Why Don't Markets Insure Long-Term Risk?

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Abstract

This paper examines the apparent failure of private markets to adequately insure long-term risks. I argue that the key to long-term insurance is the importance of intertemporal risk. Long-term risks are difficult to insure because much of the risk concerns variability in the average cost of services used, rather than cross-section heterogeneity in service use. When intertemporal risk is large, insurance will provide indemnity benefits rather than a service benefit, and this in turn will limit demand for insurance. Analysis of long-term care insurance supports this view. An insurer underwriting full long-term care insurance would have a standard deviation of average costs for its pool of policies of 13 percent. Full insurance is essentially non-existent, however. Rather, insurers offer an indemnity payment conditional on use. While I cannot directly test whether this indemnity payment limits demand, I show that other common theories of market failure cannot explain all of the low rate of insurance purchase.

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A great deal of concern has been raised by the failure of insurance markets to adequately insure long-term risk. Many insurance policies, such as acute medical care insurance, are recontracted annually, despite the fact that the underlying risk lasts far longer than one year. As a result, individuals who suffer an adverse event in one year often face large premium increases in subsequent years or are denied coverage entirely. Coverage for commercial environmental risk functions much the same way. Environmental insurance generally covers claims filed during the policy year resulting from damages incurred during the policy year. Since the filing of claims for a given event is correlated over time, firms wind up facing large premium risk associated with news of environmental damage.

In other cases, long-term insurance is sold, but the provisions of the policy are restricted and sales are limited. Insurance for long-term medical expenses (largely nursing home care) is an example of this. Long-term care insurance is typically purchased around age 65, for services that are generally not needed for 20 years. Thus, the policy is essentially pure long-term insurnace. The long-term care insurance market is not well developed. Policies pay a fixed benefit amount when the person enters a nursing home despite dramatic variability in the cost of services over time. And the overall rate of coverage is low, with insurance paying only 2 percent of nursing home bills.

Why is long-term risk so poorly insured? Several hypotheses have been proposed. One explanation is adverse selection -- those most likely to have long-term losses may be most eager to purchase insurance. Adverse selection may be compounded by commitment problems (Hosios and Peters, 1989; Dionne and Doherty, 1994). Even if people have similar expectations about their expected losses *ex ante*, those who learn that they are good risks will want to leave the pool over time. Without a mechanism to prevent this, insurers will not underwrite long-term insurance.

A second explanation focuses on excessive regulation. Epstein (1994) and Cochrane (1995)

argue that public policies often change the interpretation of insurance policies *ex post*, against the stated contract provisions. The uncertainty caused by this induces individuals and insurers to avoid long-term contracts. The implication of this view is that if government were to "deregulate" insurance, we would observe more complete long-term contracts.

A third explanation is that long-term insurance is crowded out by public programs. Pauly (1990) argues that, in the case of long-term care insurance, people know that the government will pay their medical bills through the Medicaid program if they become impoverished, and thus decide not to purchase insurance. While it is not obvious that crowdout should be a bigger issue for long-term insurance than for annual insurance, governments tend to provide more social insurance for permanent disabilities, which are a larger component of long-term risk, than for temporary disability.

In this paper, I suggest a different explanation for the lack of long-term insurance. I argue that the key issue for long-term insurance is the nature of the risk. While risk at a point in time is dominated by cross-section heterogeneity, risk over time is much more a result of changes in the average cost of an insured event. This risk is common to the insured pool, and cannot be diversified within a cohort. Indeed, if average costs are highly serially correlated, this risk cannot be pooled across cohorts either. As a result, insurers might be unwilling to underwrite long-term risk.

The consequences of this limitation are two-fold. First, insurers will avoid most of long-term risk. In some cases, policies will offer annual insurance, despite large intertemporal risk. In other cases, long-term risk will be covered, but payments will be on an indemnity basis rather than a service benefit. Indemnity coverage is valuable to consumers, but it is not as valuable as a policy paying the service cost. Further, if insurers need to earn a risk premium to provide even the indemnity policy, the cost of indemnity insurance will be greater than the cost of a service benefit

policy sold in a market without long-term risk. For both of these reasons, the demand for indemnity insurance will be smaller than the demand for service benefit insurance, and this may explain why sales of long-term insurance policies are so low.

I illustrate these points with the example of long-term care insurance. I begin by documenting the risks associated with an insurer providing long-term care insurance. Because aggregate costs are serially correlated, an insurer underwriting long-term care risk would face substantial risk. With reasonable parameter values, the standard deviation of average costs for an insurer providing full insurance is about 13 percent. I then show the consequences of this risk for the long-term care insurance market. I first show that large amounts of intertemporal risk have lead to the provision of indemnity policies instead of service benefits. I then consider whether the widespread use of indemnity insurance, coupled with a higher risk premium, explains the relative paucity of insurance coverage. While I cannot examine the importance of aggregate risk directly, I show that other theories of demand -- such as adverse selection, *ex post* contract reinterpretation, and crowding out -- cannot explain all of the low rate of insurance coverage. This is consistent with the theory of intertemporal risk, although it is clearly not definitive.

The paper is structured as follows. The first section discuss the provision of intertemporal insurance in private markets. Section II estimates the extent of aggregate risk for the long-term care insurance market. Sections III and IV consider how intertemporal risk affects the policies that are offered and why insurance purchase is so low. The last Section concludes.

I. Insurance for Intertemporal Risk

Consider provision of insurance for a risk that spans many periods. For example, insurers might be selling health insurance to 30 year-olds, who want to insure medical costs until they reach

age 65. Or the policy might be nursing home insurance for 65 year-olds, who are contemplating long-term care needs after age 85. Or, in a non-health insurance example, whole life insurance for young people is a long-term insurance contract In all of these cases, the risk being insured is a combination of cross-section and aggregate risks. The cross-section risk is standard: given the mean level of expected losses, some people will have greater claims and others smaller claims. The aggregate risk is less standard: as we insure farther and farther in the future, our ability to forecast the average loss falls.

Aggregate risk is a pervasive feature of many insurance contracts. For example, an insurer underwriting long-term medical care costs or nursing home costs is accepting the risk that unforeseen medical technologies will diffuse at much higher cost than current levels of care. If one is insuring medical costs next year, this is a relatively small problem. If one is insuring medical costs over the next 20 years, this problem becomes much more important. In the life insurance context, the aggregate risk is that overall mortality rates will increase, increasing the discounted value of payouts. This risk may be large, but because the dollar value of a payout when it occurs is fixed (as opposed to medical technology, whose costs are unknown) and insurers have a great deal of experience with life expectancy forecasts, the aggregate risk is smaller than in the medical care context.

The importance of aggregate risk can be a significant hindrance to long-term insurance. If insurance is only provided with a risk premium, insurance for risks with a significant aggregate component may not be purchased. As an example, suppose that insurance losses occur only *k* years in the future -- there is no loss between periods *t* and *t+k*.. Expected losses for individual *i* are given by:

$$(1) \qquad C_{t+k,i} = E_t[C_{t+k}] + \epsilon_i + \eta_{t,t+k},$$

where ϵ is the cross-section risk and η is the aggregate risk. In the case of medical care insurance, for example, $E_t[C_{t+k}]$ might be the logarithm of expected medical spending *k* years in the future, and $\eta_{t,t+k}$ would be the percentage uncertainty in costs resulting from changes in medical technology or prices of medical services.

In the absence of insurance, individuals have utility functions

(2) $U = E_t[U(y-C_{t+k})]$.

where I make the usual assumption that U'>0 and U"<0. I assume income is fixed and the same for everyone for convenience. There is some question about what happens if losses are greater than income. **Explain**

For a large enough pool of insureds (so that the average idiosyncratic loss is zero), average profits per policy for an insurer will be

(3) $\pi_{t+k} = (P_t - E_t[C_{t+k}]) - \epsilon bar\ i - \eta_{t,t+k} = (P_t - E_t[C_{t+k}]) - \eta_{t,t+k}$

The first term is the markup of premiums (P_t) above expected costs; the second term is the aggregate uncertainty. While the idiosyncratic risk diminishes over a large enough pool, the aggregate risk is common to all the insureds and thus does not diminish. This is the source of the insurance difficulties that I discuss.

The Baseline. It is useful to present briefly the baseline equilibrium, to compare it later to the alternatives. Suppose that the insurance market is competitive, insurers can borrow or lend unlimited amounts, and that insurers (or the investors in insurance companies) are risk neutral. Then, insurers that maximize profits will set premiums equal to expected losses:

(4) $P_t = E_t[C_{t+k}]$.

