Insurance Market Participation Under Symmetric Information*

by

Casey B. Mulligan** and Tomas J. Philipson***

University of Chicago

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**The Department of Economics. [c-mulligan@uchicago.edu]

***The Irving B. Harris Graduate School of Public Policy Studies, The Department of Economics, and The Law School.[t-philipson@uchicago.edu]

1. Introduction

When people are risk averse and full insurance can be bought at actuarially fair prices, everyone should fully insure against all risk. Many insurance markets do indeed have a remarkable share of the population participating in them, despite public alternatives that may lower the demand for private coverage. However, as seen in Table 1, for many lines of insurance there is not full participation.

Table 1: Insurance Market Participation Rate, by Type of Insurance

Insurance Type	Participation Rate, %	Population
Earthquake	29	Dwellings and Condos in California, 12/31/1994
Homeowners	92	
Auto liability	77	vehicles in CA, 12/31/1994
Health	77	non-elderly people in California, 6/1/1997
Life	78	U.S. Households, 1992
Life	90	U.S. Two-adult Households, c. 1993

Source: Zanjani (2000), except for the last row (Cawley and Philipson 1999, p. 827)

The reasons for the lack of trade in state contingent claims are important not only for participants in those markets, but maybe also for the several significant public programs like Social Security, Medicare, and Medicaid, that are sometimes justified as the optimal public response to insufficient trade in private insurance markets.

Uninsurance might be attributed to a lack of risk aversion, or to a real price of insurance (namely, the price of insurance as a ratio to the actuarially fair price) that exceeds one. Most of the literature focuses on real insurance price increases deriving from asymmetric information (i.e., adverse selection and moral hazard). But Zanjani (2002) points out that asymmetric information cannot explain why insurance prices are especially high in the earthquake insurance market.[1] More generally, other market frictions could, in effect, increase the real price of insurance, and be mainly responsible for the kind of behavior measured in Table 1. The purpose of our paper is to explore implications of some of these other market frictions, especially when they take the form of fixed administrative and "market participation" costs.

Participation costs are thought to be important in a variety of other markets, including the checking accounts markets, bond markets (Mulligan and Sala-i-Martin 2000), stock markets (Uhler and Cragg 1971), and even political markets (Ledyard 1984, Mulligan and Shleifer 2003). Could they affect the analysis of insurance markets? We show how market participation costs imply that the insured are a select sample of the population, namely those who find it worthwhile to pay the participation cost. The insured are selected according to their risk, the potential magnitude of damage, and their income, even when information is symmetric.

To the extent that contracts differ according to their administrative, underwriting, verification, and other costs, at least some insurance market participants choose less than complete coverage, and there is a correlation between consumer characteristics and the amount of coverage. The real price of insurance declines with the amount of damage insured. Insurance consumers prefer a solvent insurer, even when achieving solvency has real costs, rather than holding a portfolio of insurance contracts.

Section 2 uses information on life insurance pricing, and on the operating expenses of a variety of insurance companies, in order to obtain first estimates of the magnitude and nature of insurance company operating costs per contract. Operating costs seem to be largely per customer, or per customer per year, independent of the size of the contract. The fixed costs of insurance are roughly 20% of the damage the insurance is designed to cover, which is large enough for a lot of people to be optimally insured. Section 3 relates these implications to previous work on asymmetric information, and "costly state verification."

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[1] Zanjani attributes the high real price of earthquake insurance to taxes and other costs of doing business associated with the high levels of reserves held by earthquake insurance companies.

2. Participation Costs and Symmetric Information

2.1. Selection and Participation Costs

Consider an economy of a large number of individuals. Y denotes a person's (known) wealth, and p the probability he experiences damage δY. In other words, without insurance his wealth is $c_1 = (1\text{-}\delta)Y$ with probability p and $c_0 = Y$ with probability (1-p), where 0 and 1 index the "good" and "bad" states, respectively. Figure 1 below graphs this no-insurance allocation as a circle in the $[c_0,c_1]$ plane.

