggest that tax subsidies are unlikely to be an effective way to induce demand for a large fraction of the population, but that modifications to the existing Medicaid program may well have a significant impact on private insurance demand. In future versions of this paper, we plan to estimate the effect of recent state Medicaid reforms on the value of private long-term care insurance.

The analytical framework developed in this paper can readily be extended to consider the role of several other factors in contributing to the limited size of the private long-term care insurance market. We consider these fruitful directions for further research.

First, our framework can be used to determine how the introduction of aggregate uncertainty about the growth rate of medical costs affects the value of long-term care insurance contracts (Cutler, 1996). Second, between 15 and 40 percent of today's elderly would be denied long-term care insurance due to the presence of observable risk factors such as limitations to activities of daily living (Murtaugh et al. 1995, Weiss 2002, Finkelstein and McGarry 2003). Denials may therefore be a very important factor in explaining the limited size of the private long-term care insurance market, and an understanding of the reason for this practice is therefore of practical as well as theoretical interest. We can use the analytical framework together with actuarial data to investigate whether these high-risk individuals would in fact value existing long-term care insurance contracts at correspondingly higher prices. Binding wealth constraints or the existence of little residual risk to insure may make such individuals not value the contracts; if, however, they appear to, this suggests that an explanation for the denials phenomenon must be found elsewhere, perhaps as the unraveling of an asymmetric information equilibrium.

Third, the family is likely to play a central role in affecting demand for private long-term care insurance, although the net direction of its effect is theoretically ambiguous. Our framework can be extended to consider the insurance value of long-term care contracts to couples, rather than to individuals. One could also investigate how the desire to leave a bequest may increase demand for long-term care insurance (since these policies protect assets against Medicaid spend down rules), and how the family, by providing a potential in-kind substitute for formal long term care and a financial substitute for insurance may reduce the demand for long-term care insurance (Pauly 1990, Kotlikoff and Spivak 1981).

Finally, the possibility of uninsured long-term care expenditures has been suggested as a reason for why more individuals do not annuitize their wealth. Our model can be extended to examine this potential resolution of the "annuity puzzle." We will also be able to examine the desirability of products that combine features of annuities and long-term care insurance, as suggested by Warshawsky et al (2000).

REFERENCES

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

ACLI. 2001. Life Insurers Fact Book, 2001. Washington, DC.

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

AARP. 2002. "Long-Term Care Insurance: An Assessment of States' Capacity to Review and Regulate Rates." February, MS # 2002-02.

Brown, Jeffrey R. 2001. "Private Pensions, Mortality Risk and the Decision to Annuitize." *Journal of Public Economics* 82, pp. 29-62.

Brown, Jeffrey R. and Austan Goolsbee. 2002. "Does the Internet Make Markets More Competitive? Evidence from the Life Insurance Industry." *Journal of Political Economy*, 110 (3), pp. 481-507.

Brown, Jeffrey R., Olivia Mitchell and James Poterba. 2002. "Mortality Risk, Inflation Risk and Annuity Products." In O. Mitchell, Z. Bodie, B. Hammond, and S. Zeldes, Innovations in Retirement Financing, University of Pennsylvania Press: Philadelphia, PA, p. 175-197, 2002.

Chiappori, Pierre-Andre. 2000. Econometric Models of Insurance under Asymmetric Information. In Georges Dionne, ed. Handbook of Insurance Economics. London: Kluwer.

Chiappori, Pierre-Andre and Bernard Salanie. 2000. "Testing for Asymmetric Information in Insurance Markets." *Journal of Political Economy*, 108, 56-78.

Cohen, Marc and Maurice Weinrobe. 2000. "Tax Deductibility of long-term care insurance premiums." HIAA, March.

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

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

Cutler, David and Louise Sheiner. 1994. Policy Options for Long-Term Care. In David Wise (ed) Studies in the Economics of Aging.

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

Cutler, David. 2002. Health Care and the Public Sector. In Auerbach and Feldstein (eds) Handbook of Public Economics.

Dahlby, Bev and Douglas S. West. 1986. "Price Dispersion in an Automobile Insurance Market." *Journal of Political Economy*, 94 (April), pp. 418-38.

Davidoff, Tom, Jeffrey R. Brown and Peter A. Diamond. 2002. "Annuities and Individual Welfare." Working paper.

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.

Doerphinghaus, Helen and Sandra Gustavson. 1999. "The Effect of Firm Traits on Long-Term Care Insurance Pricing." *The Journal of Risk and Insurance* Volume 66, number 3, pp. 381-400.