Individuals will choose to purchase insurance if the utility is greater with insurance purchased than

without insurance purchased. Utility if insured is

(5) $U = U(y-E_t[C_{t+k}]) > E_t[U(y-E_t[C_{t+k}]-\epsilon_i-\eta_{t,t+k})]$.

The inequality results from decreasing marginal utility of income. Thus, all people will purchase insurance.

Risk Averse Insurers. I consider deviations from perfect competition that lead to insurance being overpriced. There are two such deviations I consider. The first is that insurers may be risk averse rather than risk neutral. Risk aversion on the part of insurers can result from several factors. If the risk being insured is large relative to the size of the economy, then even investors with a diversified portfolio will not be able to fully immunize themselves from the risk; a risk premium will be required to diversify the cost. **Cite Lucas here?** Since medical care is currently 14 percent of the economy and rising, this is an important issue in this market.

In addition, the utility function may not be for the insurance company as a whole, but for a particular person in the company. For example, insurance companies are generally divided into lines of business: health insurance, long-term care insurance, life insurance, and so on. If the long-term care division loses money, the managers of that line of business may suffer income losses or be fired. Thus, the managers of a particular line of business may be risk average even if the company as a whole is not. While it is not optimal for a risk-neutral insurance company to encourage risk averse behavior in each division, this may be the best way to encourage managers to exert maximum effort (Holmstrom, 1982; Sharfstein and Stein, 1990; Zweibel, 1995).

I model risk averse insurers has having a utility function $V = E_t[V(\pi_{t+k})]$, where $V'>0$ and $V''<0$. It is straightforward to show that the risk premium required by insurers is:

(6) $P_t = E_t[C_{t+k}] + R_v \sigma^2_\eta$,

where $R_v = -V''/2V'$, the coefficient of relative risk aversion for insurers.[1]

Individuals who are offered insurance at non-actuarial prices may or may not choose to purchase insurance. Insurance will be purchased if:

(7) $U(y-P_t) > E_t[U(y-E_t[C_{t+k}]-\epsilon_i-\eta_{t,t+k})]$

or equivalently

(8) $R_v \sigma^2_\eta < R_U (\sigma^2_\eta + \sigma^2_\epsilon)$

check on this equation

Whether insurance will be purchased or not depends on two factors. The first is the relative risk aversion of insurers and insureds. If insurers are sufficiently more risk averse than insureds, the required premium might be too high and insurance might not be purchased. Without knowing exactly why insurers are risk averse, it is difficult to know whether insurers or insureds are more risk adverse. We typically think that insureds are more risk averse than insurers, but several factors argue in the other direction. For example, if the utility function for insurers is for a particular person in the company and that person's lifetime income is significantly at risk, they may be more risk averse than individuals purchasing insurance. Or if insureds have the option of a public backstop for very high costs, they might be less risk averse than insurers.

The second factor is the ratio of aggregate to idiosyncratic risk. As aggregate risk becomes more important, the probability that insurance will not be purchased increases.

Bankruptcy. A second complication is bankruptcy. Bankruptcy has two effects on the market. First, since bankruptcy comes at a cost it leads to non-actuarial pricing. Suppose that

[1] This equation follows from taking a Taylor expansion of the zero profit condition for insurers: **show math here**

insurers can borrow up to B in the event losses are greater than expected. If losses exceed B, the insurer becomes bankrupt. Bankruptcy is associated with additional costs C. Then, if Φ is the cumulative distribution of η, expected bankruptcy costs are $(1-\Phi(B)) \cdot C$.

How bad is this formulation?

Recent estimates suggest that bankruptcy can be very costly (Cutler and Summers, 1988; Bhagat, Brickley, and Coles, 1988), and standard insurance company practice suggests prudence against this risk.[2] Thus, bankruptcy concerns may be quite important empirically.

In addition, if the insurer goes bankrupt, not everyone with a claim will be paid. Suppose that claims are filed sequentially and are paid in that order. Then, some people will have their claims paid in full and others will have only part of the claim paid. If individuals are distributed randomly in their time of incurring losses, the probability that an individual will have a claim paid is C+B / C+η. Thus, individual welfare will be:

(7) $U = (C+B / C+\eta)\, U(y-Pt) + (1 - C+B / C+\eta)\, Et\, [\, U(y-Pt - C - \eta) \mid \eta > B].$

Insuring the average cost of care in the future (C^*_{t+h}) is not as easy, however. Suppose that the logarithm of average costs is given by: $c^*_{t+1} = \rho c^*_t + \eta_{t+1}$, where C^*_t is known at the time the policy is sold. To focus on the long-term risk, suppose that the only need for services is at the end of the contract period and average use in that period is 1. Then, average costs for a cohort are: $C = C^*_{t+k}$. The logarithm of average costs will be: $c = \rho^k c_t + \sum_{i=0}^{k-1} \rho^i \eta_{t+k-i}$. The first term is expected costs; the second term is the unexpected component.

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[2] Standard insurance practices, for example, argue for keeping the risk of any line of business small. A.M. Best's (1991) cautions that "to provide stability and safety, an insurer should limit its maximum loss exposure on a single risk (or group of related risks) to a small percentage of its policyholders' surplus, normally less than 2 percent" (p. xiii).

An insurance company offering full insurance would charge premium of $E_t[C^*_{t+k}]$ and pay benefits of $C^*_{t+k} \cdot \epsilon_{t+k,j}$. This is a service benefit policy with a premium equal to *ex ante* expected costs.[3] The individual bears no risk, since he receives a payment exactly equal to the cost of services received. The policy is not risk-free for the insurer, however. The variance of the logarithm of costs is:

$$var(c) = [\sum_{i=0}^{k-1} (\rho^h)^2] \sigma_\eta^2 \quad (1)$$

If costs are serially uncorrelated (ρ=0), the variance is just the one-year variance of costs, σ^2_η, and multi-year risk poses no problems beyond the one-year risk that is a necessary part of annual insurance. As the serial correlation of costs increases, however, the variance of future costs rises. If costs are a random walk (ρ=1), for example, the variance of costs *k* years in the future is $k\sigma^2_\eta$. This policy may have substantial risk, and risk will be increasing as the time period of the insurance policy lengthens.

Even if insurers cannot diversify aggregate risk within a cohort, they many still be able to diversify costs across cohorts. Suppose that insurers are insuring cohorts with policies expiring every year from *t+1* to *t+k*. For simplicity, consider the case where each cohort is at risk for costs only in the last year of its coverage. Then, costs in year *t+h* will be C^*_{t+h} and total costs will be $C = \sum_{i=1}^{k} C^*_{t+i}$. This is exactly the same as if the insurer provided coverage to a group at risk for services each year and whose average use was constant over time. Taking a Taylor series expansion, the logarithm of average costs will be approximately: $c = (\sum_{i=1}^{k} \rho^k)/k \; c^*_t + \sum_{i=0}^{k-1} (\sum_{h=0}^{i} \rho^h)/k \; \eta_{t+k-i}$. The variance of average costs is the variance of the second term:

[3] The premiums may be paid up front or spread out over years, depending on the importance of liquidity constraints, the ability to leave the policy, and the mortality rate over the course of the policy. The timing of payments is not essential in this context.

$$var(c) = \frac{[\sum_{i=0}^{k-1}(\sum_{h=0}^{i}\rho^h)^2]\cdot\sigma_\eta^2}{k^2}. \quad (2)$$

The risk in this policy depends on the serial correlation of aggregate costs. If costs are serially uncorrelated ($\rho=0$), the variance of total costs is σ_η^2/k. This is analogous to cross-section pooling, except the effective number of individuals in the group is the number of cohorts being insured. An example of such a risk structure might be a regionally-concentrated insurance company offering earthquake insurance. In the event of an earthquake, payments will be large, but the average losses over many years can be forecast fairly accurately.

If aggregate costs are positively serially correlated, however, the ability to pool across cohorts declines. Indeed, as ρ gets sufficiently large, pooling cohorts *increases* total risk. For example, if costs are a random walk ($\rho=1$), the variance of the average cost is $(\sigma^2_\eta/k^2)(\sum_{i=1}^{k} i^2)$, which is increasing in *k*. As serial correlation increases, therefore, insurers will find themselves at increased risk by insuring multi-year risks.

In this circumstance, risk-free insurance cannot be offered. The implications of this fact for market outcomes are uncertain. If insurers are risk neutral, or if the risk is small relative to the total volume of insurance being underwritten and uncorrelated with other insured events, full insurance might be offered with little or no risk premium. Note that full insurance is a service benefit; the insurer commits to pay the *ex post* costs of an insured event.

