Commodity Bundling In Japanese Non-Life Insurance:

Savings-Type Products As Self-Selection Mechanism

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Abstract

This paper develops a self-selection rationale for the use of commodity bundling in the case of savings-type casualty insurance in Japan. The savings-cum-insurance bundle is described in detail. Two alternative models to explain its success are presented. The moral hazard model assumes that casualty insurance claims depend on unobservable actions of the insured (lack of care), while the adverse selection model centers around the assumption that consumers have private information about their exogenous claim probability. The likelihood of a claim is inversely related to personal income, because preventive safety measures are normal goods. The evidence from casualty insurance in Japan supports the adverse selection theory, while the moral hazard model is inconsistent with some of the institutional and empirical facts.

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I. Savings-Type Products

1. Overview

The single most important factor for understanding the current situation in the Japanese non-life insurance industry is the extraordinary growth of the savings-type products. Since their inception in the mid-postwar period,[1] these products have experienced rapid (if unstable) growth, which only came to an end in 1990 with the bursting of the infamous asset price bubble and the ensuing recession. Even though they account for only 5% of the insurance premia, the savings portion attached amounts now to half the liabilities of the industry [19].

Savings-type products bundle an ordinary insurance policy with a time deposit. Upon expiration of the insurance policy, the customer receives the savings portion augmented by a dividend. The dividend consists of a guaranteed rate of return and a discretionary amount related to the actual investment return which the insurance company achieved by managing these funds. The savings portion is small compared to the insurance coverage, and like a deductible is not returned to the policy holder in a total claim situation.

The total (gross) premium, consisting of the savings premium, the pure risk premium, and a loading to include commission and general sales and acquisition expenses, can be paid either as lump-sum up front or in installments. Traditionally savings-type products offer medium term savings-cum-insurance bundles (3 to 10 years duration), even though in October 1992 the first annuity-type 30 years policy was introduced. Savings-type products now cover a variety of risks, but the only two big lines are fire and personal accident.

The impact of these policies on the balance sheets of non-life insurance companies is enormous. While underwriting results are not much affected, investment margins from managing savings-type funds have in recent years provided up to 50 % of total shareholder investment income [4, p. 20]. In light of such figures, Japanese non-life

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[1] The first savings-type fire and personal accident policies were sold in 1963 and 1974, respectively.

insurance companies have been described as huge investment trusts, which also write a little insurance on the side (though generally very profitably).[2]

The paper is organized as follows. The remainder of section I describes in more detail the institutional characteristics of savings-type products. Existing theories of commodity bundling and their relevance to savings-type products are reviewed in section II. Sections III and IV present the main alternative models, moral hazard (MH) and adverse selection (AS). The evidence examined in section V supports AS, contradicting MH. Section VI concludes.

2. Premium Setting

Savings-type policies can be divided into two categories. First, the so-called 'long term comprehensive ' insurance policies, which were originally devised as savings-type policy. Second, the 'maturity refund endorsement type', which is created by adding a maturity refund to an existing conventional type policy. The risk portion of the total premium of the latter type is identical to the corresponding normal product.[3] The two categories differ mainly in the approval procedure by the Ministry of Finance (MOF). For virtually all savings-type products, there exists a comparable normal line product, offering similar coverage.

Formally, the premium rates on savings-type products of the first category are not fixed by rating associations, unlike the rates on normal fire and personal accident lines.

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[2]This development has fundamentally altered the business focus of the companies. Because of the rising influence of investment skills on company profits in a deregulated financial environment, no longer can conventional underwriting claim priority over ‘ancillary’ activities such as investment management. The savings-type policies exhibit the lack of sophisticated investment skills in the past. During the eighties, rising interest rates meant that the insurance company could invest the premia received at ever higher current market interest rates, earning large margins on these funds. This was made possible through very infrequent (yearly) adjustment of the guaranteed rate of return, as well as the fact that almost 40% of the premia are received in installments during the policy period. With the end of the bubble economy and the resulting unexpected and prolonged decline in market interest rates, the opposite and adverse effect occurred. The companies found themselves stuck with high guaranteed rates of return, while at the same time not being able to achieve an equally high rate on their investments.

This situation is a violation of the golden rule of investment, which prescribes a precise match of the duration of assets and liabilities. Some of the savings-type bundles were priced so that they result in an overall loss for the company. This experience has prompted the responses. First, rates of return on savings-type products, which are regulated and identical across all firms, are now adjusted more frequently. Second, the industry increasingly uses asset-liabilities management systems.

[3]The expense loading may be adjusted, taking into account that saving-type policies do not require yearly renewal procedures, therefore save some expenses. However, this difference is hardly significant.

Belonging to the category of Licensed Rates, savings-type premium rates are determined by individual calculation by each insurance company, independent filing with and approval by MOF.[4] "All of the maturity-refund type products are under the Licensed Rating system, and therefore, the Rating Association have had no direct involvement in these businesses both in their premium rates and policy conditions." [17, p. 19] However, "The Association has also been collecting data and compiling various statistical reports necessary as the basis for rate examination in those lines of insurance which are not under the Association rating system. ... The volume of information data on these lines of insurance has been on the increase each year, taking up approximately 30% of the total data processed by this Association at present" [17, p. 25]. Therefore, the conditions are given to make industry-wide collusive rate agreements possible, via MOF and the rating association.[5] As a matter of fact, savings-type insurance rates are identical across all firms in the industry.

3. Cross-Subsidization

In savings-type lines, all expenses are charged against the insurance portion of the premium. This accounting rule understates true underwriting profits and exaggerates investment returns. To estimate the size of this bias, I calculate expenses for the two major savings-type lines Fire and PA at the same expense ratios as their normal line counterparts. This procedure corrects for the accounting bias by correctly attributing costs to the bundle components, and allows a clearer picture of profitability of investment and underwriting in savings-type lines.

[4] Insurance Business Law, 1939.

[5] For a detailed description of MOF regulation of the non-life insurance industry in Japan, and its impact on anti-competitive conduct by the firms, see [40].

	Expense Ratio[6] (ER) PA		Expenses (bnY)		
	Normal	Savings-type (ST)	ST	ST at ER of normal lines	Overstated by
1984	39.5	53.8	86.2	63.3	22.9
1985	40.2	53.9	113.6	84.7	28.9
1986	41.0	59.1	135.5	94.0	41.5
1987	42.8	61.1	106.3	74.5	31.8
1988	43.0	61.9	107.6	74.7	32.8
1989	45.4	66.6	105.3	71.8	33.5
1990	47.5	69.3	103.6	71.0	32.6
1991	47.9	74.0	101.1	65.5	35.7
1992	49.7	77.5	110.6	71.0	39.7
1993	48.3	79.4	140.7	85.6	55.1
1994	48.1	80.9	134.2	79.8	54.4

	ER Fire		Expenses (bnY)		
	Normal	Savings-type (ST)	ST	ST at ER of normal lines	Overstated by
1984	40.7	62.5	79.7	51.9	27.8
1985	40.4	63.4	83.7	53.3	30.4
1986	41.0	62.3	86.6	57.0	29.6
1987	41.9	62.0	96.3	65.1	31.2
1988	41.9	60.8	108.9	75.0	33.9
1989	42.4	63.8	123.5	82.1	41.4
1990	42.9	67.5	124.9	79.4	45.5
1991	44.1	70.2	118.5	74.4	44.1
1992	45.5	70.4	117.0	75.6	41.4
1993	43.7	67.8	116.9	75.3	41.6
1994	43.4	68.3	112.8	71.7	41.1

The last column in the above tables gives the amount by which expenses in savings-type lines are overstated because they include expenses which belong to the investment part of the bundle.[7] Summing the entry in the last column in both tables yields an estimate for the total amount of this accounting asymmetry for each year. The following

[6] The **expense-ratio** divides expenses (i.e. corporate expenses for acquisition of new customers, maintenance, agency commission and money collection) by the insurance-portion of total premia. The **claims-ratio** divides claims incurred by the insurance-portion of the total premia. The sum of claims-ratio and expense-ratio is called **combined ratio** and provides a direct measure of profitability of the insurance product.

[7] Actual expenses are roughly similar between savings-type and normal line insurance, since both use the same sales channels (hence similar commission rates) and marketing techniques.

table presents this sum, and compares it to the margin estimated to be earned on the investment of the savings funds [4].