Feder, Judith, Harriet Komisar and Marlene Niefeld. 2000. "Long-term care in the United States: An overview." *Health Affairs* Volume 19, number 3 pp.40-56.

Finkelstein, Amy and Kathleen McGarry. 2003. Asymmetric information in insurance markets: evidence and explanations from the long-term care insurance market. Mimeo.

Finkelstein, Amy and James Poterba. 2002. "Selection effects in the United Kingdom Individual Annuities Market." *Economic Journal* Vol 112, No. 476, pp.28-50.

Friedman, Benjamin and Mark Warshawsky. 1988. "Annuity Prices and Savings Behavior in the United States." In Zvi Bodie, John Shoven and David Wise (eds) Pensions in the US Economy. Chicago: University of Chicago Press.

Froot, Kenneth. 1999. "Introduction." In Kenneth Froot (ed) The Financing of Catastrophe Risk. University of Chicago Press: Chicago.

Garber, Alan and T MaCurdy. 1993. Nursing home discharges and exhaustion of Medicare benefits." *Journal of the American Statistical Association* 88(423): 727-736.

Gruber, Jonathan. 1999. "Tax subsidies for health insurance: what do we need to know, what do we know, and how could we learn more?" MIT mimeo.

Gollier, Christian. 2002. "Insurability." Mimeo, University of Toulouse. January.

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.

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

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.

Kunreuther, Howard. 1978. Disaster Insurance Protection: Public Policy Lessons. New York: Wiley.

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.

Lewis, Christopher and Kevin Murdock. 1999. "Alternative Means of Redistributing Catastrophic Risk in a National Risk-Management System." In Kenneth Froot (ed) The Financing of Catastrophe Risk. University of Chicago Press: Chicago.
LIMRA. 2001. "Individual Medicare Supplement and Long-Term Care Insurance."

LIMRA 2002. "Individual Long-term care insurance."

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 and James Moore. 1998. Can Americans Afford to Retire? New evidence on retirement savings adequacy. *Journal of Risk and Insurance* 65(3): 371 – 400.

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 and Brenda Spillman. 1995. Risky Business: Long-term care insurance underwriting. *Inquiry* 32:371-284.

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.

NAIC. 2002a. "Executive Summary of Amendments to the Long-Term Care Insurance Model Regulation." January.

NAIC 2002b. "State Survey of Long-Term Care Insurance Rating Practices and Consumer Disclosure Amendments. September

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

Office of Management and Budget, 1999. Budget of the United States Government (2000). Government Printing Office, Washington DC.

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.

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.

Sack, Brian. 2000. "Deriving Inflation Expectations from Nominal and Inflation-Indexed Treasury Yields." *The Journal of Fixed Income.* Vol. 10, no. 2, pp 6-17.

Shen, Pu and Jonathan Corning. 2001. "Can TIPS Help Identify Long-Term Inflation Expectations?" Kansas City Federal Reserve *Economic Review*. Fourth Quarter 2001. pp. 61 – 87.

Sloan, Frank and Edward Norton. 1997. Adverse selection, bequests, crowding out, and private demand for insurance: evidence from the long term care insurance market," *Journal of Risk and Uncertainty* 15:201-219.

Social Security Administration. 2002. Office of the Chief Actuary. "United States Life Table Functions and Actuarial Functions at 3.0 Percent Interest For Males (Females) Born In 1935 Based on Alternative 2 Mortality Probabilities Used in the 2002 Trustees Report."

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.

Stallard, Eric and Robert Yee. 1999. Non-insured home and community-based long term care incidence and continuance tables. Prepared for the Society of Actuaries non-insured home and community experience subcommittee of the long term care experience committee.

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

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

U.S. House of Representatives. 1998. 1998 Green Book.

Warshawksy, Mark J., Brenda Spillman and Christopher Murtaugh. 2000. "Integration of the Life Annuity and Long-Term Care Insurance: Theory, Evidence, Practice and Policy." Pension Research Council Working paper 2000-11.

Weiss Ratings Inc. 2002. "Weiss Ratings' Consumer Guide to Long-Term Care Insurance." Palm Beach Gardens, Fl.

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.