Insurers may not be willing to bear this risk, however. In some cases, the risk might be large relative to total risk being assumed or highly correlated with other risks the shareholders of the insurance company are bearing. Standard insurance practices, for example, argue for keeping the risk of any line of business small. A.M. Best's (1991) cautions that "to provide stability and safety,

an insurer should limit its maximum loss exposure on a single risk (or group of related risks) to a small percentage of its policyholders' surplus, normally less than 2 percent" (p. xiii). Firms following this type of practice may not be willing to underwrite policies with substantial intertemporal risk.

Internal considerations of the insurer may magnify these considerations. For example, agency costs within the firm may make it difficult for the managers of the firm to take a risk where the payoff could be substantially negative, even if the expectation is for an average or above average return (Holmstrom, 1982; Sharfstein and Stein, 1990; Zweibel, 1995). Alternatively, bankruptcy costs have been estimated to be quite large (Cutler and Summers, 1988; Bhagat, Brickley, and Coles, 1988). Firms may want to avoid this possibility by reducing their exposure to aggregate risk. And even if firms are willing to accept bankruptcy risk, individuals may not be willing to purchase insurance from a company with a reasonable probability of being bankrupt.

If these problems are sufficiently important,[4] long-term insurance may not be supplied. Two other policies might be offered, however: annual insurance, and long-term indemnity insurance. For risks with both an annual and a long-term component, insurers might still offer insurance but restrict coverage to an annual horizon. Annual insurance makes sense because average costs are well forecastable one year in advance. With an insurance horizon of 1 year (k=1), the variance of total costs is just σ^2_η, which is much smaller than the variance of multi-year insurance.

This is exactly the equilibrium in the case of acute care medical insurance and environmental insurance.[5] Both markets have substantial annual and long-term variability, but in both cases

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[4] Because there is no standard theory of the "risk aversion" for firms, however, there are no clear predictions about exactly how important these factors need to be.

[5] Grady (1988) provides several examples where increases in technology lead to increased negligence, and resulting insurance crises.

insurance is entirely an annual policy. Indeed, the example of environmental insurance, at a cursory level, fits the model well (General Accounting Office, 1986; 1988; Huber, 1988; Zagaski, 1992). Prior to the mid-1980s, environmental coverage insured firms indefinitely for events that occurred during the policy year (termed an occurrence-based policy). Long-term risk was thought to be small.

Events in the 1970s and 1980s, however, highlighted the "long-tailed" nature of risk. Asbestos claims in the 1970s, for example, dealt with exposure to asbestos in the 1940s and 1950s. Problems resulting from the drug DES (to prevent miscarriage) were not evident until the children of women taking the drug reached adulthood. Added to this was the perception that legal interpretations were seen as changing the provisions of insurance policies. It was frequently asserted that courts ignored restrictions in policies to "sudden and accidental" environmental damage, and that courts imposed liabilities beyond those the policy was intended to cover. The result was increased uncertainty about the liability of environmental insurers.

What is striking is that the increase in risk did not just lead to increased premiums. Rather, increased environmental risk was claimed to be responsible for changes in the insurance policy itself. For example, the occurrence-based policy was dropped in favor of a claims-made policy, which covers damages only if the claim is filed within a certain period of time.[6] Effectively, this eliminates insurance coverage for long-term risk, placing that risk instead on the insuring firm, in the form of increases in premiums as the extent of damages is realized. Indeed, the reduction in insurance coverage was not limited to primary insurance markets; in 1984, international reinsurance markets began denying coverage for pollution liability reinsurance. Insurers also imposed aggregate

[6] The claims-made policy was first applied to medical malpractice in the 1970s and to professional liability in the 1980s. The stated reasons for the change were similar to those for environmental coverage.

dollar limits on payouts for environmental damage, to limit their overall risk exposure. These changes limited the aggregate risk born by the insurer, with the consequence that more of the risk was born by firms purchasing insurance.

For many long-term risks, annual insurance is not a real option. In the nursing home case, a substantial share of the people who do not use a nursing home die before peak utilization ages. As a result, buying insurance late in life loses a substantial share of the insurance value. A second alternative is therefore to sell a long-term policy but restrict coverage to the cross-section risk. A policy which charged premium $P = E_t[\sum_{I=1}^{k} C^*_{t+i} \cdot \bar{\epsilon}_{t+i}]$ and paid $E_t[C^*_{t+h}] \cdot \epsilon_{t+h,j}$ in year $t+h$ would be a no-risk policy insuring only cross-section risk. This is effectively an indemnity policy; conditional on needing services, consumers receive a payment equal to the *ex ante* expected cost of care. The consumer is left at risk for costs above or below the expected level.[7]

Note that indemnity insurance can be combined with an annual service benefit policy to provide at least partial long-term insurance. Cochrane (1995) and Pauly, Kunreuther and Hirth (1992) propose such a system for acute care medical insurance. Indeed, this policy would reduce one of the major difficulties with annual insurance: the fact that people who suffer a risk in one year may bear the cost of that risk in future years, in the form of higher premiums. The "market failure" here is not so much that insurers do not provide a service benefit for the life of the individual (that policy is probably too risky) but rather that indemnity policies are not sold for the intertemporal component of risk.

Real-world indemnity policies are not completely risk free. In some contexts, $\bar{\epsilon}$ may be

[7]The premium and indemnity payment may be greater than the expected cost of a unit of care. If risk is greater when realizations of ϵ_i are large, consumers may want to redistribute from states of nature with low ϵ_i to states of nature with high ϵ_i. This would be accomplished by paying a premium above average cost and making a payment greater than expected cost for individuals with large ϵ_i. The payment would still be an indemnity payment, however.

variable, for example if morbidity and mortality rates change. More fundamentally, indemnity payments are typically made conditional on an event (being admitted to a nursing home) rather than an underlying state of disability. Even if the distribution of disability is constant, the distribution of conditioning events may not be. For example, an insurer underwriting a policy that provides a fixed dollar amount per day in a nursing home will have avoided the risk of changes in day costs but will still bear the risk of changes in admission rates or length of stay conditional on admissions. Thus, even an indemnity policy will leave insurers bearing some aggregate risk. Insurers may try to limit this residual risk in other ways, for example by setting a limit on maximum payments. Insurers may also require a risk premium to insure this additional risk. Or if the risk is sufficiently large, insurers may be unwilling to underwrite even an indemnity policy.

This risk associated with indemnity insurance may contribute to the limited market for long-term insurance. Because an indemnity policy leaves consumers with some aggregate risk, the risk premium that individuals will pay for an indemnity policy is smaller than the premium they would pay for a service benefit policy. Further, if insurers bear some risk as well, the premium required to sell an indemnity policy will be greater than the premium for a service benefit policy in a market with no aggregate risk. With a lower benefit and higher cost to long-term insurance, fewer people will purchase an indemnity policy than would purchase the service benefit policy that would be sold in a market without aggregate risk.

An example is instructive. Suppose that acute care medical insurance were purchased not for the current year, as is now done, but for a year several years in the future, and that the policy provided an indemnity benefit as a result. The risk premium a person will pay for insurance is proportional to the reduction in variance the policy provides. A reasonable approximation is that the indemnity policy insures 80 percent of the risk assumed by a service benefit policy. Assume further

that the insurer requires an additional 10 percent compensation to bear the aggregate risk that is present even with an indemnity policy. Then, the effective price of the indemnity policy will be roughly 30 percent higher than the price of the service benefit policy. The price elasticity of demand for acute care medical insurance is generally estimated at between -0.5 and -2 (Phelps, 1992). Thus, the 30 percent price increase could lead to demand reductions of between 15 and 60 percent. This is a substantial effect on market outcomes.

The implications of large intertemporal risk are therefore two-fold. To the extent that we see insurance for the long-term component of risk, it is likely to be indemnity insurance rather than a service benefit. And the market for this insurance may be limited, as the reduced valuation of insurance and increased administrative load lower the net benefits of insurance.

II. An Example: Long-Term Care Risk

To illustrate the role that intertemporal risk plays in insurance, I focus on the market for long-term care insurance. Long-term care consists of nursing home care and to a lesser extent home health care. For simplicity, I focus the discussion around nursing home care. The costs of a nursing home are substantial -- over $30,000 per year in most areas.

There is substantial cross-section heterogeneity in lifetime nursing home utilization. Kemper and Murtaugh (1991) estimate that 63 percent of the elderly[8] who died in 1986 never entered a nursing home, 19 percent were in the nursing home less than 1 year, 11 percent were in a nursing home between 1 and 3 years, and 6 percent were in a nursing home over 5 years. Essentially all of this utilization is at very advanced ages. Dick, Garber, and MaCurdy (1994) estimate that about 70

[8] There is some use of nursing homes at younger ages, but this is more likely to be for the long-term disabled rather than a result of aging. Insurance for permanent disability is very different.

percent of the elderly who will be admitted to a nursing home are first admitted past age 75, and nearly half are first admitted past age 85. In contrast, 82 percent of the people who do not use a nursing home before death die before age 85. As a result, insuring people only at peak ages of utilization loses the substantial return that comes from early. Indeed, the target age for private long-term care insurance is about age 65 (Health Insurance Association of America, 1995). To a first approximation, therefore, long-term care insurance is purchased at age 65 for risks that will not occur for 20 years.