	Savings Premia (bn Y)	Margin (%)	Margin (bn Y)	Cost-Overstatement (bnY)
1984	2,939	1.34	39.4	50.7
1985	3,649	1.79	65.3	59.3
1986	5,200	1.91	99.3	51.1
1987	7,045	1.55	109.2	63.0
1988	8,763	1.82	159.5	66.7
1989	10,555	2.12	223.8	74.9
1990	12,008	1.89	226.9	78.1
1991	12,629	1.43	180.6	79.8
1992	12,836	1.71	219.5	81.1
1993	13,101	1.2	157.2	96.7
1994	13,215	0.84	111	95.5

Investment profitability on the savings-type bundle is widely overstated, and in reality these insurance policies are very profitable. This higher profitability, a result of the better claim-ratio, is masked by the cross-subsidization implicit in the accounting asymmetry.[8]

4. Why Are Savings-Type Products So Successful ?

This paper attempts to explain the success of the savings-type products. Between 1977 and 1989, the percentage of financial assets in Japan invested in saving deposits fell from 49% to 41.5% while insurance rose from 12.2% to 19%.[9] Part of this shift in market share from banks to insurance companies is attributable to the attractive rates offered on saving-type products in the non-life insurance sector. It is surprising that rates of return on savings-type policies are superior to rates on competing products in the financial sector,[10] since casualty insurers do not possess superior investment skills. In

[8] This accounting rule per se has no real consequences, and the question arises whether the reason is the convenience of not having to disentangle cost components, or whether the understated underwriting profits offer any real benefit to the industry. Possibly, disguising the high profitability from the eye of the public facilitates maintaining rates at their high level.

[9] Source: Financial Statistics of Japan 1994, Institute of Fiscal and Monetary Policy, MOF Japan.

[10] The relevant competition comes from certificates of deposit (CD) offered by commercial banks and trust banks. A comparison of rates of return between the two products is complicated by the fact that CD-rates are adjusted much more frequently than dividends on saving-type products, and also because CD-rates strongly depend on the amount invested. Official MOF statistics show CD-rates offered by commercial banks as averages across firms, and also across amounts. This disguises that rates offered by banks to small savers are significantly less attractive than rates earned above certain threshold amounts such as

addition, regulation in the insurance industry hampers investment opportunities more than those of banks.[11] In particular the liquidity requirement is much higher in the insurance sector since the industry needs to be prepared to cover claims resulting from large natural disasters.[12]

How are non-life insurance companies able to offer higher rates than banks?[13] The cross-subsidization discussed above allows that the high underwriting profits from these products are used to offer higher rates than banks. The real benefit for the industry comes not from investing the savings funds, but from the insurance portion of the bundle.

A further central question concerns the use of the bundling arrangement. If investment of the savings funds is not attractive to the companies, why is the bundle offered? Why does mixed bundling occur - i.e., why are insurance contracts offered to cover the same risks, with or without savings contract included? And why is the claims-ratio of savings-type products so much lower than that of pure insurance policies?

This paper argues that savings-type bundling is a self-selection mechanism designed to separate different risk groups. Risk differences result from differences in income across consumers. Income and risk are negatively correlated because safety is a normal good,

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$10,000 , $20,000 , or $50,000. Even so, official MOF statistics from the Institute of Fiscal and Monetary Policy 'Financial Statistics of Japan' show that rates on time deposits of at least two years until maturity during the calendar year 1992 were 5.5% until January 20 of that year, then 5% until April 20, 4.4% until June 22 and 4.07% from August 17. This compares to guaranteed rates of return on saving-type products of 5% for five year policies and 4.5% for three year policies between December 1989 and January 1994. In addition, a discretionary dividend further boosts the return on saving-type products, but this amount varies across firms and products and is adjusted almost weekly. These rates are paid even on small savings policies.

[11] The Insurance Business Law authorizes MOF to supervise investment activities of the industry through the so-called Enforcement Regulations. In the latter, permissible investment objects are specified, as well as limits on the percentage of assets of a company invested in those categories. In addition, in order to obtain a license to write insurance in Japan, each company has to provide a "Statement Showing the Methods of Utilizing Assets", also called "Investment Plan", which is subject to approval by MOF. This plan can modify the Enforcement Regulations, and provides a flexible tool for MOF to control actual investments.

[12] Around 15-20% of industry assets are invested in cash and positions of comparable liquidity.

[13] Industry sources seem at a loss when asked for an explanation of the successful development of the savings-type products. The most frequently heard suggestion goes as far as invoking customer irrationality. It is claimed that the Japanese consumer considers an insurance contract a waste of money if no claim results of it [the Insurance Council Report, January 1963, states that "if building endowment insurance and a fire mutual insurance offer refunds to policyholders upon accident-free expiration of policy period, it would better suit sentiments of a certain group of fire insurance policyholders"[36], and a consumer survey conducted by the Marine and Fire Insurance Association of Japan in April 1986 states that "the most prevailing reason why they (consumers) chose savings-type insurance is 'because buying policies with no refund upon expiration is a waste of money' (44.6 % of respondents)".]

and by spending money on safer products and protective equipment a consumer reduces the likelihood of an accident. Low risk consumers are induced to buy the bundle product through an implicitly lower insurance premium. Savings-type customers face implicitly lower insurance premium rates, because they are receiving a cross-subsidy in form of high return on the savings portion of the bundle. Higher risk consumers find it too expensive to buy the bundle because their savings are insufficient, and borrowing is costly. In effect the insurance product is bundled with a savings contract, the reservation price of which is negatively correlated with a consumer's claim likelihood. Commodity bundling allows insurance companies to overcome the market failure resulting from asymmetric information, and to offer cheaper insurance contracts to consumers with a lower expected claim value. Their lower reservation price for insurance had priced those better risk consumers out of the insurance market as in the classical lemons problem [2].

II Tying/Bundling Literature

Elsewhere I presented a concise overview of the literature on commodity bundling [39]. Here I reexamine existing theories in the light of how well they are able to explain bundling in the savings-type insurance case. Throughout the discussion I will refer to tie-in sales as the requirement of purchasing another good from the same seller as the tying good. The ratio in which the two goods are consumed depends on the tastes of the buyer. Commodity bundling is different from tie-in sales in that the quantity of the tied good is in fixed proportion to that of the tying good. The consumer can decide how many of the bundles to purchase, but is not free to consume the goods in a ratio different from the ratio in the bundle.

Efficiency explanations have been put forward in cases of tying rather than bundling. This already suggests that the additional restriction of fixing the proportion of the two goods in the bundle requires a different explanation. Efficiency arguments are threefold. First, **cost savings** can result from joint production (economies of scope), distribution, and lower search costs in consumption. There are reasons to expect bundled sales of insurance and savings contracts to entail cost savings in production and distribution. The start-up costs of approaching a potential new customer and getting to talk to her, and developing trust through an ongoing business relationship, as well as head office functions such as maintaining the customer data bases are examples of cost components where such savings should occur. Industry insiders agree, however, that the agency network and the commission-based compensation system used by insurance firms is a much costlier sales channel for savings contracts than the network of branches used by banks. Moreover, it is clear that insurance companies are more constrained than banks in their investment activities, both by regulation and through the need to maintain higher levels of liquidity to provide for catastrophe losses, resulting in lower rates of return on their investments. These disadvantages tend to offset whatever cost savings there are. Search costs for consumers are very likely small for the kind of products bundled here, because both insurance policies and deposit savings contracts are standardized and rates are homogeneous. Hence, it seems that cost savings can not explain the appeal of the savings-type bundle.

Second, tying can **signal information** to the buyer, such as in cases of experience goods where product quality is unknown to consumers at the time of purchase. This is not applicable here, since the quality of the purchase depends only on the company delivering on the promise to cover a claim and disburse the savings plus interest. Even though there is no deposit insurance in Japan, the probability of savers losing their deposits due to insolvency is virtually zero because of an implicit MOF guarantee. Although there are large differences in the solvency margin ratio among non-life insurance companies, the balance sheets of all companies are so strong that default is certainly not an issue.[14]

Third, the **transfer of risk** to a stage more efficient in bearing it can be a rationale for tying. In addition to dealing strictly with tying only, this idea is limited to vertical relationships. There is no obvious reason why insurance companies should be better bearers of deposit risks than commercial banks. On the contrary, the relatively infrequent adjustments in guaranteed rates of return on savings-type products, causing variability in

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[14]The solvency margin is a risk-weighted assessment of capital and serves to evaluate the financial soundness of the insurance company. For a description of the details of this statistic, see Credit Suisse, 1993, and for the solvency margins of individual companies based on Fiscal Year 1992 results, see Barclays de Zoete Wedd Research, 1994. The lowest ratio of all companies is obtained for Fuji, but this result is still described as "more than adequate", and that for the second lowest, Dai-Tokyo, as "more than satisfactory".

the investment margin, suggests that insurance companies are not very efficient in dealing with such risks.