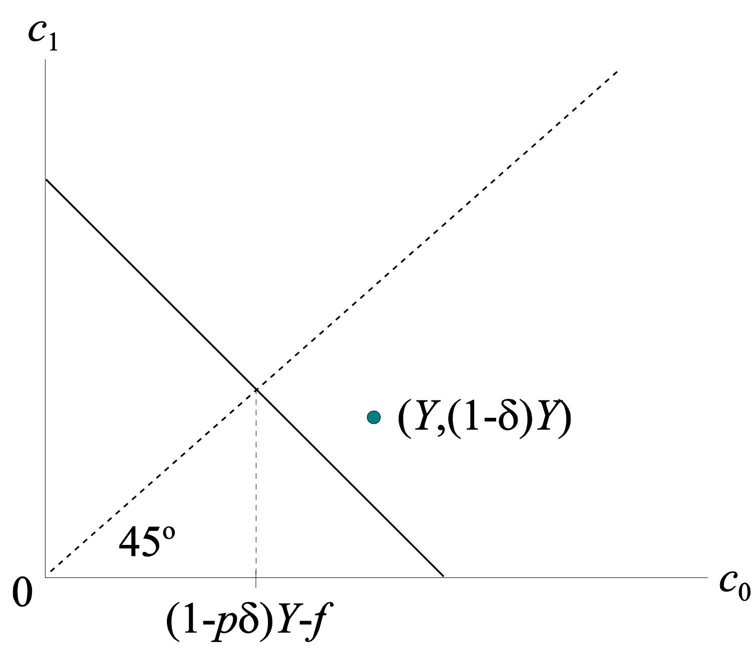

Figure 1 Consumption Possibilities with Participation Cost

At cost f, a person can travel to an insurance marketplace to pool risks with other persons. In that marketplace, each person's risk and potential damage are public knowledge, and trades in damage-contingent claims are actuarially fair. If he travels to the market, his consumption possibilities are those shown by the line in the Figure, with slope (1-p)/p and 45-degree-line intersection at $c^0 = c^1 = (1\text{-}p\delta)Y - f$.[2]

[2]With one exception, the comparative statics are the same if the fixed cost is paid only in the bad state (ie, it is an insurance award collection cost). In this case, pf replaces f in Figure 1.

Each person is an expected utility maximizer, and has the same increasing concave state-independent utility function u. When offered actuarially fair insurance, he will smooth consumption across states, so his insurance market participation decision is determined by:

$$u\big((1-p\delta)Y-f\big) \overset{>}{\underset{<}{=}} pu\big((1-\delta)Y\big) + (1-p)u(Y) \tag{1}$$

The expected utility of participation is on the left, and the expected utility of nonparticipation on the right. As f approaches zero, participation is preferable because people are assumed to be risk averse.

There is systematic selection into insurance markets in our model, despite the fact that all agents have the same information. The nature of this selection can be studied algebraically by letting the population's characteristics f, p, δ, Y be continuously distributed across individuals according to the distribution function G. The equality version of (1) defines a 3-dimensional indifference surface in the [f, p, δ, Y] plane which partitions the population into two sets (one of which may be empty) according to their market participation. We can totally differentiate the net expected utility of market participation (which we denote Δ) in order to see whether insurance market participants are above or below the indifference surface in each of the dimensions [f, p, δ, Y]. The total derivative is:

$$\begin{aligned} d\Delta = -u'\big((1-p\delta)Y-f\big)df + pY\big[u'\big((1-\delta)Y\big) - u'\big((1-p\delta)Y-f\big)\big]d\delta \\ + \big[u(Y) - u\big((1-\delta)Y\big) - \delta Y u'\big((1-p\delta)Y-f\big)\big]dp \\ + \big[(1-p\delta)u'\big((1-p\delta)Y-f\big) - (1-\delta)pu'\big((1-\delta)Y\big) - (1-p)u'(Y)\big]dY \end{aligned} \tag{2}$$

The first term conveys the obvious result that lower participation costs encourage

Below we return to the one case in which general and state specific fixed costs yield different results.

f may include, but is not limited to, the "state verification costs" studied by Kihlstrom and Pauly (1971), Townsend (1979), Bond and Crocker (1997), Fagart and Picard (1999), and others.

participation. But this may explain some important participation patterns. For example, we expect participation costs per consumer to be lower for groups. Hence group plans may dominate the market even when there is symmetric information, and some of the lower insurance prices enjoyed by group plans may not reflect only supplier concern for adverse selection, but also the lower per-consumer administrative costs enjoyed by group plans. To the extent that participation costs reflect the costs of conveying market information to consumers, participation costs may be lower for consumers with more education, or employment in the financial industry, or who have already purchased other insurance.[3]

The effect of damage is the first bracketed term, which is positive in the neighborhood of participation indifference, because participation in that neighborhood must increase consumption in the damage state.[4]

The effect of risk is seen the second bracketed term, which clearly shows that Δ is concave in p. With this in mind, notice that insurance market participation is not worthwhile as p approaches zero, because Δ approaches $u(Y\text{-}f)\text{-}u(Y)$. Insurance market participation is also unattractive as p approaches $1\text{-}f/(\delta Y)$ from below, because in these cases insurance lowers consumption in the good state and hardly raises it in the bad state. In other words, *only medium-risk consumers are expected to participate in insurance markets*. Another way to see this is to consider a second order approximation to the net expected utility of market participation Δ:

$$\Delta \approx -u'(\bar{c})\left[\frac{\rho}{2}\frac{\text{var}(c)}{\bar{c}} - f\right]$$
$$\bar{c} \equiv (1-p\delta)y - f/2\ , \quad \rho \equiv \frac{-u''(\bar{c})\,\bar{c}}{u'(\bar{c})}\ , \quad \text{var}(c) \equiv p(1-p)(\delta y)^2 \tag{3}$$

[3]Mulligan and Sala-i-Martin (2000) have an analogous empirical result for stock and bond markets: holding constant total financial wealth, persons with company pension plans were much more likely to have at least some of their financial wealth invested in stocks or bonds (rather than checking and savings accounts).