To give some sense of the magnitude of changes that can take place over a 20 year period, Table 1 shows data on nursing home utilization and charges from 1963 to 1985. Over that period, the share of the elderly that were institutionalized nearly doubled. While some of this is a result of an increase in the share of the oldest old, institutionalization rates conditional on age increased by 50 percent or more.

In addition to the increase in admission rates, the cost per month in the nursing home more than doubled in real terms. While no work has decomposed the sources of this cost increase, some work has examined the growth of costs for acute medical care (Cutler and McClellan, 1996). The results from that work suggest that essentially all of the growth of costs is a result of increases in the technology applied to medical treatments, rather than increases in the price of a given type of medical care. This presents difficulties for insurance since such technological change is essentially unforecastable.[9]

To determine the magnitude of unanticipated fluctuations in long-term care expenses, I use

[9] In principle, insurers could guarantee only a constant level of care. It is not clear that is technologically possible when there are fixed costs in keeping around older technologies. Further, much of technological change is change in the probability that a given patienti is treated one way or another. Probabilities of similar treatment may not be insurable over time.

time-series data on the cost of medical services. National data on health spending are available from 1960 through 1993, which I convert to real (using the GDP deflator), per capita terms. The first column of Table 2 shows the average increase in real, per capita spending for several components of medical care: nursing homes, home health care, all personal care (acute and long-term care), hospitals, and physicians. Spending on nursing homes grew by 7 percent a year in real, per capita terms, and spending on home health care grew by 14 percent. These are among the fastest growing parts of health spending, although the base in 1960 was quite low. The next three columns report estimates of an AR(1) for spending:

$$\log(c_t^*) = \alpha + \rho \log(c_{t-1}^*) + \eta_t. \quad \textbf{(3)}$$

All health spending displays a great deal of serial correlation. The autocorrelation coefficients are near 1, consistent with a random walk.[10] Further, the standard deviation of the residual is large -- 4 percent for nursing home care, 14 percent for home health care, and 1 to 3 percent for other components of spending. Assuming costs are a random walk, the residual variance for nursing home and home health costs translate into a standard deviation of costs 20 years in the future of 18 to 63 percent, which are extremely large.

The values of persistence and residual variability in Table 2, coupled with equation (2), yield direct estimates of the variability of average costs for an insurance company. Table 3 presents

[10] Dickey-Fuller tests of difference stationarity vs. trend stationarity are borderline rejection for nursing home care and hospital care, but fail to reject difference stationarity for the other aspects of spending. When a time trend is added to the equation, the AR(1) coefficients are still large. For the nursing home regressions, the AR(1) coefficient is .991 (.041). The AR(1) coefficient in other regressions ranges from .77 to .98. I simulate variability under an AR(1) parameter of 0.9 to capture the trend stationary case. I have also added the share of the population aged 65-74, 75-84, and 85+ to the regressions. These variables were generally statistically insignificant and did not substantially affect the coefficient on the AR(1).

estimates of the standard deviation of the logarithm of average costs implied by this risk distribution, assuming 20 years between insurance and the need for services. I report results for two autocorrelation parameters (.9 and 1.0) and three values of the residual standard deviation (.01, .05, and .10). For the most preferred specification (ρ=1, σ_n=.05), the standard deviation of average costs is 13 percent. Even with the lower serial correlation coefficient, the standard deviation of average costs is 7 percent. A plausible range of variation is 2 to 27 percent. Under all but the most conservative assumptions, therefore, long-term care is thus a market with substantial intertemporal risk.

III. Intertemporal Risk and the Insurance Policy

The first prediction of the theory of intertemporal risk is that when aggregate risk is large, insurance for intertemporal risk should pay indemnity benefits. To examine this prediction, I use information on the provisions of 53 long-term care insurance policies sold in 1988 and 73 policies sold in 1991 (Consumers Union, 1988, 1991).[11] Many more companies sell long-term care insurance than are contained in this sample (about 130 total in 1991), although some sell just life insurance policies with a rider that pays early benefits if the person enters a nursing home. The sample contains the bulk of true long-term care insurance policies sold to individuals, where most sales take place.

Long-term care policies generally cover nursing home care (skilled, intermediate, and custodial care facilities), and home or other noninstitutional care. A typical policy has a premium of about $1,200 per year for a person aged 65-69. By state law, policies must be renewable except for non-payment of premiums.

[11] There are no more recent data on the characteristics of insurance policies.

Moral hazard is clearly a concern of insurers. A typical policy requires a deductible of 20 to 30 days of institutional care, and 90 to 100 days of home health care. In addition to deductibles, moral hazard is limited by restricting benefits to those with specified levels of illness, for example three or more impairments in Activities of Daily Living.[12] Older policies required that institutionalization be preceded by a hospital stay, although this is now illegal in many states. Adverse selection is also a concern. Most policies exclude pre-existing conditions for the first 6 months. Insurers also require applicants to fill out a medical questionnaire, which they may use to deny or restrict coverage. And many insurers excluded coverage for Alzheimer's disease, until they were required to cover it by state law.

Of most interest for risk bearing is the nature of the benefit payments. Table 4 shows provisions of the policies along these margins. With few exceptions, long-term care insurance is an indemnity benefit rather than a service guarantee. A typical policy pays $80 per day of nursing home care and $40 per day of home health care. Only two policies provided a service benefit in 1988, and only one did so in 1991.[13] In fact, the company that provided the service benefit in 1991 failed by early 1992 and was taken over by the state insurance regulator. There were thus no policies that guaranteed the cost of nursing home care at the time of need.

The indemnity payment does increase over time, but generally not in a way that is related to nursing home costs. Some policies offer consumers the option of buying increased coverage in the future (for example to increase payment from $80 to $100 per day). Others specify a simple or compound increase (usually at a rate of 5 percent annually; sometimes at the overall Consumer Price

[12] Activities of Daily Living consist of: eating; getting in or out of bed; getting in or out of chairs; walking around inside; going outside; dressing; bathing; using the toilet; and controlling bowel movements or urination.

[13] This policy did impose a $500,000 maximum payment over the lifetime of insured.

Index). The compound increase involves the most risk for the insurer, since payments will be highest in the future when uncertainty is greatest. The simple increase involves less risk, and the right to buy increased coverage involves the least risk. Even these partial benefit increases are often limited in duration. Only one-third of the policies increased benefit levels throughout the life of the policy. The remainder increase benefits until about age 85.

The indemnity benefit does not eliminate all of the risk for the insurer. Insurers are still at risk for changes in average admission rates and length of stay over time. Most policies deal with this risk by limiting the total amount they will pay for a particular individual or for the policy as a whole. Most policies guarantee the premium will not change *provided* there is no increase in aggregate losses under the policy. Almost all of the policies, however, allow the insurance company to increase the rates of everyone in a class if the loss experience is greater than anticipated.[14] A number of companies have used this provision. In 1990, for example, there were an average of 2.4 rate increase requests per state, of which most (92 percent) were granted. Only three policies guaranteed no rate increase for three years, and only two policies guaranteed the rate forever. There are also limits on the maximum payment for an individual. In the 1988 survey, only one-third of policies offered unlimited benefits. The maximum benefit period typically ranged from 2 to 5 years. Since 6 percent of those who die after age 65 will have been in a nursing home for more than 5 years, and 16 percent will have been in a nursing home for over 1 year, these limitations are binding.

The imposition of maximum benefits on insurance payments is not unique to long-term care. As the United States House of Representatives (1988) reports, only 26 percent of employer-provided health insurance plans have an unlimited lifetime service benefit. The remaining plans come with

[14] A class of people is generally considered all the people with a given policy in a state, although there is no requirement that the group be defined in this way.

lifetime caps of between $250,000 and $1 million or more. And as noted above, environmental insurance now comes with overall limits on payments under the policy. Thus, in the component of annual insurance that relates to multi-year claims, insurers impose limitations similar to those for long-term care.

The combined effects of these plan provisions is to lower the insurer's risk from cost variation. The tradeoff is that individuals wind up bearing a substantial share of this risk.