Market power theories form another strand in the literature on commodity bundling. Telser [33] formalizes the long-standing intuition that bundling can act as a **metering** device identifying high intensity users and charging them more than low intensity users. This theory does not explain savings-type bundling since it requires complementarity in the use of the two bundled goods. Savings and insurance are if at all related, rather substitutes than complements. Furthermore metering is a theory of tying and has little applicability to (mixed) bundling.

The **leverage** theory claims that a firm with market power in the tying good market can affect rivals' behavior in the tied market. Through bundling a firm can influence the entry and exit decision of rivals in the tied good market (Whinston [41]), or the level of the strategic variable chosen by rivals (Carbajo et al [10]). Both models require imperfect competition in the tied market. Insurance companies are very small players in the fiercely competitive deposit market, and the cross-subsidization discussed above demonstrates that the investment margin is not the incentive to bundle. Moreover, these theories cannot explain the difference in claim ratio between savings-type and normal lines of insurance. Hence what happens in the market for savings does not appear to be the driving force behind savings-type bundling.

A better explanation for saving-type bundling is provided by an alternative interpretation of the leverage theory, proposed by Burstein [8,9] and Kaplov [22]. These authors view commodity bundling as means to extract the profit potential inherent in the tying market more fully, rather than the creation of market power in the tied market. In the case of savings-type bundling firms are unable to extract fully the profit potential in the insurance market because policies cannot be priced according to the exact willingness to pay of each individual consumer. This could be the result of asymmetric information, or a restriction on the set of variables a policy can be contingent on. Efficient price discrimination is achieved by offering a bundle of products such that the reservation price for the bundle is correlated with the variable affecting claim likelihood. Recent contributions (Schmalensee [30], McAfee et al [26]) broaden the applicability of this theory by showing that the incentive to bundle does not rest on negatively correlated reservation prices for the bundle components in the population of consumers. Indeed it would be difficult to argue that the reservation prices for savings and insurance contracts are negatively correlated, in particular since the bundle components can be purchased separately.

However, these papers do not quite seem to explain savings-type bundling. Since the reservation prices for the bundle are always less dispersed than those for the individual components alone, Schmalensee [30] argues that it is the lower dispersion which allows firms to extract more surplus with the bundle. In the savings-type bundle case insurance companies are legally barred from selling savings contracts separately, and the market level of returns on savings is very competitive. Hence, the bundle price has to be set low to induce consumers to buy it. The firms are not able to make the alternative option of buying the components of the bundle separately less attractive by lowering CD rates. This constraint counteracts the effect of less dispersion of reservation prices for the bundle.

Key to understanding the profitability of bundling is the fact that claim ratios for savings-type products are significantly lower than for normal lines. Effectively the companies are selling the same product to a different group of consumers (who self-select into savings-type products) at a different price (the premium rate implicit in the bundle is lower than for normal lines). Bundling does not lower the dispersion of reservation prices in the population of consumers, but offers a solution to the problem of hidden information with respect to claim likelihood.

III. A Moral Hazard Model

The striking difference in claim ratios between saving-type products and normal insurance lines can be theoretically explained by either moral hazard (saving-type buyers are more careful) or adverse selection (they belong to a better risk class). This section presents a moral hazard model, based on the assumption that claim likelihood is inversely related to the costly exercise of prudence by the policy holder. Prudence is unobservable (or observable but not verifiable), so that contracts contingent on the level of prudence are not feasible. The cost of prudence stems from the inconvenience of being careful.

In this model, the saving-type buyer is induced to be prudent in the following manner. Since part or all of the savings portion is lost in a total claim case, this amount can be subtracted from the insurance payment. Like a deductible, this amounts to incomplete coverage, since the net payment to the insured is less than for normal lines. Facing incomplete coverage, savings-type customers will then find it optimal to lower the probability of a loss by being more careful.

Let consumers have identical tastes $U = U(Y, S)$, where Y is monetary income and S ('suffering') represents the non-monetary dimension of a loss, taking on the value one in the bad state of nature and zero in the good state. If consumers decide to purchase insurance coverage available at premium p they will receive K in the claim case to cover the monetary loss L. The probability of an accident is given by $p = (1 - \mathrm{q}_i)$ where $\mathrm{q}_i \in [0,1]$ is the (normalized) level of self protection of consumer i. Disutility of self-protection is measured by $C_i(\mathrm{q})$ which is increasing, convex and $C_i(0) = C_i'(0) = 0$.

Consumers can choose between normal and saving-type insurance.[15] The savings portion of the latter is only partially refunded in a claim case, and therefore the net insurance payment to saving-type customers in a claim case is less than K, say $K - \Delta$, where $\Delta \in (0, K)$ is the part of savings lost in a claim case.[16] Consumers first decide whether to buy insurance, and which type. Once that decision is taken, the optimal level of self-protection is chosen, and consumers face the revelation of the state of nature under the so determined odds. The optimal level of self-protection for each consumer, as a function of the insurance decision, is determined by

[15] Without loss of generality I am ignoring here those consumers who prefer to go without insurance.

[16] In a claim case, the insurance contract automatically lapses, and the savings portion of the premium is not returned to the policy holder. If the claim occurs after the tenth year of the insurance contract, the insured receives the dividend and return therefrom related to the first ten years back, but not the savings portion itself. In case the whole savings portion had been paid in a lump-sum up front, the part belonging to the period after the claim occurred is returned to the policy holder. Interestingly the savings portion of those lapsed claim case policies is not used to cover part of those claims, but is allocated to the maturity refund of other policy holders. Those who suffer a claim thus end up subsidizing the dividends which the luckier policy holders receive on their savings. Ex ante, the expected return of an average policy holder are therefore not lowered by the fact that the savings portion is lost in a total claim case.

$$\max_{\mathrm{q}_i}\left\{p\cdot U\left(Y-\mathrm{p}-L+K^j,1\right)+\left(1-p\right)\cdot U\left(Y-\mathrm{p},0\right)-C_i\left(\mathrm{q}\right)\right\}$$
$$=\max_{\mathrm{q}_i}\left\{\left(1-\mathrm{q}_i\right)\cdot U\left(Y-\mathrm{p}-L+K^j,1\right)+\mathrm{q}_i\cdot U\left(Y-\mathrm{p},0\right)-C_i\left(\mathrm{q}\right)\right\}$$
$$where\quad K^j=\begin{cases}K & \text{if normal type}\\ (K-\Delta) & \text{if saving - type}\end{cases}$$

The first order condition is

$$-U\left(Y-\mathrm{p}-L+K^j,1\right)+U\left(Y-\mathrm{p},0\right)-C_i'\left(\mathrm{q}\right)=0$$
$$U\left(Y-\mathrm{p},0\right)-U\left(Y-\mathrm{p}-L+K^j,1\right)=C_i'\left(\mathrm{q}\right)$$

Letting the superscripts ST and NO denote savings-type and normal line customer, respectively, $\mathrm{q}_i^{ST}>\mathrm{q}_i^{NO}$ since for saving-type customers monetary income is not equal in both states, and it is optimal for them to be more careful than normal type customers whose monetary loss is fully covered. Hence savings-type customers have lower accident probability and the model implies lower claim-ratios in saving-type insurance lines.

The fact that both normal and savings-type insurance policies are sold suggests consumer heterogeneity. This heterogeneity is incorporated in the model by letting consumers differ in their cost of prudence. It remains true that for each individual consumer prudence is higher under a saving-type insurance policy than under a normal type, but the choice between the two types is determined by a comparison of expected utility (EU) levels. Consumer i will buy normal type insurance if $EU(NO)>EU(ST)$ or

$$\left(1-\mathrm{q}_i^{NO}\right)\cdot U\left(Y-\mathrm{p}-L+K^{NO},1\right)+\mathrm{q}_i^{NO}\cdot U\left(Y-\mathrm{p},0\right)-C_i\left(\mathrm{q}_i^{NO}\right)>\left(1-\mathrm{q}_i^{ST}\right)\cdot U\left(Y-\mathrm{p}-L+K^{ST},1\right)+\mathrm{q}_i^{ST}\cdot U\left(Y-\mathrm{p},0\right)-C_i\left(\mathrm{q}_i^{ST}\right)$$

where $\mathrm{q}_i^{No},\mathrm{q}_i^{ST}$ are the optimal levels of self-protection of consumer i under normal and savings-type insurance, respectively.