[4]Persons of all types reduce their c^0 by participating in the insurance market (they have to pay the fixed cost plus the premium). Hence participation indifference implies that c^1 is increased by participation, which is the case shown in Figure 1. Algebraically, participation indifference implies $(1\text{-}\delta)Y < (1\text{-}p\delta)Y - f$.

where the approximation is in the neighborhood of the average of expected consumption with and without insurance, *var*(*c*) is the variance of uninsured consumption, and ρ is the (local) coefficient of relative risk aversion. The variance of consumption depends in $p(1\text{-}p)$; the medium risk types face more uncertainty without insurance than do the low and high risk types. High risk types unfortunately have low expected incomes, but the purpose of insurance is not to raise expected income, but rather to reduce uncertainty. As p exceeds ½, the high risk types face less uncertainty, and thereby have less to gain from insurance. The low risk types are absent from the market because the participation cost f is for sure, and the gains from insurance are only in the (unlikely) bad state.[5]

Since our model has symmetric information, this means that the empirical observation that low risk consumers are more likely to be uninsured is not necessarily evidence of adverse selection induced by asymmetric information. Likewise, observations that very high risk consumers are uninsured (for example, observations that people with AIDS do not acquire health insurance, or persons with terminal illnesses do not acquire life insurance) is not necessarily evidence of insurance market failure, except to the extent that participation costs are themselves market failures.

The wealth effect on participation is seen in equation (2)'s third bracketed term. All else the same, market participants have more wealth, as long as the degree of risk aversion does not decline too rapidly with wealth,[6] because the fixed cost becomes small relative to the potential damage. This is an example of selection on characteristics other than risk, which is important for interpreting empirical studies of insurance market selection. For example, it is often observed that insurance market participants are wealthier than the non-insured. This might be explained as selection on risk, and that wealth just happens to be a proxy for risk. An alternative hypothesis comes from our model – namely that wealth has a direct effect on participation. In fact, selection on wealth is likely to

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[5]If f were purely state specific (so that none of it is paid in the good state), low risk persons would be in the market whenever otherwise similar medium risk types were present. See also Figure 2 below.

[6]If, for example, marginal utility were nearly constant above $c = (1\text{-}p\delta)Y\text{-}f$, then the third bracketed term would be negative and wealth would decrease participation.

Because it features the ratio of uninsured consumption *variance* to consumption mean, equation (3) shows how the coefficient of uninsured consumption variation could decline with wealth, and the wealthy still be the more likely to participate.

dominate selection on risk in our model, merely because wealth varies so much more within cohort than do mortality prospects.

The markets for life insurance and annuities are interesting case studies in this regard. If wealth is correlated with life expectancy, and the main selection in these markets takes the form of long (short) life expectancy persons buying life annuities (life insurance), then the wealth selection into the life insurance and annuity markets should be very different. In fact, it appears that both life insurance and annuity contract owners are wealthier than the uninsured (Cawley and Philipson 1999), as implied by a our model of participation costs and symmetric information.

2.2. Behavior on the Intensive Margin: Reinsurance, Deductibles, and Contingency Exclusions

Insurance companies are disproportionately among the most solvent companies, and they incur some real costs to attain this solvency.[7] For example, Zanjani (2000, 2002) shows how insurance company reserves create significant tax liabilities. Another way an insurance company can enhance solvency is to purchase reinsurance, and thereby limit its exposure to a large claim or by correlated claims from its customer base. In the absence of fixed market participation costs, paying costs to hold reserves or obtain reinsurance would be puzzling because an insurance consumer could diversify his insurer risk by holding policies with multiple insurers. But there may be a participation cost for obtaining the second policy, and a cost for the third, etc., even though these additional costs may be less than the cost of obtaining the first policy. Hence, in order to avoid the additional costs, insurance customers are willing to pay more than the actuarial value of solvency, and insurance companies will supply solvency even up to the point where the marginal tax, reinsurance, etc., costs are significant. This effect is not important in the markets for groceries, shoes, DVD rentals, etc., because supplier insolvency does induce customers in these markets to deal with more merchants than they otherwise would.

Our simple model has only one risk, and does not distinguish between a fixed cost associated with acquiring a policy from the fixed cost of collecting an insurance award in the bad state. But to the extent some of the fixed cost is associated with collecting the award, we expect insurance

[7]Maybe government regulators should get credit for insurance company solvency? Carefully answering this question is beyond the scope of this paper, but we point out that insurance company reserves often significantly exceed regulatory requirements.

contracts to have deductibles and other provisions to limit the states in which awards are collected. To see this, we amend our basic model to have several bad states $s = 1, \ldots S$, and suppose that the fixed cost f is paid only in the insured bad states. Which bad states should be insured? Subtract the expected utility without any insurance from the expected utility of insuring state s only:

$$(p_0 + p_s)\, u\big((1 - \tilde{p}_s \delta_s) Y - \tilde{p}_s f_s\big) - \tilde{p}_s u\big((1 - \delta_s) Y\big) - p_0 u(Y)$$

$$\tilde{p}_s \equiv \frac{p_s}{p_0 + p_s}$$

where p_0 is the probability of no damage. Notice how the utility gain from insuring state s is similar to the utility gain from insurance shown in equation (1). Hence it does not pay to insure states without much damage, states with high award collection costs, or states that are very likely. Of course, it is common sense that insurance companies should not be processing claims for every tiny piece of damage suffered by their customers.[8] But the point of our paper is to show that this common understanding has a variety of implications, and has not been sufficiently treated in empirical and theoretical analyses of insurance markets.