Table 1: Description of common policy scenarios for which prices are listed in Weiss data

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Covers Nursing Home	YES	YES	YES	YES
Covers Assisted Living Facility	YES	YES	YES	YES
Covers Home and Community-Based Care	NO	YES	YES	YES
Deductible	90 Day	60 day	30 days	0 days
Benefit Period	2 Year	4 year	Unlimited	Unlimited
Daily Benefit	$100	$100	$100	$100

Note: Deductible specifies the number of days in otherwise-covered care during which no benefits are paid toward the policyholder's expenses. Benefit period gives the maximum length of time for which the policy will pay the daily benefit. The daily benefit gives the maximum amount paid by the company per day toward covered care. In all of the policies studied, the daily benefit is the same across covered care states.

Table 2: Descriptive statistics on annual median premiums in 2002

	Constant Nominal Daily Benefit								Nominal Daily Benefit Escalates at 5% / yr							
	Age 50	Age 55	Age 60	Age 65	Age 70	Age 75	Age 80	Age 85	Age 50	Age 55	Age 60	Age 65	Age 70	Age 75	Age 80	Age 85
Scenario 1: Facility only; 90 day deductible; 2 year benefit period																
Premium	210	270	360	530	843	1,410	2,470	3,986	447	558	752	1,016	1,470	2,218	3,320	4,846
N	10	10	10	10	10	10	10	3	10	10	10	10	10	10	10	3
Scenario 2: All care covered; 60 day deductible; 4 year benefit period																
Premium	459	597	821	1,192	1,907	3,232	5,156	7,707	1,032	1,271	1,572	2,140	3,268	5,038	7,565	10,189
N	9	9	9	9	9	9	8	5	8	8	8	8	8	8	7	4
Scenario 3: All care covered; 30 day deductible; unlimited benefit period																
Premium	751	912	1,280	1,872	3003	5,004	7,875	10,411	1,630	1,910	2,490	3,450	5,112	7,843	11,930	13,857
N	8	8	8	8	8	8	4	1	8	8	8	8	8	8	4	1
Scenario 4: Scenario 3 with 0 day deductible																
Premium	602	843	1,147	1,698	2,616	4,345	8,290	10,071	1,565	2,007	2,496	3,326	4,509	6,613	11,150	12,327
N	3	3	3	3	3	3	2	2	2	2	2	2	2	2	1	1

Note: "Premium" refers to median premium and "N" refers to number of companies over which median is calculated. All policies have $100 maximum daily benefit for any covered care. All companies quote unisex prices. The somewhat anomalous result that median premiums are lower for (more generous) Scenario 4 policies than (less generous) Scenario 3 policies arises from heterogeneity in the set of companies offering these different policies. Comparisons of premiums across ages between 50 and 75 or between men and women are not subject to this difficulty since companies that offer a given policy will tend to offer it for all of the ages reported and at a unisex price.

Table 3: Comparison of nursing home (NH) utilization estimates: Robinson model and other published studies (65 year old).

Model	Data Sources	Probability of ever entering a NH			Average Age of First Entry into NH (conditional on entry)			Expected Time in NH (conditional on entry)	% of those who spend any time in NH 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)	1.9 years	66%	18%
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%
Liang and Tu	1977 NNHS			0.36				10.3 years		

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 which do not make these restrictions. The Robinson estimates used in the analysis of MW and insurance value, however, do incorporate these important restrictions.

Table 4: Descriptive Statistics of Care Utilization for 65 year old, from Robinson Model

		Probability of Use					Duration of Use (Among Users)			Exit and reentry (among users)	
		Prob. Ever Use	Prob. ever use, cond'l on living to 75	Prob. ever use, cond'l on living to 90	Prob. Use by 80, Condl on Living to 80	Avg Age of First Use (among users)	Avg Years Spent in Care	Prob use more than 1 year	Prob use more than 5 years	Prob ever exit to non-death state	Avg # of spells
Nursing Home (NH)	Men	0.27	0.33	0.46	0.07	83	2.0	0.57	0.09	0.65	1.28
	Women	0.44	0.49	0.59	0.10	85	3.0	0.69	0.19	0.66	1.40
Assisted Living Facility (ALF)	Men	0.12	0.14	0.17	0.03	83	0.50	0.11	0.005	0.90	1.18
	Women	0.20	0.22	0.26	0.04	86	0.40	0.10	0.008	0.93	1.26
Facility Care (NH or ALF)	Men	0.28	0.34	0.47	0.08	83	2.2	0.61	0.10	0.60	1.27
	Women	0.46	0.50	0.60	0.11	84	3.3	0.73	0.22	0.62	1.37
Home Care (HC)	Men	0.29	0.31	0.33	0.11	80	1.7	0.47	0.08	0.67	1.45
	Women	0.35	0.37	0.38	0.12	82	1.8	0.44	0.10	0.77	1.68
Any Care (NH or ALF or HC)	Men	0.40	0.45	0.55	0.16	80	3.3	0.82	0.20	0.33	1.20
	Women	0.54	0.58	0.67	0.18	82	4.6	0.89	0.35	0.35	1.27