Let $C_i(\mathrm{q})>C_l(\mathrm{q}),\ \forall\, i>l$. By implication $\dfrac{d\mathrm{q}_i^{No,ST}}{di}<0$. This alone is not a sufficient condition for efficient self-selection of consumers into the two types to be possible, since higher levels of self-protection under the saving-type coverage tend to counteract the lower utility from incomplete coverage, and it is not clear that higher cost consumers will necessarily prefer normal type insurance. For proper self-selection of customers into insurance types according to their differing costs of self-protection, a $\overline{C_i}$

is required such that all consumers with higher costs are better off buying normal type, and all consumers with lower costs will prefer saving-type products. A necessary condition for such a $\overline{C_i}$ to exist is given by

$U_i(ST) = U_i(NO) \Rightarrow U_l(ST) > U_l(NO), \forall i, \forall l < i$. In words, if consumer i is indifferent, then any consumer with lower costs of prudence must strictly prefer savings-type over normal insurance. A sufficient condition for this is (written in the obvious shorthand notation):

$$i) \quad U_l(NO) < U_i(NO)$$

$$\left(\theta_l^{NO} - \theta_i^{NO}\right) \cdot \left[U(NO,1) - U(NO,0)\right] > C_i\left(\theta_i^{NO}\right) - C_l\left(\theta_l^{NO}\right) \quad \text{and}$$

$$ii) \quad U_l(ST) > U_i(ST)$$

$$\left(\theta_l^{ST} - \theta_i^{ST}\right) \cdot \left[U(ST,1) - U(ST,0)\right] < C_i\left(\theta_i^{ST}\right) - C_l\left(\theta_l^{ST}\right)$$

Whether i) and ii) hold depends on the cost of self-protection (determining the optimal level of prudence for each type, in each situation). Type l will strictly prefer savings-type insurance if the cost of self-protection is sufficiently low. This condition is sufficient but not necessary for the separation of consumers into the insurance types according to their cost of prudence. Even if perfect separation is not feasible, imperfect separation (where some consumers with higher costs choose savings-type while lower costs choose normal type, over some range of costs) may be possible. While the direct profit incentive of companies is not explicitly characterized in this section, it is clear that profits may be higher if the companies can use incentive schemes which sort customers into groups according to their claim probability.

It is important to understand why some consumers choose not to buy the savings-type policy. The attractive conditions of the bundle are insufficient to compensate them for their high disutility of exercising care. Self-selection will work better if all consumers can afford both types, so that their choice is only influenced by their personal cost of prudence. Binding income constraints force consumers to stick with normal policies regardless of their cost of prudence.

On theoretical grounds, this model of moral hazard with consumer heterogeneity is plausible. Both elements are common in the insurance literature. Therefore the evidence examined in section V must decide on the model's merit.

IV. A Self-Selection Model

1. The Demand For Insurance

Consumers (indexed i=1...n, with n large) live for two periods (lifetime). In the first period, after the personal income Y_i is received, the insurance purchase and savings decisions are made, and the state of nature is revealed. In the second period all individuals receive the same fixed amount of income $\overline{Y}$ **(**in addition to the savings from period one)**,** which can be interpreted as public retirement payment. In the bad state, the individual suffers a loss L, and the indivisible insurance pays out L to policy-holders. There is no discounting. Before insurance, income in period one is Y_i in the good state and (Y_i-L) in the bad state (known to consumers). Outside opportunities in the financial sector are represented by a competitive banking industry, offering the market rate of return for deposits.

Consumers differ only in their normalized income $Y_i \in [0,1]$. The probability q_i of the bad state occurring depends negatively on Y_i :

$$q_i = (1 - Y_i),\ q_i \in [0,1]$$

Y_i is distributed in the population of consumers according to some continuous distribution function which is known to firms. Personal income affects q_i because preventive safety measures are normal goods.[17] Wealthy individuals therefore invest more in protective equipment.[18] Differing levels of protection by insurance buyers are caused by the underlying differences in income rather than by prudent behavior.

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[17] Could it be that safety is an inferior good, or that a customer substitutes insurance for safety? The argument would be that higher wealth allows for more self-insurance. Either self-insurance, or holding an insurance policy, could decrease spending on safety, if insurance and safety are substitutes. The insured/rich would spend less on safety because its benefit is less than without either form of insurance. I would like to argue that the degree of substitutability between insurance and safety is small (at least in fire and personal accident). Insurance can only promise to restore the material level of wealth after the bad state of nature has occurred. However, even full insurance rarely wholly indemnifies. Depreciation rates for durable goods are higher, and damage assessment often less than the insured's subjective corresponding values are. This may reflect imperfections in second hand markets, or could be the result of the insurers' incentive to keep damage payments small ex post. Furthermore there are significant non-monetary dimensions of loss, such as body injuries. Therefore I assume that safety is a normal good.

[18] For instance, Mercedes Benz boasts that its passenger cells remain undeformed at crashes against a concrete wall up to a speed of 60 km (around 38 mph), protecting passengers against injuries. Other examples are safer sports equipment, modern and less fire-prone private homes, high-quality and

The instantaneous felicity function U(Y,S) of all individuals is an increasing and concave function of income, and a negative function of S which measures the non-monetary dimension of a claim case. To illustrate the consumers' purchase decision for insurance coverage I will use the constant absolute risk aversion (CARA) utility function for income, $U(Y,S) = -Se^{-\lambda Y}$ which has the virtue of excluding income effects on risk aversion. S takes on the value $\overline{S}>1$ in the loss case, $\underline{S}=1$ otherwise. Consumer i maximizes von Neumann-Morgenstern expected utility, and will purchase insurance available for premium π if the following holds:

$$U\left(Y_i - \pi, ES\right) \geq p_i \cdot U\left(Y_i - L, \overline{S}\right) + \left(1 - p_i\right) \cdot U\left(Y_i, \underline{S}\right),\ \textit{where}\ \mathrm{ES} = \mathrm{p_i} \cdot \overline{S} + \left(1 - p_i\right)$$

The reservation premium π_i^* of consumer i is obtained from the following equality, expressing indifference between buying insurance and not buying:

$$ES \cdot e^{-\lambda\left(Y_i - \pi_i^*\right)} = \left(1 - Y_i\right) \cdot \overline{S} \cdot e^{-\lambda\left(Y_i - L\right)} + Y_i \cdot \underline{S} \cdot e^{-\lambda Y_i}$$

$$\log ES - \lambda\left(Y_i - \pi_i^*\right) = \log\left[\left(1 - Y_i\right) \cdot \overline{S} \cdot e^{-\lambda\left(Y_i - L\right)} + Y_i \cdot e^{-\lambda Y_i}\right]$$

$$\pi_i^* = \frac{1}{\lambda} \cdot \left\{\log\left[\left(1 - Y_i\right) \cdot \overline{S} \cdot e^{-\lambda\left(Y_i - L\right)} + Y_i \cdot e^{-\lambda Y_i}\right] - \log ES\right\} + Y_i$$

π_i^* is bounded above by L. Y_i affects the reservation premium in two ways. As income rises the consumer purchases more safety and the reservation premium for insurance falls. Income also affects utility through the non-monetary dimension of a loss. Higher income lowers the expected suffering. Therefore the reservation premium of consumer i falls as income rises.

The savings behavior of consumers is modeled in the following simple manner. If $Y_i > \overline{Y}$ in period one the individual saves a fixed proportion $\alpha \in (0,1)$ of the difference for consumption in the next period, otherwise savings are zero:

$$\sigma_i = \begin{cases} \alpha \cdot \left(Y_i - \overline{Y}\right) & \text{if } Y_i > \overline{Y} \\ 0 & \text{otherwise} \end{cases}$$

maintenance of fire alarm systems, etc. And wealthier people tend to live in safer (suburban) residential areas than poor people who live in dangerous inner city residences close to busy streets.