If we interpret the collection of insured contingencies as an "insurance contract," insurance contracts will vary systematically across market participants, even though there is symmetric information. Hence, while we agree with Finkelstein and Poterba (2002) that insurance companies offer a menu of insurance contracts, we do not agree that the menu is necessarily designed "to screen customers according to their risk type." Rather, menus may be designed to accommodate known individual differences in insurance demand.

One difference between the equation above and equation (1) is their dependence on the probability of damage (p_s above and p in equation (1)) in the neighborhood of $p_s = 0$. Figure 2 displays the net utility gain from insuring state s as a function of the probability p_s of that state

[8]Gollier (1987) calls them "nuisance claims." Clearly noncoverage of nuisance claims is equivalent to not insuring small damage states, but Gollier (1987) explores the question of whether noncoverage of small damage states should be achieved by a deductible, a franchise, or a partially disappearing deductible. See Raviv (1979) for an early analysis of the use of deductibles to economize on administrative costs.

(assuming for the sake of drawing the diagram that the fixed cost is small enough that it makes sense to insure state *s* for at least some p_s).

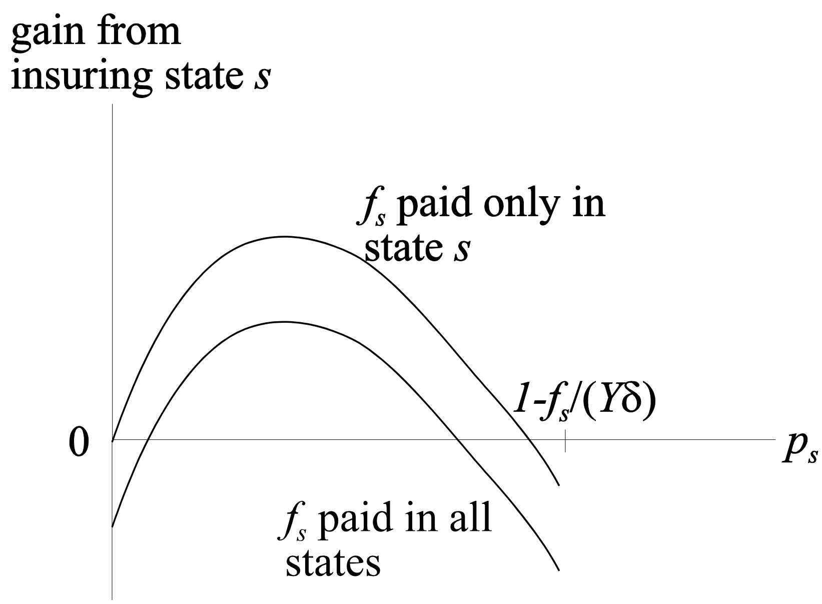

Figure 2 Selection on Risk with Participation and Award Collection Costs

The lower curve is for the case of a "general" participation cost of the kind studied in equation (1), namely a cost of insuring state *s* that has to be paid in all states. As discussed above, the net gain from insuring is negative for low and high risk types, because those types do not face much consumption uncertainty. The higher curve is for the case of an "award collection cost" namely a "state specific" participation cost that is paid only when there is damage. Although the low risk types have less consumption uncertainty, the net gain to insurance is still positive for them because their expected participation cost pf_s is low. Hence, if participation costs were fully damage-state-specific, the low risk types would be absent from the market only when all types are absent from the market.

The more interesting case has participation costs as a combination of general and specific costs. At least part of the general component is paid when insuring the first state (the one for which the demand for insurance is the highest) which, as we explain above, is states with medium risk, high damage, or a low state-specific components of the participation cost. Insuring the second, third, etc., states thereby has less of the general component. Hence, the existence of insurance market participation costs implies that low risk *consumers* (ie, those for whom the demand for insurance is low even for the first state) are likely to be absent from the market, but that low risk *contingencies* will be dealt with in the insurance market as long as those contingencies pertain to a consumer who has some higher risk contingencies to insure, so that part of the general participation cost is sunk and insurance for the low risk contingencies has a low real price at the margin. In other words, *low risk contingencies are pulled into the insurance market on the intensive margin*.

To the extent that the fixed cost is incurred by the insurance company, contract premia should increase less than proportionally with the amount of damage insured. Cawley and Philipson (1999) show that insurance premia do decline with contract size in the life insurance market (the largest insurance market in the U.S.). Their data was from TIAA (1997), but we have updated it by obtaining TIAA-CREF quotes from www.tiaa-cref.org for a nonsmoking 40 year old male.[9] Figure 3 display the TIAA premia as squares. For example, TIAA-CREF charges $215 per year for $250,000 of coverage, but only $355 per year for $500,000 of coverage.

[9]Height 6'0", weight 200 pounds, and answering negative to the various severe health questions. 10-year level term contract.