Note: All statistics are reported for the version of the model used in calculating MW and insurance value. Specifically, all individuals are assumed to be healthy enough to be eligible for private insurance at the time of purchase (here, age 65) and care utilization is measured as care utilization by individuals whose health characteristics simultaneously satisfy the benefit triggers required for care costs to be reimbursable by insurance contracts. See text for further details.

Table 5: MW for 65 year old, median premiums in 2002

		Constant nominal benefits				Benefits Escalate at 5% per Year			
Care covered		All	All	All	Facility Only	All	All	All	Facility Only
Deductible		None	30 day	60 day	90 day	None	30 day	60 day	90 day
Benefit Period		Unlimited	Unlimited	4 year	2 year	Unlimited	Unlimited	4 year	2 year
Scenario		4	3	2	1	4	3	2	1
Base Case	Men	0.653	0.573	0.681	0.924	0.665	0.622	0.730	1.047
	Women	1.268	1.123	1.160	1.443	1.423	1.343	1.316	1.757
Allow for probability of lapsing	Men	0.424	0.372	0.440	0.588	0.371	0.348	0.403	0.550
	Women	0.780	0.691	0.711	0.871	0.740	0.699	0.675	0.856

Note: "Base case" calculates money's worth using the Treasury term structure, real cost growth of 1.5% per year, and all companies in the Weiss data. Facility only policies cover care in an assisted living facility or in a nursing home, but not home health care.

Table 6: MW By Age; median premiums in 2002 (base case assumptions)

		Constant Nominal Benefits				Benefits Escalate at 5% per Year			
Care covered		All	All	All	Facility Only	All	All	All	Facility Only
Deductible		None	30 day	60 day	90 day	None	30 day	60 day	90 day
Benefit Period		Unlimited	Unlimited	4 year	2 year	Unlimited	Unlimited	4 year	2 year
Scenario		4	3	2	1	4	3	2	1
Men	Age 50	0.712	0.554	0.670	0.782	0.822	0.768	0.865	1.391
	Age 55	0.670	0.600	0.682	0.845	0.744	0.761	0.819	1.292
	Age 60	0.673	0.585	0.683	0.910	0.713	0.695	0.794	1.141
	Age 65	0.653	0.573	0.681	0.924	0.665	0.622	0.730	1.047
	Age 70	0.649	0.546	0.658	0.912	0.652	0.557	0.642	9.555
	Age 75	0.601	0.504	0.606	0.855	0.609	0.497	0.582	0.864
	Age 80	0.477	0.476	0.587	0.754	0.500	0.471	0.549	0.803
Women	Age 50	1.412	1.106	1.176	1.284	1.873	1.765	1.659	2.510
	Age 55	1.333	1.204	1.196	1.372	1.671	1.723	1.548	2.290
	Age 60	1.325	1.160	1.181	1.446	1.566	1.539	1.467	1.972
	Age 65	1.268	1.123	1.160	1.443	1.423	1.343	1.316	1.757
	Age 70	1.216	1.033	1.082	1.377	1.330	1.148	1.109	1.532
	Age 75	1.065	0.900	0.945	1.229	1.166	0.961	0.949	1.312
	Age 80	0.811	0.818	0.883	1.049	0.908	0.865	0.858	1.164

Note: Premiums are all median premiums. MW are all calculated using base case assumptions. See notes to Table 5 for more detail.