Although policies sold in 1988 and 1991 avoid much of the intertemporal risk, one might wonder whether this is just because the policies were still evolving in 1991. Long-term care insurance was first sold in the early 1970s but was not promoted widely until the mid-1980s, when the Reagan Administration and many states encouraged the development of private polices as a means of financing long-term care (Health Care Financing Administration, 1984; Somers and Merrill, 1991; McCall, Knickman, and Bauer, 1991; Freudenheim, 1992). As knowledge of underlying risks increases, the market might incorporate more long-term insurance. While there has been no wide-scale reporting of long-term care insurance policies since 1991, the Health Insurance Association of America does periodic surveys of the policies of the largest insurers. Since the largest insurers tend to have the most generous policies, the characteristics of these policies are an upper bound on the generosity of the average policy.

The HIAA data indicate some changes in policy terms since 1991. The range of services has increased (now including adult day care, alternate care, and respite care), and policyholders can receive benefits with less strict physician or hospital certification. But payments are still on an indemnity basis and increases in benefits are specified in advance. None of the leading companies offers a service benefit guarantee. On the issue of intertemporal risk, therefore, the market is not changing in a way that offers more insurance.

While this evidence is consistent with the intertemporal risk explanation, it is not conclusive. Other explanations, for example consumer ignorance about long-term risk or moral hazard, may also explain the indemnity nature of benefits. I use two tests to consider whether the nature of benefits is likely due to intertemporal risk. The first is to examine the risk premium required by insurers to underwrite long-term care. If long-term care is riskier to underwrite than other lines of insurance, the risk premium on long-term care policies should be greater than for other risks. The other theories suggest no greater risk premium.

To determine the risk premium in long-term care insurance, I examined the actuarial memoranda of the seven companies licensed to sell long-term care insurance in Massachusetts. Three of the companies reported their expected profit on long-term care insurance sales. One reported a profit rate of 9.56 percent on its nursing home policy and 10.11 percent on its companion home health care policy. The other two reported profit margins of 5 percent on their long-term care policy. For the company with the 9.56 percent profit rate on its nursing home policy, the reported profit rate on its "Medigap" policy[15] was 5.35 percent. One of the companies with a 5 percent profit rate on long-term care insurance reported a profit rate on its Medigap policy of 3 percent. Indeed, the same company also targeted a 3 percent profit rate for catastrophic medical coverage and individual accident coverage as well. Long-term care insurance thus appears to command a larger risk premium than other forms of health insurance without the intertemporal risk, even when the group purchasing insurance is roughly the same.

Profit rates are likely to be understated in regulatory processes (Trapnell, 1990). Thus, the

[15] This policy covers hospital deductibles and physician copayments required by Medicare, as well as prescription drugs and other medical devices. It generally does not cover nursing home costs, with the exception that it will pay the copayment required during a Medicare-reimbursed nursing home stay.

true risk premium might be even larger. To partially address this, I examined the total administrative load -- the difference between premiums and expected claims payments, as a share of expected claims payments -- that long-term care insurers report for their policies. Companies that want to report low expected profits might indicate above average administrative costs, so that total administrative costs may reflect profits better than the stated profit rate.[16] Five of the companies reported a load factor. Four of the companies reported the legal maximum of 67 percent.[17] The other company reported a load of 54 percent, for an overall average of 64 percent. This estimate is close to Shearer (1989), who found that administrative costs account for about 50 percent of long-term care insurance premia. The fact that so many companies report the maximum administrative load suggests that even these numbers are likely to be a lower bound on true administrative loads.

These administrative loads are greater than for other lines of insurance. Friedman and Warshawsky (1988) estimate that the load factor on sales of annuities (also sold to individuals around retirement age) is about 18 to 33 percent. Perhaps more relevant is the administrative load in individual and small group (four or fewer people) health insurance, which the Congressional Research Service (1988) estimates at 40 percent. The administrative load in long-term care insurance is greater than either of these estimates, even though annual processing costs are almost certainly lower in long-term care insurance (since it is used infrequently) than for these other policies. Long-term care insurance thus appears to have administrative loads 10 to 40 percent greater than for other types of insurance. To the extent that some of this differential is actually a risk premium, the

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[16] Even this may not account for all of the difference in profitability, since insurers may inflate claims costs as well. For example, companies may lower the interest rate to increase costs in future years or reduce the share of people they expect to drop coverage. I have no way to measure these activities.

[17] The constraint is that the "loss ratio" -- the ratio of expected claims to premiums -- not fall below 60 percent.

evidence is consistent with the intertemporal risk explanation.

As a second test of the intertemporal risk explanation, I examine which companies offer more generous coverage for long-term risk. The intertemporal risk explanation suggests that companies with greater reserves should be less averse to bearing aggregate risk than companies with smaller reserves. Explanations of consumer ignorance or moral hazard would not have this prediction.

To test this, I gathered data on the reserves of companies offering long-term care insurance. For each of the companies except those affiliated with Blue Cross (4 companies, representing 5 insurance policies), A.M. Best (1991) provides a financial size category, defined as policyholders' surplus plus reserve funds. Firms are grouped into 15 categories, with higher numbers signifying greater surplus. The mean policy is by a firm in category 7. Since larger firms also tend to be more stable and are potentially more knowledgeable about the industry, they may be able to introduce riskier policies for other reasons. To control for other factors, I include an indicator variable for whether the firm received an A or A+ rating from Best's. The rating is based on measures of profitability, leverage, risk spreading, and similar features. The theory predicts that the financial size of the firm, not its financial rating, should affect the ability to bear aggregate risk. More knowledgeable firms, or firms that are more stable, may be better represented by a good financial rating than by large size. Twenty-three firms received an A or A+ from Best's; 11 were below that level.

I use these variables to predict two characteristics of insurance policies:[18] the type of benefit increase (the right to buy coverage at future prices; simple benefit increases; or compound benefit

[18] The other characteristics had too little variation to be estimated.

increases);[19] and whether the policy increased benefits throughout the life of the individual. The type of benefit increase is estimated as an ordered logit, since the options follow a natural progression. The duration of increases is estimated as a logit.

Table 5 presents equations predicting these characteristics. The results are consistent with the theory. Financial size predicts the decision to bear intertemporal risk, but having a rating of A or A+ does not. The first row shows that firms that are larger financially are more likely to offer indexed benefits. Moving from category 7 to category 8, for example, (roughly 15 percentage points in the distribution of firms) increases the probability of offering compound benefits by 4.3 percentage points.[20] Since the mean probability of offering compound benefits is about 35 percent, this increase is about 12 percent of the average probability. The second row shows that firms with larger financial size are more likely to offer unlimited benefit increases. The change in this probability as a result of moving from category 7 to category 8 is about 2.6 percentage points, about 14 percent of the base level.

In contrast to the results for financial size, the overall rating of the company has no effect on either the method of indexation or the time period over which benefits are indexed. The coefficients are of mixed sign and are statistically insignificant. These results thus suggests that an insurer's ability to diversify cost risk is important in explaining the policies that the firm offers, as predicted by the theory of intertemporal risk.

IV. Explaining the Low Rate of Insurance Purchase

[19] I include the one firm that had no benefit increase in the first group and the one firm that paid the cost of care in the last group. These changes had no effect on the results.

[20] This calculation assumes the firm is rated A or A + overall.

The substantial uncertainty about long-term care expenses suggests that long-term care insurance ought to be quite prevalent. The striking fact, however, is that very little long-term care insurance is actually purchased. In 1993, there were about 3.4 million policies outstanding (including the riders to life insurance) compared to nearly 20 million elderly with Medicare supplemental coverage and 180 million Americans with private acute care health insurance.[21]

This lack of insurance has a substantial effect on payments for long-term care. In 1993, only 2 percent of nursing home expenses were paid for by private insurance. One-third of expenses were paid for out-of-pocket, and another 30 percent was paid for by Medicaid, which covers expenses once people have exhausted their income and assets on medical services. Medicare pays for about 10 percent of nursing home care, when the use is rehabilitative and related to an acute care hospital admission, and only for a maximum of 100 days.

The importance of intertemporal risk may be a factor in these limited sales. For the same risk distribution, consumers will value indemnity insurance less highly than they will value a service benefit policy. Administrative costs are likely to be higher for an indemnity policy than for a service benefit policy sold in a market with no aggregate risk, however, because of the higher risk premium required by insurers. The combination of less risk reduction and increased administrative load will lead fewer people to buy an insurance policy in the presence of aggregate risk.