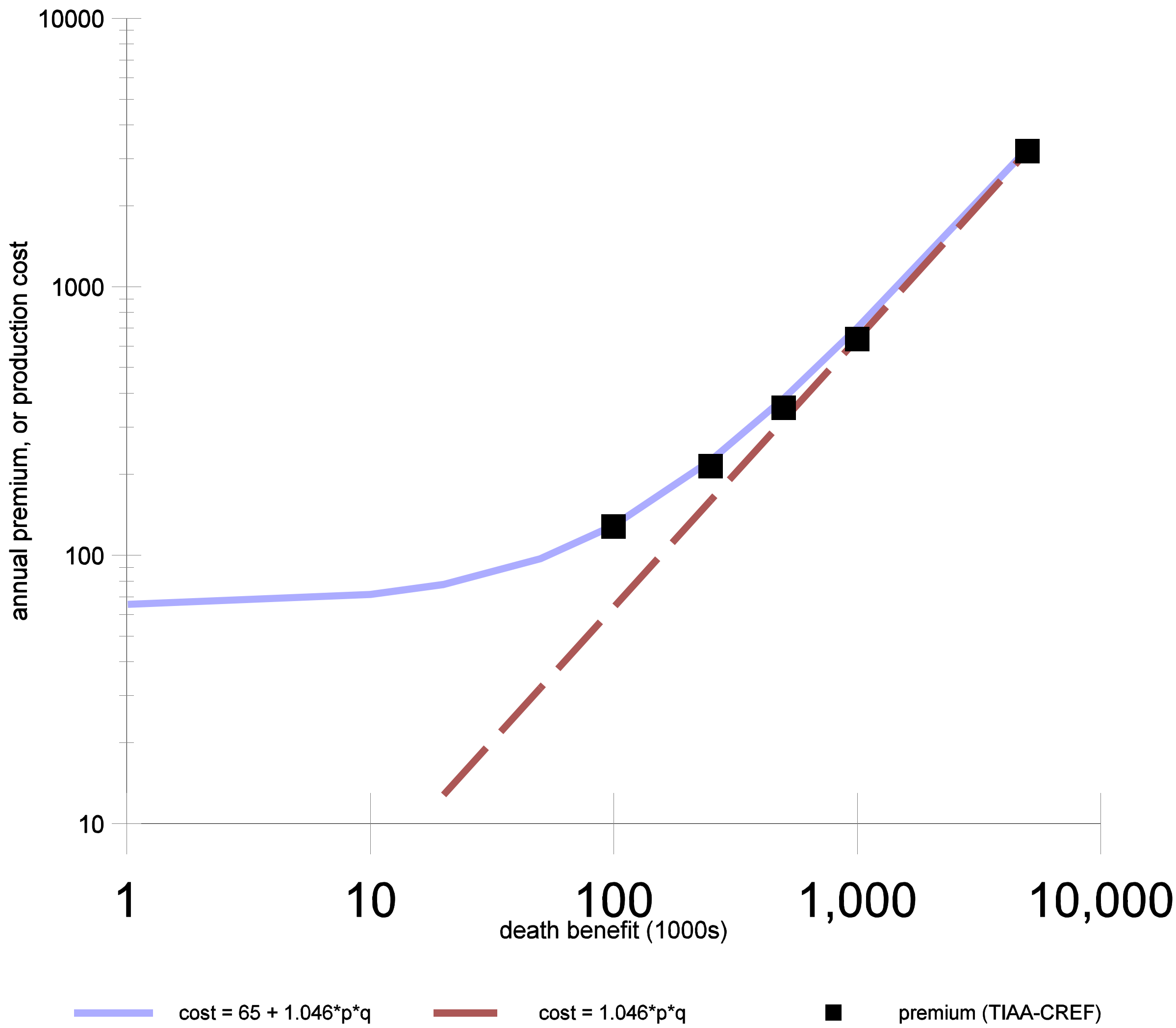

Figure 3 Life Insurance Contract Size, Observed Premia, and Hypothetic Production Costs

The lines in Figure 3 are hypothetical TIAA-CREF "annual production costs" (inclusive of a marginal loading factor) composed of an annual fixed component *f* plus a constant marginal component. The marginal component is the same in both cases, namely a marginal loading factor of 1.046 times the annual death hazard (0.000612) for a 44 year old health nonsmoking man in the TIAA-CREF insured pool.[10] The two lines differ according to the fixed component ($65 for the

[10]In order to estimate the death hazard, we recognize that: (a) the life insured population lives longer than the general population, (b) nonsmokers live longer than smokers, (c) mortality has declined since 1980, and (d) the TIAA-CREF group probably lives longer than other life-insured populations. Hence we obtain life tables for the nonsmoking male life insured

solid line, \$0 for the dashed line), and we see how a f = \$65 fits the premia data better than f = 0.[11]

f = \$65 is an estimate of the portion of the *annual* premium that is a per-customer cost. If we want an estimate of the expected present value of \$65 per year (for example, these may be intended to cover initial medical exams, underwriting costs, etc.), we need an estimate of the expected time that the customer will continue to make payments. For the full ten years, the present value would be about \$500.

2.3. Accounting for the Participation Cost

How can the market participation cost be measured? One approach is to associate part of the market participation cost with an insurance company administrative cost and, following Diamond's (1998) and Mitchell's (1998) analysis of pension administrative costs, use insurance company financial data. Another is to study the quantitative relation between insurance premia, and the size and other attributes of insurance contracts. However, with either approach we try to recognize that a wide variety of financial services, which are distinct from insurance from an economic point of view, are nonetheless called "insurance" by the laymen.[12] The excessively broad

population from the Commissioners Standard Ordinary Table – which unfortunately is from 1980 – and find a 44 year old hazard of .0018. General population mortality has declined 32% since then, so we have a year 2003 estimate of .0012. We guess that TIAA-CREF mortality is half that. Finally, we set the marginal loading (4.6%) in order to match premium and production cost for the larger contracts. Note from the Figure that, if TIAA-CREF mortality exceeds .00061 by more than five percent, then premia would be below production cost.