A consumer can only chose a savings-type product if her savings are sufficient to afford the savings premium, i.e. if $s_i \geq \bar{s}$, since loans are either not available or too expensive to be used as savings portion. Some consumers, whose savings are just below the threshold needed for the savings-type bundle will find it optimal to save just a little more. Formally, the marginal benefit of raising savings above $\bar{s}$ is $\left\{\left[\min\left(p_{NO}, p_i^*\right)\right] - p_{ST}\right\}$, where p_{NO} is the nominal insurance premium on normal type policies and p_{ST} denotes the implicit lower insurance premium rate on savings-type policies. Marginal consumers will then save $g_i\left(Y_i - \bar{Y}\right)$, $g_i > a$ and buy the savings-type product. Hence there is an income level $\tilde{Y} > \bar{Y}$ such that for all $Y_i \geq \tilde{Y}$ consumer i has sufficient savings to buy the savings-type product.

Consumers have the option of buying either insurance (Ins) or savings contract (CD) alone, or the bundle (ST), or neither and spend all income on consumption. The following inequalities determine a consumer's choice:

$$i)\quad \left.\begin{matrix} p_i^* > p_{NO} \\ Y_i < \bar{Y} \end{matrix}\right\}\ \text{Ins} \qquad\qquad ii)\quad \left.\begin{matrix} p_i^* > p_{NO} \\ \bar{Y} < Y_i < \tilde{Y} \end{matrix}\right\}\ \text{Ins}, CD$$

$$iii)\quad \left.\begin{matrix} p_i^* < p_{NO} \\ Y_i < \bar{Y} \end{matrix}\right\}\ \textit{nothing} \qquad\qquad \text{i}v)\quad \left.\begin{matrix} p_{NO} > p_i^* > p_{ST} \\ \bar{Y} < Y_i < \tilde{Y} \end{matrix}\right\}\ CD$$

$$v)\quad \left.\begin{matrix} p_i^* > p_{ST} \\ Y_i > \tilde{Y} \end{matrix}\right\}\ \text{ST}, CD \qquad\qquad vi)\quad \left.\begin{matrix} p_i^* < p_{ST} \\ Y_i > \bar{Y} \end{matrix}\right\}\ \text{CD}$$

The resulting sorting of consumers into the different options is illustrated in the following diagrams, which graph the income of consumers against their reservation premium.

In a), some consumers who would have bought normal line insurance even at the higher p_{NO} switch into buying the savings-type product. These consumers lie on the reservation premium curve between points A and B. The picture illustrates the relative magnitudes of the switching effect (between A and B) and the market expansion effect (between B and F). In diagram b), no switches occur, and the only effect of offering the savings-type bundle is to attract new consumers between the points C and D into the insurance market who would not have bought insurance at the higher p_{NO}.

2. The Supply Of Insurance

a. Structure

Insurance companies are offering perfectly homogeneous products, are identical in the safety of their operations and undifferentiated in their distribution systems.[19] MOF protects the oligopoly from entry, so that high underwriting profits can persist.[20] Under these circumstances, competition between firms is sufficiently muted to analyze the industry as a monopoly. Insurance companies achieve a lower rate of return on their investments (r_{INS}) than banks, because they are hampered by regulatory restrictions on investment possibilities.

Policies contingent on the personal income of a customer are not feasible, either because income is only partially observable (in particular wealth), or because society does not allow it for egalitarian reasons. By regulation, companies have the exclusive right to write insurance policies, but can not issue certificates of deposits, unless bundled with an insurance policy.

The companies maximize in two stages. In the first stage, corresponding to the period before the introduction of savings-type products, the premium level for normal insurance policies is myopically set at the monopoly level. In the second stage the savings-type product is designed and premium rates for savings-type insurance as well as the dividends paid on the savings portion are determined (subject to approval by MOF). In the present simplified setting, there is only one coverage, offering full insurance in the

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[19] A brief justification of these categorical assumptions is in order. Products are homogeneous because insurance policies are standardized and subject to licensing by MOF. Insurance rates are fixed across the industry by the rate setting associations subject to MOF-approval. For the safety of operations, see the extremely comfortable levels of solvency ratios calculated in [4]. With respect to distribution systems, the homogeneity assumption is made for analytic convenience.

loss case, and therefore the only product design decision is the amount of savings portion bundled with the insurance policy. At the end of stage two, demand is realized, and the state of nature is revealed and profits determined.

b. Stage One

The industry is unaware of the future introduction of savings-type products, and sets the premium level collusively so as to maximize current profits:

$$\max_{p} f_1 = (p - C) \cdot Q \qquad (1)$$

where

f_1 = expected profit at stage one,

p = premium rate of the normal insurance policy,

C = average expected cost per insurance policy, the sum of all expenses and the expected value of claims, and

Q = quantity of policies sold.

The first order condition is the standard monopoly problem:

$$\frac{df}{dp} = Q + p \cdot \frac{dQ}{dp} - C \cdot \frac{dQ}{dp} - Q \cdot \frac{dC}{dp} = 0$$

$$Q + p \cdot \frac{dQ}{dp} = C \cdot \frac{dQ}{dp} + Q \cdot \frac{dC}{dp} \qquad (2)$$

This equation implicitly defines the profit-maximizing premium level which will in the following be referred to as p. In equation (2) expected cost per insurance policy depends on the premium charged because average expected claims depend on the insurance purchase decision of each individual, and claim likelihood varies across insurance customers.

c. Stage Two

The nominal risk premium is identical for both types of products. Consumers are offered savings contracts at the competitive CD-rate in the banking sector, which is lower than the rate of return on the savings-type product. This leads to a divergence of the

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[20]For a detailed analysis of collusive behavior in the insurance industry in Japan, and the role MOF plays in maintaining the cartel, see Wallner [40].

nominal risk premium p in the bundle (the same as for normal lines, determined in stage one) and the implicit insurance premium p_{ST} in savings-type insurance ($p_{ST} < p$ due to the implicit cross-subsidy from the investment part of the bundle).

Risk premia cannot be invested since the insurance company needs to hold liquid funds to disburse the claims resulting from these premia as they occur. The industry problem then is to choose the savings portion and the dividend level so as to maximize profits:

$$\max_{\bar{s},d} f_2 = (p - C_{ST}) \cdot Q_{ST} + (p - C_{NO}) \cdot Q_{NO} + (r_{INS} - d) \cdot \bar{s} \cdot Q_{ST} \qquad (3)$$

where

f_2 = profit at stage 2,

p = the fixed net (insurance) premium per policy,

C_{ST} = the total cost of a savings-type policy, the sum of all expenses and the expected value of claims,

C_{NO} = the total cost of a normal policy, the sum of all expenses and the expected value of claims,

Q_{ST}, Q_{NO} = number of savings-type and normal policies sold, respectively,

r_{INS} = the net rate of return which insurance companies achieve on their investments,

d = the dividend rate paid out to policy holders on their savings portions, and

$\bar{s}$ = the savings portion of the total premium per policy, in Yen.

Q_{ST}, Q_{NO}, C_{ST} and C_{NO} are functions of d and $\bar{s}$. The first order conditions are:

$$\frac{df_2}{d\bar{s}} = p \cdot \left(\frac{dQ_{ST}}{d\bar{s}} + \frac{dQ_{NO}}{d\bar{s}} \right) - C_{ST} \cdot \frac{dQ_{ST}}{d\bar{s}} - C_{NO} \cdot \frac{dQ_{NO}}{d\bar{s}} - Q_{ST} \cdot \frac{dC_{ST}}{d\bar{s}} - Q_{NO} \cdot \frac{dC_{NO}}{d\bar{s}} + \left(r_{INS} - d\right) \cdot Q_{ST} + \left(r_{INS} - d\right) \cdot \bar{s} \cdot \frac{dQ_{ST}}{d\bar{s}} = 0 \qquad (4)$$

where

(i) $p \cdot \left(\frac{dQ_{ST}}{d\bar{s}} + \frac{dQ_{NO}}{d\bar{s}} \right)$ is the marginal premium revenue of altering the savings portion,

(ii) $C_{ST} \cdot \frac{dQ_{ST}}{d\bar{s}} + C_{NO} \cdot \frac{dQ_{NO}}{d\bar{s}} + Q_{ST} \cdot \frac{dC_{ST}}{d\bar{s}} + Q_{NO} \cdot \frac{dC_{NO}}{d\bar{s}}$ is the marginal cost on the insurance side of doing so,