With the magnitude of aggregate risk noted above, this could be a significant issue. Suppose a potential purchaser has expected utility defined over wealth (W) net of nursing home expenses. For simplicity, I compress nursing home risk into one period, although I keep aggregate risk the

[21] Sales are growing at about 500,000 annually. At this rate, coverage rates would not approach coverage for Medicare supplemental insurance for over 30 years.

same as in the multi-period case.[22] With indemnity insurance, consumers pay a premium of $P_I = E_t[C^*_{t+k}] \cdot \bar{\epsilon} \cdot (1+\lambda_I)$, where λ_I is the administrative load, and are at residual risk for costs of $C' = (C^*_{t+k} - E_t[C^*_{t+k}]) \cdot \epsilon_j$. With a constant relative risk aversion utility function, expected utility under the indemnity policy is $U_I = \sum_{C^*,\epsilon} [W-P_I-C']^{1-A} / (1-A) \cdot Pr[C^*,\epsilon]$, where A is the coefficient of relative risk aversion. If there were no aggregate risk, individuals would receive a service benefit policy and wealth would be constant in all periods: $U_S = [W-P_S]^{1-A} / (1-A)$. Note that the premium P_S may differ from the indemnity premium P_I if the risk premiums differ.

Not everyone has wealth sufficient to afford long-term care insurance, or to pay for long-term care services directly should they exceed their insurance limits or be without insurance entirely. To account for these people, I assume that the government pays for all care that would reduce wealth to below $5,000, roughly the Medicaid level. With this specification, insurance will be purchased by the "middle class". The poor will not purchase insurance because they will free-ride on the public system. The very wealthy also will not purchase insurance, since the risk premium they are willing to pay declines with wealth but administrative loads do not.

Given an administrative load and distribution of individual and aggregate risks, expected utility can be solved for the levels of wealth at which insurance would be purchased. I simulate these wealth levels assuming that long-term care expenses are expected to cost $30,000 per year in real terms, with a standard deviation of 22 percent (5 percent per year for 20 years). Individuals face idiosyncratic risk given by the national data (Kemper and Murtaugh, 1991). Using the data in Section III, I assume that indemnity insurance is sold with a load of 64 percent, while in the absence of risk the service benefit policy would be sold with administrative load of 40 percent.

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[22] A more complete model would incorporate annual changes in savings and consumption as the person ages. Since long-term care expenses are typically at the end of life, this equation may best be interpreted as the valuation of bequests.

Table 6 shows the levels of wealth at which people will purchase long-term care insurance. I present results for two values of risk aversion: A=1 (logarithmic utility); and A=2. There are significant differences in the set of people predicted to purchase each policy. With logarithmic utility, only those near the very top of the wealth distribution will purchase indemnity insurance. The range of wealth values, $160,000 to $260,000, is roughly the 70th to the 85th percentile of the wealth distribution for households with a head aged 65-69 (Poterba, Venti, and Wise, 1994). The service benefit policy, in contrast, will be purchased by people with wealth from roughly the median to the 90th percentile. Thus, insurance would be substantially less prevalent under the indemnity policy than the service benefit policy sold in the equivalent market with no aggregate risk. With higher values of risk aversion, the set of purchasers for both policies expands, but there is still a differential in demand.

Survey evidence suggests that the riskiness of residual costs has been a concern of potential purchasers. In a Lifeplans (1992) survey of approximately 1800 people who spoke with an agent about long-term care insurance but did not purchase a policy,[23] 88 percent of the respondents thought that "I don't think benefits will keep up with inflation" was "very important" or "important" in their decision; only 12 percent thought it was "not very important" or "not at all important".[24] A great deal of the elderly thus wonder about the ability of long-term care insurance to meet future costs. And a reader of the Consumer Reports (1988, 1991) articles on long-term care insurance would certainly know to check whether the policy offered "inflation protection".

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[23] Note that this is a selected sample, for example they are much richer than average, so this may not generalize to the population as a whole.

[24] This explanation was tied for the second highest percent, along with the response that "It is hard for me to know what a good policy is". The explanation that most non-purchasers cited as important or very important was "The policy costs too much" (91 percent).

Of course, there are several other explanations for the low rate of purchase of long-term care insurance:

Affordability. Insurance premiums may simply be too high for large numbers of people to contemplate purchase. Estimates of the share of people at or near retirement age that could easily afford long-term care insurance (generally defined as premiums below 5 to 10 percent of income or assets) range from 20 to 50 percent, however (Rivlin and Weiner, 1988; Families USA, 1990; Friedland, 1990; Alecxih and Lutzky, 1995), which is substantially greater than the share that purchase now.

Eligibility. Many elderly may think (perhaps correctly) that they are not eligible for the policy because of past health difficulties.

Information Problems. A recurring concern is that people think Medicare covers long-term care services, even though it generally does not. In the mid-1980s, this belief was widespread; in a 1984 survey, three-quarters of the elderly believed that Medicare would cover long-term care expenses. As shown below, this perception changed rapidly, so that by 1990 few elderly thought that Medicare paid for long-term care.

Moral Hazard. If moral hazard is sufficiently large, individuals may not want to purchase insurance at the premium required. While moral hazard is certainly important, it does not appear to be the dominant factor in the market. If moral hazard were the barrier to purchase, we would expect to see policies increasingly focus on catastrophic coverage over time; as noted above, the opposite is occurring.

Adverse Selection. Adverse selection may occur either because individuals know more about their true health state than do insurers, or because individuals have differing tastes for nursing homes that will influence their subsequent behavior. Some limited evidence suggests that adverse selection is

present, but is quantitatively small. In the Lifeplans survey of people who purchased long-term care insurance and those who inquired about it but did not purchase, 34 percent of purchasers thought they were at least 50 percent likely to use a nursing home for longer than six months, compared to 27 percent of non-purchasers.[25] There are differences between the groups, but they are not dramatic.

Family Interactions. Increased family interactions may make people more or less likely to purchase long-term care insurance. Since long-term care services are typically needed at the end of life, demand for long-term care insurance may be limited to those with strong bequest motives (Pauly, 1990). Countering this is the fact when people have long-term care insurance, their family may be more likely to put them in a nursing home rather than provide for them directly. People who prefer being cared for by relatives as opposed to in an institution may avoid purchasing insurance, to limit this possibility (Bernheim, Shleifer, and Summers, 1985).

Crowding Out. Private insurance may be crowded out by the availability of public coverage for long-term care services. There are two mechanisms through which this might occur. The first is that people know Medicaid provides catastrophic coverage if they need it, and may thus choose to forgo private insurance and rely on the public sector (Pauly, 1990). Some work has found support for this hypothesis (Norton and Sloan, 1995). A related mechanism is that uncertainty about future government policies may limit the demand for long-term insurance (Epstein, 1994; Cochrane, 1995). In the case of long-term care, the "risk" is that the government will cover these services before the person needs them, and thus money spent on insurance will be wasted.[26]

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[25] In a question about the probability of needing home health care, 32 percent of the purchasers thought they were likely to use this service, compared to 31 percent of the non-purchasers.

[26] Indeed, around this time period there was some debate about whether national health reform should cover long-term care services (some of which was proposed in President Clinton's Health

Testing these theories empirically is difficult, since we are trying to learn why insurance is *not* purchased, and there are few purchasers to analyze. I get around this by using data on a hypothetical set of question regarding interest in long-term care insurance. In a 1990 supplement to the PSID, all individuals aged 50 and older (2,429 in total) were asked their interest in a typical long-term care insurance policy sold at then-prevailing prices. Individuals were described the policy and asked how likely they were to purchase it: very likely; somewhat likely; somewhat unlikely; or very unlikely.[27] They were also asked a series of questions about their perception of long-term care needs and planning for long-term care expenses, which can be coupled with demographic data to test these different theories.

I focus on the 489 heads of families aged 65-74, since that age group is most likely to purchase long-term care insurance.[28] After eliminating people that reported "don't know" or did not answer the question about likelihood of insurance purchase (147 people), people who provided no information on any follow-up questions about long-term care expectations (4 people)[29], and people

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Reform plan). The history of Medicare catastrophic coverage is also salient here. In 1988, Medicare was expanded to cover catastrophic services. Because so many elderly already had catastrophic coverage, however, the legislation caused widespread anger and was repealed shortly afterwards.

[27] The exact question was: "Thinking about the long-term care plan on the previous page, how likely is it that you would purchase such a policy <u>for yourself</u> at this time? Is it: (1) very likely; (2) somewhat likely; (3) somewhat unlikely; (4) very unlikely; (5) don't know."

[28] I consider only the head of the family since the response of individuals to the purchase about insurance for their spouse is very similar to the response for purchase for themselves.

[29] There were 13 follow-up questions. People were excluded if they reported "don't know" or did not answer all of these questions. Many individuals reported "don't know" or did not answer some of these questions. In the empirical work, I treat these people as having answered "false".

who reported already owning a long-term care insurance policy (5 people),[30] the final sample is 333 people.

Hypothetical questions may elicit different responses from real-world situations. Still, the distribution of responses seems reasonable. Seven percent of people thought it very likely they would purchase this policy, 11 percent thought it somewhat likely, 14 percent thought it somewhat unlikely, and 68 percent thought it very unlikely.