Regarding the 4.6% marginal load, also note that, for their universal life products TIAA-CREF has a 4% "premium expense charge" plus some other charges.

[11]Mulligan and Sala-i-Martin (2000, p. 988) infer (from consumer financial behavior) a median stock and bond market participation cost of \$111 per year. Their \$111 combines the participation costs falling on consumers and financial intermediaries, and is thereby consistent with our \$65 paid by insurance companies.

[12]One case is estate planning services. People often do not want to burden their family with funeral expenses. Even knowing the date of their death well ahead of time (so that the economic idea of insurance is not applicable), they might purchase a bond that pays their heirs, say, \$10,000 on the date of their death. Such a contact would be called "life insurance" by the layman, but should be understood as "estate planning services" by the economist.

Another case is tax avoidance services. For example, people arrange to have money withheld pretax from their paychecks to pay for future visits to the dentist, even when the exact cost and exact dates of those visits are known ahead of time. The economist understands such a use of the term makes it difficult to empirically separate the costs of providing various financial services from the costs of providing insurance. However, our TIAA-CREF data is informative in this regard. TIAA-CREF Life is arguably a "no frills" insurance company in that its basic contract offers insurance and hardly any other financial services. Second, we estimate from their ten-year term premia a fixed cost of $65 annually, which after a year or two would cover the resource cost of a medical exam.[13] Arguably TIAA-CREF has other operating costs, that depend more on the number of insured rather than the amount insured, of about the same order of magnitude. Hence, much of the $65 per year is likely a fixed cost of insurance like we model in section 2. For a $250,000 policy, $65 is significant, because it is almost a third of the annual premium (maybe that's why TIAA-CREF doesn't offer a one-year term? or contracts of less than $100,000?).

Table 2 presents some financial information for five insurance companies. As shown in the fourth column of the Table, a variety of insurance companies seem to collect between $300,000 and $400,000 in premiums per employee. Employees are obviously real resource costs which, at $50,000 employer cost, amounts to about $0.15 of every premium dollar going to insurance company employees. The last two columns of the Table use more comprehensive measures of operating expenses, and show that between $0.11 and $0.47 of every premium dollar goes to operating expenses and corporate income taxes. Perhaps Geico and Humana are the "no frills" companies represented in the table, because their expense ratios are 0.11 and 0.15, respectively.

contract as "tax avoidance services" even while the layman calls it "dental insurance."

[13]Perhaps insurance customers view the medical exam as an extra service beyond insurance services? Or maybe they view it as a disservice, adding to the full price of insurance!

Table 2: Insurance Company Premiums and Expenses

Company, division, and year	Type	Empl-oyees	Premium $ per employee	per premium $: oper. expenses	oper. expenses + inc tax
Erie Family Life Insurance Company, 2002	life	145	352,614	.38	.47
MetLife, all Divisions, 2002	many	48,500	393,526	.37	.40
MetLife, Auto & Home Division, 2002	auto & home	NA	NA	.28	.29
Geico, 1995	auto	8,278	336,677	.09	.11
Humana, 1995-97	health	18,200	347,691	.14	.15
Healthsource, 1996	health	5,500	311,630	.25	.25

Source: Company income statements from the SEC's EDGAR database.

If $0.15 of every premium dollar go to operating expenses and corporate income taxes, how much of this a fixed cost (i.e., per customer, or per customer per year, independent of the size of the contract), and how much is a variable cost? Perhaps corporate income taxes are a variable cost (although we argued above that they are paid in part because of the fixed costs borne by insurance consumers), but we see in the table that they are typically much smaller than operating expenses. If Figure 3's solid line is the right production cost, our TIAA-CREF data suggests that 90% of the load on a $250,000 life insurance contract is fixed.[14] Hence, it seems that the fixed costs of insurance *paid by insurance companies* amount to at least 10% of premiums. And this 10% does not count the fixed insurance costs paid by consumers on top of their premium, such as the cost of searching for a contact, learning about the marketplace, making sure premiums are paid and awards collected, etc.

To the extent that fixed costs are damage state-specific, and increasing less than proportionally with damages, then life insurance markets should have much lower fixed costs per

[14] 70% for a $1 million life insurance contract.

contract because, as compared with auto, home, and health insurance markets, claims per contract are very few and large. For example, 1 out of 1000 insured might make a life insurance claim during the year, while 7 out of 100 insured may make an auto claim during the year. But, based on operating costs per dollar of premium, Table 2 gives us no reason to believe that life insurance companies have much lower fixed costs per contract.[15]