Table 7: Sensitivity Analysis: MW for 65 year old, median premiums in 2002

		Constant nominal benefits				Benefits Escalate at 5% per Year			
Care covered		All	All	All	Facility Only	All	All	All	Facility Only
Deductible		None	30 day	60 day	90 day	None	30 day	60 day	90 day
Benefit Period		Unlimited	Unlimited	4 year	2 year	Unlimited	Unlimited	4 year	2 year
Scenario		4	3	2	1	4	3	2	1
Base Case	Men	0.653	0.573	0.681	0.924	0.665	0.622	0.730	1.047
	Women	1.268	1.123	1.160	1.443	1.423	1.343	1.316	1.757
Sensitivity Analysis									
Corporate interest rate	Men	0.583	0.511	0.615	0.839	0.575	0.538	0.640	0.917
	Women	1.107	0.980	1.035	1.295	1.196	1.128	1.134	1.517
Real cost growth 3% / year	Men	0.690	0.607	0.718	0.926	0.697	0.652	0.763	1.065
	Women	1.334	1.182	1.221	1.445	1.506	1.423	1.367	1.793
Real cost growth 0.75% / year	Men	0.636	0.559	0.664	0.923	0.617	0.577	0.684	0.987
	Women	1.234	1.093	1.130	1.440	1.286	1.214	1.211	1.630
Top five companies	Men	----	0.564	0.669	0.807	-----	0.603	0.677	0.912
	Women		1.106	1.139	1.260		1.303	1.220	1.531

Note: "Base case" calculates money's worth using the Treasury term structure, real cost growth of 1.5% per year, and all companies in the Weiss data. The next four rows show how MW estimates change when one of these "base case" assumptions is relaxed. See notes to Table 5 for more detail.

Table 8: The insurance value of LTC insurance at different points in the wealth distribution

Wealth Percentile	Financial Wealth	Annuitized Wealth	Insurance Value for Men; Risk Aversion			Insurance Value for Women; Risk Aversion		
			1	2	3	1	2	3
10th	13,045	52,180	*	*	*	*	*	*
20th	15,348	80,577	*	*	*	*	*	*
30th	28,677	114,708	-18,434	-20,990	-22,724	-21,425	-24,479	-26,894
40th	50,567	151,701	-16,872	-18,943	-20,715	-20,151	-24,909	-28,379
50th	77,839	173,255	-14,346	-12,909	-8,768	-15,513	-15,071	-14,836
60th	107,731	200,071	-13,892	-10,812	+578	-13,122	-8,609	-4,539
70th	159,876	239,814	-12,597	-5,931	+6,997	-8,190	+4,142	+6,289
80th	236,274	288,779	-10,791	+509	+4,592	-3,100	+17,421	+24,149
90th	399,701	368,955	-8,880	+10,041	+32,452	+3,353	+35,408	+36,360

* Denotes disutility from policy exceeds value of starting financial wealth

Notes: The insurance values are all calculated for a 65 year old with a policy that covers all three types of care, has no deductible and an unlimited benefit period, and pays a (constant nominal) maximum daily benefit of $100. The "Money's Worth" of the policy is 0.65 for men, and 1.25 for women (providing both with an equal monthly premium of $145; the EPDV of benefits from the policy is $10,147 for men, and $21,784 for women). The real rate of interest, the discount rate, and the annual rate of inflation are all .03. Medicare pays for 40% of home care costs. Real cost growth is 1.5% annually. Medicaid pays for care for individuals with wealth less than or equal to $2000, and who meet the income test (with a monthly income disregard of $30). It is assumed that care in an assisted living facility or a nursing home provides consumption value of $514 monthly, and that this value is the same regardless of the source of funding for the care.

Table 9: The Effect of Varying the MW on the Insurance Value

Money's Worth	Monthly Premium	Median Wealth; Risk Aversion			90th Percentile Wealth; Risk Aversion		
		1	2	3	1	2	3
Panel A: Men							
0.2	469	-59,327	-66,989	-73,083	-57,281	-32,257	-19,361
0.4	235	-26,740	-27,815	-27,261	-22,352	-1,620	+18,369
0.6	156	-15,990	-14,857	-11,156	-10,669	+8,490	+30,590
0.65	**145**	**-14,346**	**-12,909**	**-8,768**	**-8,880**	**+10,041**	**+32,452**
0.8	117	-10,655	-8,568	-3,478	-4,865	+13,528	+36,635
1.0	94	-7,465	-4,848	+1,020	-1,395	+16,547	+40,242
1.2	78	-5,342	-2,388	+3,973	+914	+18,559	+42,635
1.4	67	-3,827	-641	+6,063	+2,560	+19,995	+44,349
1.6	59	-2,691	+664	+7,623	+3,794	+21,071	+45,630
1.8	52	-1,808	+1,676	+8,832	+4,752	+21,909	+46,624
Panel B: Women							
0.2	908	*	*	*	-107,883	-65,802	-121,178
0.4	454	-63,613	-73,009	*	-41,850	-3,591	-27,926
0.6	303	-40,113	-46,561	-53,439	-19,741	+15,837	+3,652
0.8	227	-28,125	-30,950	-34,354	-1,988	+30,947	+28,846
1.0	182	-21,081	-22,026	-23,409	+2,463	+34,667	+35,113
1.2	151	-16,437	-16,220	-16,261	+3,353	+35,408	+36,360
1.25	**145**	**-15,513**	**-15,071**	**-14,836**	**+3,353**	**+35,408**	**+36,360**
1.4	130	-13,144	-12,136	-11,207	+5,643	+37,310	+39,568
1.6	113	-10,687	-9,098	-7,445	+8,030	+39,284	+42,917
1.8	101	-8,782	-6,747	-4,358	+9,888	+40,827	+45,511