(iii) $\left(r_{INS} - \mathrm{d}\right) \cdot Q_{ST} + \left(r_{INS} - \mathrm{d}\right) \cdot \bar{s} \cdot \frac{dQ_{ST}}{d\bar{s}}$ is the net marginal effect on the savings side,

and

$$\frac{d\mathrm{f}_2}{d\mathrm{d}} = (\mathrm{p} - C_{ST}) \cdot \frac{dQ_{ST}}{d\mathrm{d}} - Q_{ST} \cdot \frac{dC_{ST}}{d\mathrm{d}} + (\mathrm{p} - C_{NO}) \cdot \frac{dQ_{NO}}{d\mathrm{d}} - Q_{NO} \cdot \frac{dC_{NO}}{d\mathrm{d}}$$
$$- \bar{s} \cdot \mathrm{Q}_{\mathrm{ST}} + (r_{INS} - \mathrm{d}) \cdot \bar{s} \cdot \frac{dQ_{ST}}{d\mathrm{d}} = 0 \qquad (5)$$

where

(iv) $\mathrm{p} \cdot \left(\frac{dQ_{ST}}{d\mathrm{d}} + \frac{dQ_{NO}}{d\mathrm{d}} \right)$ is the marginal insurance premium revenue,

(v) $C_{ST} \cdot \frac{dQ_{ST}}{d\mathrm{d}} + Q_{ST} \cdot \frac{dC_{ST}}{d\mathrm{d}} + C_{NO} \cdot \frac{dQ_{NO}}{d\mathrm{d}} + Q_{NO} \cdot \frac{dC_{NO}}{d\mathrm{d}}$ is the marginal claim cost, and

(vi) $-\bar{s} \cdot Q_{ST} + (r_{INS} - \mathrm{d}) \cdot \bar{s} \cdot \frac{dQ_{ST}}{d\mathrm{d}}$ is the net marginal investment return.

d. Interpretation Of The First-Order Conditions

To interpret these equations, I refer again to diagrams a) and b). Equation (4) can give rise to two different cases. The first case is shown in diagram b). The line $\tilde{Y}$ intersects the reservation premium curve to the right of the income level at which the reservation premium drops below p_{NO} (point E), so that there is a discrete section on the reservation premium curve containing consumers who do not purchase either product. In this situation, Q_{NO} and C_{NO} are not affected by changes in the size of the savings portion. Then term (i) is larger in absolute value than (ii), and a sufficient condition for $\left.\frac{d\mathrm{f}_2}{d\bar{s}}\right|_{\tilde{Y} > Y^E} < 0$ is that (iii) is negative. The latter happens if

$Q_{ST} > \bar{s} \cdot \frac{dQ_{ST}}{d\bar{s}}$, i.e. $1 > \frac{\bar{s}}{Q_{ST}} \cdot \frac{dQ_{ST}}{d\bar{s}} = \mathrm{e}_{Q_{ST},\bar{s}}$. In words, as long as the elasticity of Q_{ST} with respect to $\bar{s}$, $\mathrm{e}_{Q_{ST},\bar{s}}$, is less than unity or (by continuity) not too elastic, profits will rise if the savings portion in the bundle is lowered. The incentive to decrease $\bar{s}$ persists as long as the line $\tilde{Y}$ intersects the reservation premium curve to the right of point E. The other case is shown in diagram a). $\tilde{Y}$ intersects the reservation premium curve to the left of point E and there are some consumers (between A and B) who would have bought normal type insurance but switch to the savings-type. In this case the marginal revenue and marginal cost terms (i and ii) cancel each other (since the nominal insurance premium and the expected claim value of the switching consumers is unaffected by the switch) , and the sign of the effect of a change in $\bar{s}$ on profits depends on the sign of term iii). If $e_{Q_{ST},\bar{s}}=1$ is to the left of point E, then $\tilde{Y}$ will be optimally set at the point of unitary elasticity.

$e_{Q_{ST},\bar{s}}$ depends on the distribution of income among the population of consumers and there is nothing a priori we can say where the point of unitary elasticity falls relative to E. However, in the following I will assume that everywhere to the right of E, $e_{Q_{ST},\bar{s}}<1$. This assumption, while arbitrary, is very useful in the following analysis. Diagram b) is then strictly excluded, and all the analysis will relate to the case shown in a). The convenience of this assumption derives from the fact that it is a sufficient (but not necessary) condition for the use of equation (2) in the analysis.

Turning next to equation (5), in situation a) the marginal revenue term (iv) can be rewritten using

$$\frac{dQ}{dp}\cdot\frac{dp}{dd}=\frac{dQ_{ST}}{dd}+\frac{dQ_{NO}}{dd} \qquad (6)$$

as

$$p\cdot\frac{dQ}{dp}\cdot\frac{dp}{dd}=e_D\cdot Q\cdot b \qquad (7)$$

where

e_D = the elasticity of demand for insurance, and

$b=\frac{dp}{dd}$ is a constant (at any given level of p) measuring how the implicit savings-type premium varies with d.

Term (v) in equation (5) is the marginal effect on insurance costs as a change in d attracts consumers with different claim probabilities to buy the product. Consider the maximum possible bundle price, i.e. p plus the rate of return which banks pay their customers on deposits, r_{CD} (the bundle can obviously not be priced higher, since then consumers could purchase the components separately at a lower combined price). The effect of marginally raising δ above that level is to shift the line π_{ST} parallel down from π_{NO}. This has the same effect on total expected claims as if π had been lowered in stage one. Therefore (v) can be rewritten using (2) as

$$\left(Q+\pi\cdot\frac{dQ}{d\pi}\right)\cdot\frac{d\pi}{d\delta}=Q\cdot\left(1+\varepsilon_D\right)\cdot\beta \tag{8}$$

and the sum of (iv) and (v) becomes

$$\varepsilon_D\cdot Q\cdot\beta-Q\cdot\left(1+\varepsilon_D\right)\cdot\beta=-Q\cdot\beta \tag{9}$$

The interpretation of this term is as follows. In stage one π was determined by equation (2), equating marginal revenue with marginal cost. In (9) marginal revenue is larger than in (2), because the nominal premium is fixed, and the lower premium implicit in the bundle accrues only to the new savings-type customers, in form of subsidized return on their savings. The infra-marginal buyers who change from normal type to savings-type insurance cause the switching effect, which is contained in (vi). As long as there are some infra-marginal buyers who are prevented from switching to the bundle, introduction of the savings-type product may be in the interest of the industry. The profitability depends on the sign of the difference between (9) and (vi), evaluated at $Q_{ST}=0$:

$$\left.\frac{d\varphi_2}{d\delta}\right|_{\delta=r_{CD}}=-Q\cdot\frac{d\pi}{d\delta}-(r_{INS}-\delta)\cdot\bar{\sigma}\cdot\frac{dQ_{ST}}{d\delta} \tag{10}$$

It is profitable on the margin to introduce the bundle by raising δ above r_{CD} if the following condition holds:

$$\left\{-Q-\left(r_{INS}-\delta\right)\cdot\bar{\sigma}\cdot\frac{dQ_{ST}}{d\pi_{ST}}\right\}\cdot\frac{d\pi_{ST}}{d\delta}>0 \tag{11}$$

or $$Q > -(r_{INS} - \delta)\cdot\bar{\sigma}\cdot\frac{dQ_{ST}}{d\pi_{ST}}$$

(12)

Ceteris paribus, bundling is more likely to be profitable on the margin the larger the size of the market. This could explain why the savings-type products were not introduced earlier in the Japanese insurance market. Bundling is also more likely to be profitable the smaller the loss margin caused by subsidizing the investment return, the smaller the savings portion attached to the bundle (which in turn is endogenously determined in equation 4), and the smaller the switching effect.