2.4. Small Participation Costs have Large Effects

It seems that market participation costs, such as travel costs, learning about the market, sharing personal information with the insurer, or verifying the damage when it occurs, are not as large as the cash transactions between insurance companies and those suffering damages. This may be the case, and participation costs may still have significant behavioral effects, for the simple reason that the gains are small from insuring damages that are a small fraction of one's lifetime wealth. To see this, consider an isoelastic utility function $u(c) = [c^{1-\rho}-1]/(1-\rho)$, where the constant ρ is the coefficient of relative risk aversion. Let $\varphi(p,\delta,\rho)$ denote the participation cost, expressed as a fraction of expected damages $p\delta Y$, that leave a person with risk p, potential damage as a fraction of wealth δ, and risk aversion ρ indifferent between participating or not. We can use the equality version of (1) to calculate φ:[16]

$$\varphi(p,\delta,\rho) = \frac{1 - p\delta - [1 - p + p(1-\delta)^{1-\rho}]^{1/(1-\rho)}}{p\delta}$$

For $p = 0.1$, and for three values of the risk aversion coefficient, Figure 4 graphs the critical participation cost as a function of the potential damage.

[15]Nor does Table 1 suggest that life insurance participation is dramatically higher than participation in home, auto, and health insurance markets, although this could be consistent with lower life insurance fixed costs if expected damage or some other factor reduces life insurance demand relative to demand for other insurance products.

[16]Equation (3) can be used to derive a simpler, but approximate, formula for the critical participation cost $\varphi \approx \rho(1-p)\delta/[2(1-p\delta)]$.

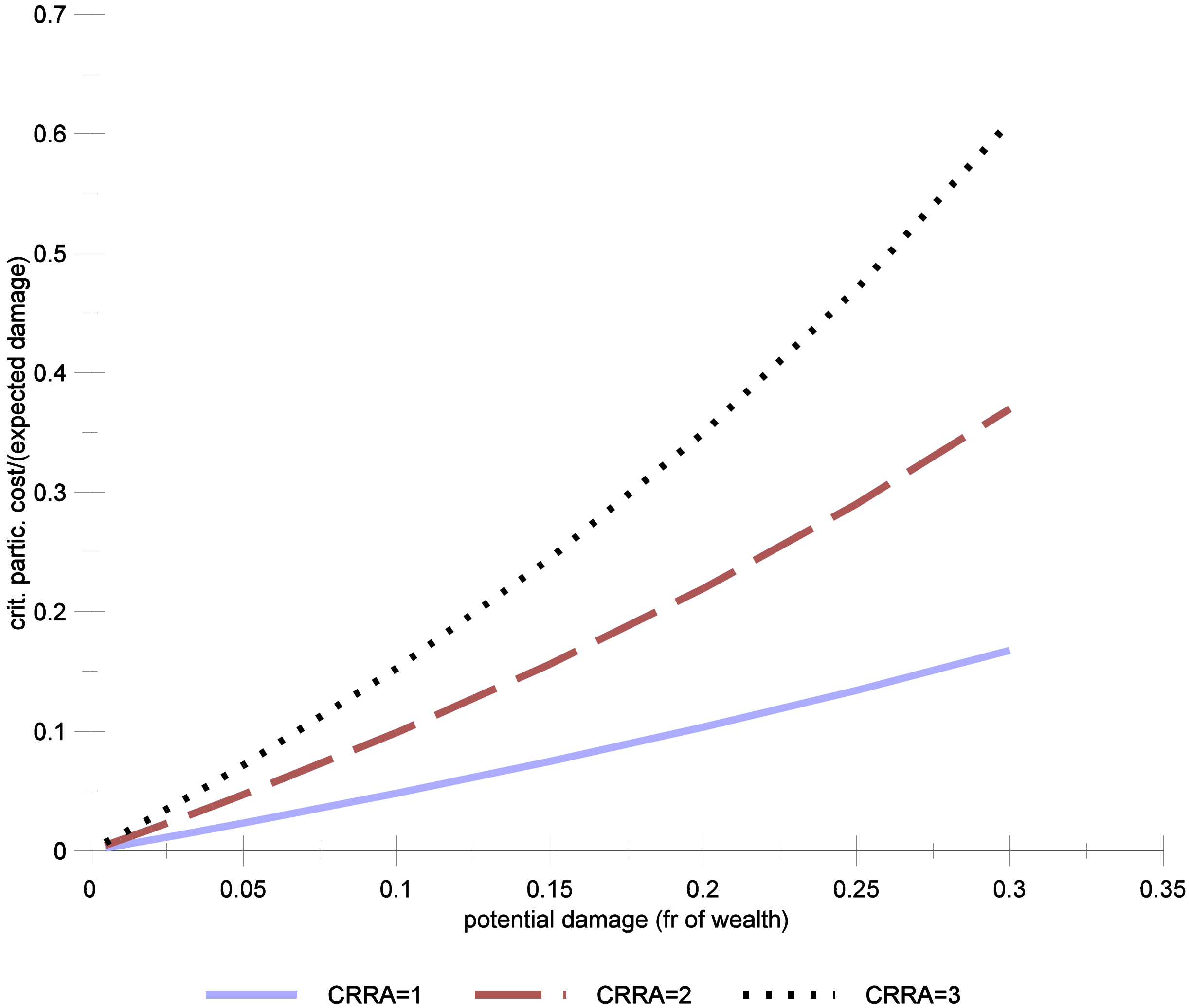

Figure 4 Critical Participation Costs with CRRA Utility

The Figure shows that, as long as potential damage is less than 10 or 15% of wealth, then for a range of risk aversion parameters the critical participation cost is less than 20% of expected damage, which is easily less than the participation costs estimated above. If, say, 15% of premiums pay for operating costs, and the other 85% pay for damages, then operating costs are 18% of damages and the total participation cost (including that paid by the consumer) could easily exceed 20% of expected damage and thereby leave a lot of consumers optimally uninsured.