I estimate an ordered logit model for the person's interest in long-term care insurance. I include proxies for as many of the theories as possible. The most difficult theories to test are the theory about intertemporal riskbearing and moral hazard. The survey did not ask people about the importance of the indemnity nature of payments, expected inflation in long-term care services, or utilization with and without the policy. The survey did ask people whether the statement "This policy is too expensive" was true or false. If the value of the policy were low relative to the administrative expense, consumers would agree with this statement (two-thirds agree). I thus include a dummy variable for whether the person thought the policy cost too much.[31]

Of course, the statement that the policy is too expensive would also be agreed to by consumers operating under many of the other hypotheses as well. Thus, it is essential to try to control for these other hypotheses, which I attempt to do. Still, it is important to stress that even controlling for these other theories, I do *not* interpret the cost variable as directly measuring the

[30] People who reported policies that appeared to be long-term care insurance were excluded since it was unclear how they would answer the question about likelihood of purchase. This group is a small share of the population, however, so alternative treatments of this group have no effect on the results.

[31] This question does not appear to be a catchall for whether the person is interested in insurance. 8 percent of people who believe the policy is overpriced and are very or somewhat likely to purchase it, and 26 percent of those very unlikely to purchase insurance do not think the policy is overpriced.

importance of intertemporal risk. The cost variable is clearly a combination of risk, administrative expense, moral hazard, and other factors, and without a more specific question I cannot tell for certain what the variable measures. What can be learned, however, is the extent to which the other explanations explain all of the purchase decision, or whether additional hypotheses about behavior are necessary.

Table 7 shows the measures that I use to test the other theories. To determine if people believe they are eligible for the policy, I include a dummy variable for people that agree "I probably would not qualify for this policy because of my health". As the first column shows, 13 percent of people agree with this statement. Those who believe they would not qualify for the policy are no more or less likely to purchase the policy than are those who disagree, however. To test the theory that people have incorrect information about Medicare, I include a dummy variable for consumers who agree "I think Medicare already covers these services". The share agreeing with this (20 percent) is substantially below the level in the mid-1980s. There is no difference in likelihood of purchase on the basis of this answer, however.

I include two variables to proxy for adverse selection. The first is a dummy variable for whether the person's self-reported health status is fair or poor (36 percent). Since I include controls for observable physical and mental impairments in the regression, self-reported health status is likely to pick up private information about health. The second variable is a dummy variables for people who agree that "I don't want to go to a nursing home" (65 percent). This is designed to capture differential tastes for nursing home care. People who want to avoid nursing homes are significantly less likely to be interested in insurance than those neutral or favorable to them.

To test the theories about family interactions, I include a dummy variable for whether the

person has any children, and the number of children.[32] People with children are less likely to be interested in the policy, but this difference is not statistically significant. Finally, I include two variables to test crowdout. The first is a dummy variable for individuals who agree that "Medicaid covers these services and I am or could soon be eligible", or "I am a veteran and would use a Veteran's nursing home if I needed one" (32 percent). This is designed to capture crowdout from current government programs. The second variable is a dummy variable for individuals who agree that "I think Medicare will cover these services by the time I need them" (20 percent). This is meant to pick up limited demand resulting from uncertainty about future public policy changes. Neither of these two variables are related to the likelihood of insurance purchase.

I also include a variety of control variables in the regression. A first set of variables are demographics: dummy variables for ages 65-69, whites, male household heads, people who are married, and education (less than high school; some college; and college degree). I also include the number of medical conditions the person had (up to 21 possible conditions)[33] and the number of impairments in activities of daily living (up to 14). I include several financial measures: a dummy variable for whether the person is retired; the logarithm of family income; and wealth dummy variables (divided into wealth above $250,000; wealth between $25,000 and $250,000; and wealth below $25,000). Finally, I include a dummy variable for whether the person has Medigap insurance, to capture tastes for risk or knowledge of insurance.

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[32] I use the maximum number of children for either the head or the spouse, since people may care about children born to either person.

[33] The acute conditions are arthritis or rheumatism; cancer (except skin cancer); major paralysis or neurologic problems; using a cardiac pacemaker; amputation of an arm or leg; heart failure or enlarged heart; angina; asthma or other severe lung problems; back problems; ulcer; chronic inflamed bowel; allergies; kidney disease; trouble seeing; diabetes; high blood pressure or hypertension; deafness; hernia or rupture; problem controlling bowel movements or urination; trouble with thinking, concentrating, or memory; and other major problems.

Table 8 reports ordered logit models for the probability that an individual is likely to purchase long-term care insurance. The first column includes the cost variable but leaves out the proxies for the other theories. The control variables are generally in the expected direction. Insurance demand is greater for those who are better educated, younger, and have a Medigap policy. There is no effect of income or wealth on insurance demand, although without the education and Medigap proxies these coefficients are significantly related to demand. Somewhat surprisingly, people in worse health are not significantly more likely to want insurance. Perceptions about the cost of insurance have a large and statistically significant effect on insurance demand. Moving the population from thinking the policy is reasonably priced to thinking it is overpriced changes the probability that an individual is very or somewhat likely to buy the policy from 31 to 11 percent, or roughly two-thirds. Without controls for the other theories, the direction and significant of this effect is not particularly surprising.

The second column shows the effect of the other theories on insurance demand, without including the variable measuring how expensive the policy is. There is clear evidence for adverse selection and crowdout influencing purchase. People who dislike nursing homes are less likely to be interested in purchasing the policy than people who are neutral or like them. The effect is large (about 11 percentage points). Interestingly, the regression suggests that it is entirely tastes for nursing home care, not health status, that influences the demand for long-term care insurance. People who think that they are likely to be eligible for Medicaid or nursing homes for Veterans are also less likely to be interested in private purchase, by roughly 8 percentage points.[34] While this effect is substantial, it is important to note that, even if there were no Medicaid or Veterans program

[34] The difference between this coefficient and the tabulations in Table 6 is that other variables are included in the regression and more responses about the likelihood of purchase are incorporated.

at all, only 21 percent of people would be very or somewhat likely to purchase the policy. Eliminating Medicaid coverage of long-term care would not result in most elderly purchasing private insurance. There is no evidence that other factors -- eligibility concerns, information problems, number of children, or uncertainty about changes in Medicare policy -- affect insurance demand.

The important question regarding the adverse selection and crowdout variables is whether they explain all of peoples' views that the policy is too expensive and thus undesirable. If they do, other theories such as intertemporal risk would not need to be considered. To test this, it is natural to add the cost variable to the regression in the second column. There is a problem with this strategy, however. Consider the variable measuring tastes for nursing homes. If people who do not want to enter a nursing home are more likely to think the policy is too expensive, adding the cost variable to the regression will "explain" some of the effect that is more appropriately attributed to tastes for nursing homes. To avoid this, I constrain the coefficients on the explanatory factors entered into column (2) to be the same as their value in column (2). That way, any correlation between those variables and perceptions of costs will be attributed to those factors directly, and we can examine whether there is any residual explanatory power from the perception about insurance costs.

The constrained estimates for insurance demand are shown in the third column of Table 8. While the coefficient on the cost variable falls relative to column (1), the reduction is not large -- about 10 percent. Equivalently, 90 percent of peoples' view that long-term care insurance is too expensive is unrelated to these other factors. Thus, while there is clear evidence in support of the adverse selection and crowdout explanations, there is also clear evidence that these hypotheses do not explain all of the lack of demand. Even accounting for these factors, many consumers think long-term care insurance is too expensive and do not purchase the policy. This is consistent with the

risk aversion hypothesis, but it is clearly not conclusive. More direct tests of the intertemporal risk explanation, where perceptions about this can be addressed directly, seem important.

V. Conclusions

A great deal of interest has been generated by the failure of private markets to adequately insure long-term risks. In this paper, I look theoretically and empirically at market provision of long-term insurance, with particular attention to insurance for long-term nursing home expenses. I reach two conclusions. First, I find that the importance of aggregate risk can explain why insurance pays an indemnity benefit instead of a service benefit. The indemnity benefit limits the insurer's exposure to much of the aggregate risk that would be assumed under a service benefit policy. Second, I show that common explanations for the lack of long-term insurance purchase -- principally adverse selection and crowding out from government provision -- can explain some of the lack of insurance purchase, but they are not the whole explanation. Even accounting for these factors, there are a substantial share of people who believe insurance is overpriced and thus do not want to purchase it. This is consistent with the importance of intertemporal risk, but is obviously not conclusive.