Equation (12) may or may not be satisfied, and there is nothing we can say short of knowing the exact parameters of the problem and in particular the distribution of income in the population, as well as the consumers' utility function. If it is not profitable on the margin to introduce the savings-type bundle, is it possible that it becomes profitable beyond a certain threshold level of δ? Consider what happens in equation (5) if the firms raise δ further.

$$\left.\frac{d\pi_2}{d\delta}\right|_{\delta>>r_{INS}} = \pi\cdot\frac{dQ_{ST}}{d\delta} - C_{ST}\cdot\frac{dQ_{ST}}{d\delta} - Q_{ST}\cdot\frac{dC_{ST}}{d\delta} - \bar{\sigma}\cdot Q_{ST} + \left(r_{INS} - \delta\right)\cdot\bar{\sigma}\cdot\frac{dQ_{ST}}{d\delta} \qquad (13)$$

The components on the right-hand side of (13) can be interpreted as before as marginal revenue, expected claim cost, and investment margin. The latter includes $\bar{\sigma}\cdot Q_{ST}$, since now $Q_{ST}>>0$. Note that risk aversion implies $\pi_i^*>E_i(L)$, i.e. the expected claim for any consumer i is strictly less than that consumer's reservation premium. This in turn implies

$$\pi\cdot\frac{dQ_{ST}}{d\delta} - C_{ST}\cdot\frac{dQ_{ST}}{d\delta} - Q_{ST}\cdot\frac{dC_{ST}}{d\delta} + \left(r_{INS} - \delta\right)\cdot\bar{\sigma}\cdot\frac{dQ_{ST}}{d\delta} > 0 \qquad (14)$$

because the terms in (14) are nothing but π_{ST} minus the expected claim cost of the marginal customer ($\pi + \left(r_{INS} - \delta\right)\cdot\bar{\sigma} = \pi_{ST}$). Since for the marginal customer $\pi_{ST} = \pi_i^*$, (14) is positive. Only if (14) is larger than $\bar{\sigma}\cdot Q_{ST}$, profits rise in δ and (13) is positive.

$\bar{\sigma}\cdot Q_{ST}$ is the effect of lowering π_{ST} to all buyers of the savings-type product, not only the marginal buyer. This condition highlights the role of the size of the switching effect (lowering profits) relative to the market expansion effect (raising profits). If the switching effect is relatively large, then it is never profitable to introduce the bundle. If the switching effect is only moderately large then it may be unprofitable to introduce the bundle on the margin, but profitable beyond some threshold level of d. If the switching effect is small enough it may be profitable to introduce the bundle at the margin. The infra-marginal subsidies get larger as d rises, and more people buy the savings-type bundle. Hence even if (13) becomes positive beyond some threshold level of d, eventually it will turn negative again, setting a lower bound to the implicit insurance premium in the savings-type bundle.[21]

e. Incentive To Oversubsidize

So far, the dividend rate paid on savings portions is determined by the marginal cost and marginal benefit of subsidizing savings-type products. The marginal benefit is the market expansion effect, and the underwriting margin achieved on those new savings-type policies; the marginal costs are the subsidies to infra-marginal savings-type customers.

There are additional effects of modifying the dividend rate. First, there are benefits from obtaining large amounts of savings.[22] There are increasing returns to scale in investment management, and a company with a larger portfolio can achieve higher returns, by using more sophisticated investment techniques. One problem with this is that we need to come up with an explanation of why the firms manage their funds themselves, instead of contracting out (or equivalently, hiring outside specialists to work exclusively for them). More plausibly, a larger volume of funds makes it possible for Japanese insurance companies to find more attractive customers for their loans, or to increase the cross-share holdings in customer companies. This in turn, yields a higher

[21] I have so far assumed a perfectly competitive banking sector. For the insurance industry, this is the worst scenario. The higher the profit margin of banks in the deposit business, the more scope the insurance industry has for lowering the implicit insurance premium on savings-type products, without incurring a loss on its investments.

[22] To illustrate the magnitude of the increase of total assets held by non-life insurance companies in Japan, I present the following figures from [19] for the period of fiscal year 1975 until 1992 (in billion Yen):

Fiscal Year	75	80	82	84	86	88	90	92
Assets	3,876	7,201	8,814	10,813	15,080	20,669	26,180	27,445
Savings Type	621	1,439	2,420	3,605	6,878	10,581	13,825	14,324

volume of business which these companies allocate to the insurance company.[23] Here, financial linkages between companies function as an important marketing instrument.

Second, it is possible that the pure insurance premium itself is sensitive in the long run to the claim-ratios produced. Since self-selection implies a rise in the claim-ratio of normal lines, the companies might take this as welcome fact to lobby for higher premium rates. While this is plausible in terms of the political economy of the determination of premium rates under regulatory involvement, it may be hard to find evidence that this effect has raised premia.

If these additional effects of higher dividend rates are included in the maximization problem, dividend levels will be even higher than from the point of view of self-selection alone.

V. Evidence

How well are the two alternative theories AS and MH able to explain the evidence from the non-life insurance industry in Japan?

The Typhoon Year 1991

Both theories predict **different claim ratios** between savings-type and normal policies, which is strongly reflected in the data. Some of the year-on-year changes within a line offer indirect evidence as to the relative importance of moral hazard and adverse selection.

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[23] cf. 'Insurance Sector Report 1993: A Study of Japanese Insurance Procurement Practices within *Keiretsu* Groups', published by the American Chamber of Commerce in Japan. The report states (p. 3f): "...11 *Keiretsu* member companies account for more than 80 % of the total non-life insurance market in Japan. With respect to the purchasing practices of the eight horizontal groups and the six vertical groups studied, on average over 70 % of the non-life insurance business of these *Keiretsu* groups is given to the respective member insurance companies of the groups. Moreover, at least 92 % of the insurance business of such groups is handled by financially related insurers. ... Certain other groups...appear more open, demonstrating more complex multi-insurer relationships. In fact, however, almost all of these multi-insurer relationships can be traced to shareholdings and cross-shareholdings or other financial (such as lending and customer) relationships, in the insured companies and their groups. Of the hundreds of companies surveyed, there are almost no cases reported in which an insurer was chosen based on a competitive insurance product or service offering alone.'

	Claim-Ratio[24]			
	Fire		Personal Accident (PA)	
	Savings-type	Normal	Savings-type	Normal
1983	26.3	44.4	47.0	54.1
1984	23.7	47.4	39.1	53.0
1985	26.1	46.2	35.4	50.8
1986	25.1	39.3	32.6	46.5
1987	22.3	40.3	31.5	45.7
1988	19.2	37.0	30.9	45.3
1989	18.3	43.5	34.1	43.9
1990	21.3	45.0	30.8	44.7
1991	46.8	87.5	25.2	46.3
1992	22.2	44.2	25.3	47.8
1993	29.5	48.7	20	48.1
1994	22.7	39.5	17.5	47.9

Of particular interest is Fire in fiscal year 1991 in which Japan was hit by some particularly devastating typhoons. Clearly the damages in such large-scale nationwide disasters are not caused by individual actions. The fact that the claim ratio in savings-type fire insurance rose by 25.5 percentage points over the preceding year, whereas in normal lines it increased by 42.5, shows that there is significantly different exogenous risk probability between normal and saving-type insurance lines. While the typhoon year alone is insufficient to reject the possibility that there is also moral hazard, it demonstrates that a pure adverse selection explanation based on the lower claim probability of savings-type customers can explain bundling in those lines. This catastrophic year, unfortunate as it was for the country, provides us with evidence that at least in Fire individual claim probability is most influenced by factors other than behavior.

The Use of Deductibles

In those lines which are available in both saving-type products and normal lines traditional deductibles are not used. In car insurance, which is not available as saving-type product, deductibles are widely used for the obvious purpose of inducing drivers to be careful. Deductibles are a much simpler and more efficient tool to deal with a moral

[24]Source: Barclays de Zoete Wedd Research [4] and Insurance (1994).

hazard problem. However, in those lines which are now also available as saving-type products, deductibles were not used even before the beginning of the saving-type products. This suggests that moral hazard is not the main problem which insurance companies face in those lines.

Path Of Savings-Type Premia Over Time

The behavior of savings-type premia over time is characterized by three main stylized facts, which will be discussed in order.

<u>i. Long-Term Upward Trend In Savings-Type Premia</u>

The total premium (which includes both insurance premium and savings portion) in savings-type **PA** rose from 580.3 bn Yen in 1983 to 1,980.6 bn Yen in 1992, whereas the insurance portion thereof remained flat (from 124.1 bn Yen to 127.5 bn Yen over the same time period). Companies offer a menu of around 3-5 different bundling options, which contain the same insurance component and differ only in the savings portion attached. AS explains this as wealthier consumers getting the attractive rate of return on savings on a larger amount of savings, and therefore paying implicitly a lower insurance premium. Direct evidence to the effect that wealthier people buy more savings-type products is contained in the *1994 Family Saving Survey*, which shows that households with less than one million Yen savings spent on average 28,000 Yen on non-life insurance products, while those with 40 million and over spent 936,000 on it.[25] Over time, incomes rose in line with economic growth, and consumers bought more preventive safety. This caused claim ratios to fall which is precisely what happened in the statistics of PA. MH is less suited to explain these facts. In order to explain the fall in claim-ratio over time, MH would say that wealthier people become more prudent, or at least more inclined to select the higher savings-portion bundle among the savings-type options.[26] It

[25] The correlation coefficient between the amount of savings (i.e. the categories in the survey) and the corresponding proportion of savings held in non-life insurance policies is 0.99. A similar picture, but a slightly smaller correlation coefficient of 0.88, emerges when looking at income rather than the amount of savings held. Source: *1994 Family Savings Survey*, Statistics Bureau, Management and Coordination Agency, Japan.