Our calculation of the critical participation cost is overstated, because we have assumed that market participation permits consumers to be fully insured. In reality, marginal loadings and other factors may leave insurance market participants less than fully insured, and thereby reduce the value of insurance market participation.

3. Relations with Asymmetric Information

How can we determine whether observed patterns of insurance market participation derive from market participation costs, asymmetric information, or some combination? First of all, we point out that under some models of adverse selection, *everyone* buys insurance, and the efficiency loss from adverse selection is associated with less-than-full insurance for some types. In order to explain nonparticipation, these models need other market frictions *in addition to* adverse selection.

Regardless of whether asymmetric information alone is consistent with nonparticipation, answering the question requires partitioning asymmetric information models in two classes. In one class, private information can be made public at some reasonable cost. This cost would be of the same variety as the market participation cost we model above, as with the life insurance medical exam. From a qualitative point of view, this version of asymmetric information is a special case of our model.[17] Quantitatively, the question is whether the costs of medical exams and other procedures for publicizing personal information are a majority of the market participation costs generating the observed patterns of pricing, deductibles, participation, etc. We suggest above that the annual fixed cost of $65 implicit in TIAA-CREF's 10 year term life insurance pricing is too much to be explained by the cost of medical exams alone.

Consumer private information is irrelevant in stock and bond markets, because the sellers of stocks and bonds do not care about the identity of their buyers (indeed, trades in these markets are often anonymous). If most of the insurance participation cost derived from asymmetric information, then participation costs to be much larger for insurance markets than for bond markets, stock markets, etc., because all of these markets should be pretty similar in terms of the other types of participation costs (administrative, consumer learning, etc.). But in fact, bond and stock market participation costs seem to be just as high. Mulligan and Sala-i-Martin (2000, p. 988) infer (from

[17]The cost of making private information public has been called "costly state verification." In Kihlstrom and Pauly (1971), the cost is general (paid in all states). In Townsend (1979), the cost is state-specific. Bond and Crocker (1997), and Fagart and Picard (1999), allow states to be verified at the discretion of the insurer, in a way that economizes on the cost but still gives incentives for truth-telling.

consumer financial behavior) a median stock and bond market participation cost of $111 per year. Keeping in mind that the $111 combines the participation costs falling on consumers and financial intermediaries, compare with the $65 we estimate for the annual fixed cost of underwriting and administering life insurance. Perhaps the $65 is largely the kind of administrative costs associated financial intermediation, and only in small part a cost of publicizing information.

The second class of asymmetric information models assume that private information only becomes public via opportunistic behavior in the insurance market. These models have several more differences with ours. Although risk may predict insurance participation in either asymmetric information or participation cost models, the latter suggests that selection on other factors like income, education, etc., will often dominate. The life insurance market is a case in point, where the insured live longer than the general population, mainly because they are richer and more educated. Furthermore, when selection in the participation cost model does occur on risk, it is not monotonic; both high and low risk types are likely to be absent from insurance markets. Low risk contingencies are pulled into the market on the intensive margin.

Either adverse selection or fixed costs of insurance (especially when some component of the fixed cost is state specific), can explain why insurers may offer many different insurance contracts, and that consumers would be systematically matched with contracts according to their personal characteristics. Chiappori and Salanie (2000) and Finkelstein and Poterba (2002) suggest that a correlation between risk and contract type would be a confirmation of adverse selection, and a lack of correlation might reject adverse selection. However, such a correlation is consistent with symmetric information and fixed costs, as long as risk is not overwhelmed by other determinants of insurance demand, so that the correlation is zero or of the wrong sign, as in the life insurance example.[18] We conjecture that, if combined with fixed costs, asymmetric information could also be consistent with no correlation between risk and contract type.

Adverse selection implies that the contract menu is shorter than under symmetric information, in order to induce consumers to truthfully reveal their type. A unique implication of adverse selection is that forcibly removing one type of consumer from the insurance market can make other types better off, by expanding or altering the menu of contracts offered by consumers.

[18]High risks could also have less comprehensive coverage if they were on the downward sloping part of Figure 2.

In other words, aside from directly measuring the information sets of agents, testing for asymmetric information requires a removal of types from the market, and not just confirming or denying a correlation between risk and contract type.

Participation costs imply that insurance consumers want insurance company solvency, even when real resources are required to create solvency. Participation costs imply that insurance prices should decline with contract size, at least to the extent that some of those costs are paid by insurers. We are not aware of asymmetric information models that can explain costly solvency without participation costs, and Chiappori and Salanie (2000, p. 58) insist that insurance prices that *rise* with contract size is a pretty robust implication of adverse selection (in the absence of a state verification technology). Maybe the real question is not why some people are absent from insurance markets, but why so many people are insured?

4. Conclusions

@ forthcoming @

5. References

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