* Denotes disutility from policy exceeds value of starting financial wealth
Note: Bolded rows reflect our base case assumptions; all other rows reflect changes in MW from the base case. See notes to Table 8 for details on these base case assumptions.

Table 10: The effects of tax subsidies on the insurance value of long-term care insurance contracts

Federal MTR	Subsidized MW	Subsidized Monthly Premium	Median Wealth; Risk Aversion			90th Percentile Wealth; Risk Aversion		
			1	2	3	1	2	3
Panel A: Men								
0	**0.65**	**145**	**-14,346**	**-12,909**	**-8,768**	**-8,880**	**+10,041**	**+32,452**
0.15	0.905	104	-8,809	-6,411	-865	-2,856	+15,274	+38,724
0.275	1.08	87	-6,532	-3,765	+2,323	-380	+17,431	+41,293
0.391	1.31	71	-4,422	-1,326	+5,243	+1,913	+19,430	+43,676
Panel B: Women								
0	**1.25**	**145**	**-15,513**	**-15,071**	**-14,836**	**+3,353**	**+35,408**	**+36,360**
0.15	1.74	104	-9,310	-7,397	-5,344	+9,372	+40,399	+44,790
0.275	2.08	87	-6,769	-4,267	-1,479	+11,857	+42,474	+48,269
0.391	2.53	71	-4,422	-1,381	+2,086	+14,164	+44,413	+51,478

Note: Bolded rows reflect our base case assumptions; all other rows reflect changes in MW from the base case due to federal tax subsidies. In addition to the reported federal marginal tax rate, we assume that the LTCI premium would reduce FICA taxes, which are levied at a rate of 7.65% on both the employee and employer**.** See notes to Table 8 for details on the base case assumptions.

Table 11: The effect of Medicaid "quality" on the insurance value of long-term care contracts

Parameters of Medicaid Program			Male, Median Wealth; Risk Aversion		
Asset Disregard $(\underline{W})$	Income Disregard $(\underline{C})$	"Medicaid Quality" $(F_{s,t}^{medicaid} / F_{s,t}^{private})$	1	2	3
Panel A: Vary Medicaid Quality					
2000	**30**	**1.0**	**-14,346**	**-12,909**	**-8,768**
2000	30	0.75	-13,647	-10,536	-1,931
2000	30	0.50	-13,093	-7,351	-1,075
2000	30	0.25	-12,397	-977	+28,369
2000	30	0.0	-10,412	+24,805	+81,529

Note: All results reported are for a 65-year old male at the median wealth level. Bolded rows reflect our base case assumptions; all other rows reflect changes in the assumptions about Medicaid quality relative to the base case. See notes to Table 8 for details on the base case assumptions.

Table 12 The effect of alternative benefit structures on insurance value

Structure of Policy		Median Wealth; Risk Aversion			90th Percentile Wealth; Risk Aversion		
Daily Benefit Cap	Monthly Premium	1	2	3	1	2	3
Panel A: Men							
$100	**145**	**-14,346**	**-12,909**	**-8,768**	**-8,880**	**+10,041**	**+32,452**
No Cap	351	-34,582	-33,626	-27,199	-7,290	+57,793	+173,320
Panel B: Women							
$100	**145**	**-15,513**	**-15,071**	**-14,836**	**+3,353**	**+35,408**	**+36,360**
No Cap	386	-38,212	-40,476	-40,836	+27,247	+155,044	+246,771

Note: Bolded rows reflect our base case assumptions; other rows reflect the change in insurance value associated with removing the $100 benefit cap (and adjusting the premium accordingly while keeping the MW of the policy the same). See notes to Table 8 for details on the base case assumptions.

Figure 1
Insurance Value as a Function of Total Wealth
(Male, CRRA=3, Holding Fraction of Wealth Annuitized Fixed at 69%)