[26] A falling claim ratio over time could also be the result of shrinking size of the average claim value. If this value changes over time, it almost certainly rises in line with the general price level. However with inflation in Japan being extremely moderate during the past decades, the assumption made earlier of a constant L seems reasonable.

is implausible that consumers value the difference in p_{ST} between different savings-type options more as they get richer.

Although the total savings-type **Fire** premia also grew over time, insurance premia rose along with the savings portion. As property prices and rents rise with GDP, the insured risks get larger, and wealthier consumers opt to buy larger coverage.

ii. Savings-Type Premia Move With The Business Cycle

The predictions of the two rival theories run as follows. MH implies that the ratio of savings to insurance premia remain stable, but total premia move with the business cycle, because it requires consumers not to be income constrained to be able to buy the savings-type product serving the function of a deductible. AS suggests that consumers are income constrained in their savings-type purchase decision, so that only the richer (i.e. safer) customers can afford the savings-type bundle, and therefore both the total premia and the ratio of savings to insurance premia should fluctuate in line with the business cycle. That consumers are in fact constrained by their limited wealth is suggested by the almost perfect correlation (0.99) between the amount of savings of households, and the savings held in savings-type policies.[27]

The evidence shows that in both major savings-type lines, the total premia followed the ups and downs of the business cycle, and so did the ratio of savings to insurance premia in PA, but not in Fire. As argued earlier, the likelihood of a strong moral hazard element in Fire is particularly low on theoretical grounds, and the dependence of claim value on general economic activity is manifested in the pro-cyclical nature of property values. Thus the behavior of Fire can be accounted for and is no evidence against AS.

iii. Popularity Of Savings-Type Bundle Relative To Normal Lines

AS predicts that it is profitable to offer the savings bundle if the market expansion effect is large relative to the switching effect. The development of written premia over time implies that this is empirically what happened. The high growth of the savings-type lines occurred in a time when normal lines grew moderately along some stable trend path, suggesting that the savings-type sales represent an expansion of the insurance market, rather than a mere redistribution of the existing customer pool into different categories.

[27] Source: *1994 Family Savings Survey*, Statistics Bureau, Management and Coordination Agency, Japan.

This observation not only helps discriminate between competing explanations for commodity bundling, but also presents direct evidence for the presence of adverse selection in the insurance market. MH on the other hand predicts that a large portion of consumers will switch from normal to savings lines when they are introduced, as they are attracted by the opportunity to obtain insurance at a lower premium in exchange for being more careful. Again, since switching seems to be small compared to market expansion, the evidence speaks against MH. In addition, the fact that both types of insurance contracts are sold in equilibrium indicates significant consumer heterogeneity.

Only Some Lines Offered as Savings-Type

Some insurance product lines are offered as savings-type while others are not. Can this be explained by the self-selection hypothesis? Automobile insurance is by far the largest line of insurance in Japan, with around 60% of written insurance premia. If the margin earned on the savings-portions were the main rationale for bundling, automobile insurance should be the first line to bundle savings with. Two reasons explain why there is no savings-type car insurance product. First, driving skills and frequency are major determinants of claim probability but are not necessarily correlated with personal income. Second, the choice of automobile is closely correlated with personal income, and since it is possible to differentiate insurance policies according to the characteristics of the car the company has a better way of taking income information into account than indirectly via the savings-type bundle. Hence the difference between lines offered as savings-type lines and those which are not can be explained by how personal income affects claim probability, and whether the insurance company is able to use information about income to discriminate between buyers. The fact that there is no savings-type automobile insurance product while a fire insurance savings-type exists despite the much lower moral hazard element is evidence against the MH story.

Different Payment Options

The fact that various payment options coexist is evidence that moral hazard effects from the lost savings-portion in a total-loss case are not driving the difference in claim ratios. If this sort of deductible were the reason for more care in preventing claims, it could make sense to choose the lump-sum up front payment option (with accordingly lower p_{ST}) even though the refund conditions for the portion of savings paid ahead of time are restrictive and extremely disadvantageous for the insured.[28] But then the savings-type monthly installment payment products should display a much higher claim probability in the early periods of the insurance coverage (nearly the same claim probability as normal lines) and dramatically falling claim probability towards the end of the policy, as the amount lost in a claim case gets larger and the insured is more careful. There is no evidence of such a front loading of claim incidence, and conversations with insurance industry managers suggest that claims are evenly distributed over the policy period. In 1992 a quarter of all savings-type policies used lump-sum payments. AS is consistent with this behavior. Richer people can better afford the lump-sum payment which gives them higher returns on savings (in excess of what the company earns on the prepaid savings), because they have lower claim probabilities.

Taxation

An attempt to explain the success of savings-type bundling would be incomplete without considering the possibility of tax advantages of these products. Since the tax reform of 1988 which introduced a 20% tax on general interest earned, savings-type dividends are exempt from that income tax if the duration of the policy is longer than five years, or if the amount of insurance is more than five times the maturity refund, or if the premium is payable annually, semi-annually or monthly, under certain additional conditions. The idea of this tax treatment is that if the main motive is insurance then the savings return should not be subjected to income tax. However, the importance of this tax advantage of the bundled product over unbundled sales is not reflected in the empirical facts, possibly because there are other tax breaks on income from bank deposits. Between 1986 and 1991, total insurance premia for personal accident savings-type products fell every year, hence the introduction of the tax advantage cannot explain the popularity of the savings-type products. Most savings-type policies do not exceed five years, and lump-sum payment up-front is a popular payment mode.[29] Further evidence

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[28]When a policy is terminated because a covered loss has occurred the policy holder receives a refund of the savings portion and corresponding dividend for the first ten years only if the accident happened after the tenth policy year.

[29]Goldman Sachs Japan Research [18] estimates that at least half the existing savings-type insurance contracts are single payment.

comes from the *Nationwide Survey on Non-Life Insurance*, conducted in 1992 by the Non-Life Insurance Association in Japan. Only 9.2% of the consumers surveyed considered tax considerations an important factor that made them choose the savings-type product, whereas 39.1% mentioned the maturity refund.

VI. Concluding remarks

The self-selection theory based on adverse selection is supported by the evidence, while the moral hazard explanation is at odds with some of the institutional and empirical facts of savings-type insurance in Japan.

Savings-type insurance products in Japan provide an example of how a company can overcome market failures resulting from asymmetric information between insurer and insuree. Adverse selection, where consumers with a low reservation price for insurance choose to go uninsured, is partly mitigated by the insurance company offering a menu of two insurance premium rates, where the lower rate is linked to purchase of the bundle. Self-selection results, since rich people represent better risks, and only they are able to afford the savings-type insurance policy. By partially separating the groups, the insurance company is able to charge different premia and extract surplus more efficiently. It may not be profitable for the industry to set the savings portion attached to the insurance policy in the bundle high enough to prevent some consumers with high reservation prices for insurance from choosing the savings-type product even though the firm would have preferred to charge them the higher premium of the normal lines. In a second best situation, where perfect price discrimination is not an option, this may be the best the companies can achieve.

Commodity bundling here represents a Pareto improvement, since it serves to overcome a market failure. It is not an instance of leverage, and through bundling the companies merely extract the potential profit inherent in their position of market power in the insurance market more efficiently. Total surplus in the economy goes up since some consumers who were previously priced out of the insurance market, are now able to purchase it at the lower implicit premium in the bundle. No consumers are worse off, since the option of buying normal insurance policies still exists, and new customers are better off. That bundling here is socially desirable is independent of existing market power in the tying market (insurance), though the private incentive to bundle depends on positive profits. This contrasts with the literature on bundling where market power based explanations are either socially undesirable or mere redistributions of surplus from consumers to producers, and the social evaluation depends on market power in the tying market.

The question why saving-type bundling is used in Japan but not in other countries naturally arises. An obvious candidate explanation is that in the US insurance market premium rates are unregulated. Without the high underwriting margins in Japan, the incentive to bundle disappears. Any American insurer offering such a bundle based on cross-subsidies from insurance to savings would be quickly undercut by competitors and could not sustain profits on the bundle.

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