While this paper demonstrates the need to account for intertemporal risk in understanding the market for long-term insurance, it has not separated out which type of intertemporal risks are most important to understand. Some intertemporal risk is a result of uncertainty about public sector actions. For example, governments regulate the number of nursing home beds in every state, and uncertainty about future government policies is a source of aggregate risk. Other risk is endemic to the market. Technological change in medicine is extremely rapid, and the cost fluctuations induced by this technological change are another source of aggregate risk. In general, it is hard to imagine a

long-term insurance market without both types of risk. The fact that not all risks originate in the public sector is important, however, since it casts doubt on the presumption of Cochrane (1995) and Epstein (1994) that long-term insurance markets would work perfectly if only the government would get out of the way.

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Table 1: Utilization of Nursing Homes

	Year		
Measure	1963	1977	1985
Institutionalization Rate			
Total	2.5%	4.7%	4.6%
65-74	0.8%	1.4%	1.3%
75-84	4.0	6.4	5.8
85+	14.8	22.6	22.0
Average Monthly Charge ($1985)	$645	$1163	$1456

Source: United States Department of Health and Human Services (1990).

Table 2: Serial Correlation of Medical Care Costs, 1960-1993

Cost Measure	Average Annual Cost Increase	Constant	$\log(c^*_{t-1})$	σ_η
Nursing Home Care	7.2%	.064 (.008)	.966 (.010)	.043
Home Health Care	12.7	.155 (.057)	1.010 (.019)	.135
Personal Care	4.8	.066 (.011)	.993 (.005)	.012
Hospital Care	5.0	.084 (.010)	.978 (.006)	.018
Physicians Care	4.8	.051 (.010)	.996 (.010)	.026

Note: The table reports coefficients from regressions of the form:

$$\log(c_t^*) = \alpha + \rho \log(c_{t-1}^*) + \eta_t.$$

The data are real, per capita spending, deflated using the GDP deflator.

Table 3: Standard Deviation of Average Costs

	Standard Deviation of Residual (σ_η)		
Correlation of Costs (ρ)	.01	.05	.10
0.9	.015	.072	.145
1.0	.027	.134	.268

Note: The Table shows the standard deviation of the logarithm of average nursing home costs for an insurance company. The standard deviation is

$$\sigma_c = [\sum_{i=0}^{k-1} (\sum_{h=0}^{i} \rho^h)^2]^{1/2} \cdot \sigma_\eta / k.$$

The number of cohorts (k) is set to 20.

Table 4: Characteristics of Long-Term Care Insurance Policies

	1988		1991	
Characteristic	Number	Percent	Number	Percent
Number of Policies	53	100%	73	100%
Benefit Determination				
Indemnity payment	51	96.2	72	98.6
Service benefit	2*	3.8	1	1.4
Method of Benefit Increase Over Time				
None	28	52.8	1	1.4
Right to buy more at future price	6	11.3	8	11.0
Simple benefit increase	17	32.1	41	56.2
Compound benefit increase			22	30.1
Service benefit	2	3.8	1	1.4
Time Period During which Benefits Increase				
Fixed number of years (10,15,20)	---	---	23	31.5
Fixed age (85,86)	---	---	4	5.5
Combination of (years,age)	---	---	13	17.8
Unlimited increase	---	---	33	45.2
Allowable Rate Increase				
Rates not guaranteed	---	---	68	93.2
Rates guaranteed for 3 years	---	---	3	4.1
Rates guaranteed for life	---	---	2	2.7
Maximum Benefits				
Limited Benefits	37	69.8	---	---
Unlimited Benefits	16	30.2	---	---

Note: The Table shows the provisions of long-term care insurance policies for insuring aggregate risk. Data are from Consumers Union (1988, 1991).

* One policy pays 75 percent of nursing home charges.

Table 5: Predictions of Insurance Provisions

Dependent Variable	Model	Firm Characteristics: Financial Size Category	Firm Characteristics: Rating of A or A+	Constant: Constant	Constant: Cutoff-1	Constant: Cutoff-2	Pseudo-R^2
Method of Benefit Increase	Ordered Logit	.182** (.091)	.159 (.717)	---	-1.175** (.565)	2.033** (.566)	.045
Time Period of Benefit Increase	Logit	.163* (.097)	-.612 (.876)	-2.008** (.634)	---	---	.079

Note: The first row reports ordered logit estimates for the method of benefit increase: no increase or the right to buy at future prices; simple benefit increase; and compound benefit increase or payment of cost of care. The second row reports logit estimates for the time period of benefits increases. A 1 indicates an unlimited time period, and a 0 indicates any time restriction. The financial size category ranges from 1 to 15. Both the size class and the overall rating are from A.M. Best (1991).

* Statistically significant at the 10 percent level or better.

** Statistically significant at the 5 percent level or better.

Table 6: Range of Wealth for Purchase of Long-Term Care Insurance

Risk Aversion	Type of Policy	
	Indemnity	Service Benefit
A=1	$160,000 - $260,000	$96,000 - $334,000
A=2	$67,000 - $431,000	$56,000 - $527,000

Note: The table reports the wealth range over which an individual would choose to purchase long-term care insurance. The coefficient of relative risk aversion is given in the first column.

Table 7: Summary of Factors Explaining Purchase of Insurance

Variable	Percent Answering "True"	Percent Very or Somewhat Likely to Purchase		
		True	False	p-value
Eligibility				
Would not be eligible because of health	13%	20%	18%	.653
Information Problems				
Medicare covers long-term care	20	19	18	.792
Adverse Selection				
Fair or poor health status	36	19	17	.644
Don't want to go to nursing home	65	14	25	.018
Family Members				
Have any children*	89	17	25	.250
Number of children**	3.5	.0004		.964
Crowdout				
Could by covered by Medicaid or Veterans	32	18	18	.932
Medicare will cover when need	20	18	18	.969

Note: The second columns give the share who are very or somewhat likely to purchase the policy, based on whether they thought the statement in the row was "true" or "false". For example, 20 percent of those who agree that they would not be eligible for the policy because of their health are likely to purchase the policy, as are 18 percent of those who do not agree with the statement. The p-value is for the difference in the two percentages.

* True and false correspond to having children and not having children.

** The number in the columns for True and False is the coefficient on the number of children in a linear regression for the likelihood of purchasing the policy.

Table 8: Explaining The Likelihood of Purchasing Long-Term Care Insurance

Independent Variable	(1)	(2)	(3)
Cost			
Policy too expensive	-1.423**	---	-1.278**
	(.264)		(.269)
Eligibility			
Will not qualify because of health	---	-.094	-.094
		(.399)	
Information Problems			
Medicare covers long-term care	---	.492	.492
		(.487)	
Adverse Selection			
Fair or poor health status	---	.509	.509
		(.324)	
Don't want to go to nursing home	---	-.810**	-.810
		(.262)	
Family			
Have children	---	-.044	-.044
		(.490)	
Number of children	---	.062	.062
		(.063)	
Crowding Out			
Could be covered by Medicaid or Veterans	---	-.642**	-.642
		(.288)	
Medicare will cover when need	---	.050	.050
		(.477)	
Demographics			
Male	.545	1.150**	.788*
	(.451)	(.452)	(.457)
White	-.813**	-.547	-.790**
	(.356)	(.371)	(.366)
Married	.010	-.375	-.065
	(.437)	(.438)	(.447)
Aged 65-69	.486*	.594**	.502*
	(.263)	(.266)	(.270)
Less than high school	-.247	-.527	-.489
	(.369)	(.377)	(.379)

Table 8 (continued)

Independent Variable	(1)	(2)	(3)
Some college	.792**	.490	.705*
	(.362)	(.361)	(.370)
College degree	.815**	.707*	.737*
	(.393)	(.401)	(.400)
Health Status			
Number of acute conditions	.029	.011	.016
	(.055)	(.060)	(.057)
Number of IADLs	.058	.042	.054
	(.036)	(.038)	(.038)
Financial			
Retired	-.074	-.118	-.127
	(.305)	(.311)	(.311)
ln(Family Income)	.254	.333	.357
	(.229)	(.232)	(.232)
Wealth >$250,000	-.138	.167	-.005
	(.356)	(.356)	(.366)
Wealth between $25,000 and $250,000	-.296	-.174	-.315
	(.304)	(.303)	(.312)
Insurance			
Have Medigap policy	.699*	.639*	.807**
	(.386)	(.395)	(.394)
Summary Statistics			
N	333	333	333
ln(Likelihood)	-285.23	-290.80	-279.30

Note: The regressions are ordered logit models for the likelihood that the person will purchase the insurance policy. In the third column, the coefficients in the first block are held at their level in the second column. Standard errors are in parentheses.

* Statistically significant at the 10 percent level or better.

** Statistically significant at the 5 percent level or better.