NÚMERO 207

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ON THE AGENCY INSURERS ´ ROLE IN COMPETITION AMONG INSURANCE COMPANIES.

Abstract

This paper studies the effects on insurance premiums and consumer welfare when commissions to insurance agencies exist and are used strategically to sell insurance policies. The opportunistic behavior of agency insurers that sell the policy paying the highest commission is considered. Different market structures are considered, namely: a duopoly of insurers that compete in commissions (insurer competition), collusion among insurers with agency insurers remaining independent (horizontal collusion or insurer monopoly) and collusion between insurers and agency insurers (vertical integration or exclusive agents). We find that insurer competition and vertical integration trigger higher premiums than horizontal collusion with independent agencies. Furthermore, we argue that the optimal commission from the consumer viewpoint may be greater than the commission offered under any of the above three market structures.

Resumen

Este artículo estudia los efectos en las primas de las pólizas de seguros y en el bienestar del consumidor cuando las compañías aseguradoras ofrecen comisiones a las agencias de seguros por vender sus pólizas. Se considera que las agencias de seguros tienen un comportamiento oportunista al ofrecer las pólizas de la aseguradora que ofrece comisiones más altas. Se consideran distintas estructuras de mercado: un duopolio de aseguradoras que compiten en comisiones (competencia entre aseguradoras), colusión entre aseguradoras con agentes de seguros independientes (colusión horizontal o monopolio de asegurados) y colusión entre asegurados y agentes de seguros (integración vertical o agentes exclusivos. Encontramos que la competencia entre aseguradoras y la integración vertical llevan a mayores primas que la colusión horizontal con agencias independientes. También demostramos que la comisión óptima, desde el punto de vista del consumidor puede ser mayor que la comisión que resulta de cualquiera de las estructuras de mercado antes mencionadas.

Introduction

As is well known, an insurance system is a mechanism for reducing the adverse financial impact of random events that prevent the fulfillment of reasonable expectations. It encompasses systems that cover losses in property, human-life and liability values. The economic justification for an insurance system is that it contributes to general welfare by improving the prospect that plans will not be frustrated by random events. Such a system may also increase total production by encouraging individuals to embark on ventures where the possibility of large losses would otherwise inhibit such projects. Insurance organizations (insurers) were established to help reduce the financial consequences of unexpected events. The insurers issue contracts (policies) that promise to pay the policy-holder a defined amount equal to or less than the financial loss if the covered event occurs during the period of the policy[1].

In spite of economic advantages of insurance, not all people and businesses use such protection, particularly where it is non-compulsory[2]. Among many reasons, people do not purchase insurance due to the lack of information about the advantage of such insurance[3]. Insurers spend many resources to convince potential customers of the advantages of their products. According to Barrese and Nelson (1992), the most important way to sell insurance is through insurance agencies.[4] There are two kinds of insurance agencies: exclusive agents and independent agents. The latter represent multiple insurers and are not obligated to place business with any particular one of them. Following the insurance literature, we will refer to them as *agency insurers* or *agency*.

For insurers, dealing with exclusive or independents agents has the advantage of allowing a more rapid expansion. However, it introduces a principal/agent problem: the agents have more information than insurers about consumer preferences, and the agent's level of effort and selling costs are not known by the insurers. As the agency system expands, agencies obtain greater bargaining power over insurers, while insurers face problems in controlling the agency[5]. The typical solution to this moral hazard problem has been to pay commissions to agents on the basis of sales in order to encourage the agencies' effort. It is expected that the

[1] See Bowers et al., 1997.

[2] This is especially true in developing countries. In 1999 Mexico City government tried to implement a program of compulsory liability insurance for car drivers. This intent failed and was aborted after a few short months.

[3] Another reason may be the low-income level of potential clients.

[4] Other distribution systems include direct mail marketing, salaried-employee systems and credit cards.

[5] The degree of agency bargaining power depends on the number of agencies and insurers in the market.

greater the commission the greater the selling effort[6]. Another problem that arises in the case of independent agents is that the agencies consider their clientele to be an asset belonging to them. That is, an agent believes that he has the right to sell his client list to other agency if he so desires.[7] Thus, since independent agencies sell policies from several insurers, it is expected that agency insurers will try to sell policies from the insurer that pays them the highest commissions.[8] Thus, commissions become an important tool of competition among insurers. This opportunistic behavior arises when there are consumers that would not consider purchasing a policy unless persuaded or convinced by an insurance agent[9].

This paper studies the effects on insurance premiums and consumer welfare of commissions to agencies, when commissions are used strategically to sell insurance policies. We take into account the opportunistic behavior of agencies selling the insurance policy for which they receive the highest commission[10]. We consider different market structures, namely: a duopoly of insurers that compete in commissions (insurer competition), collusion among insurers with agents remaining independent (horizontal collusion or insurer monopoly), and collusion between insurers and agencies (vertical integration or exclusive agents).

We find that insurer competition and vertical integration trigger higher premiums than horizontal collusion with independent agencies. These results contrast with standard economic theory, which would predict that competition and vertical integration trigger lower prices than monopoly with independent agencies. The reason for such counter-intuitive results lies in the fact that on the one hand, insurer competition encourages insurers to increase commissions so that agencies promote their policies. On the other hand, since we assume that the unit revenue to insurers is regulated, vertical integration among insurer and agency allows the agency-insurer monopoly to fix a monopoly-level premium.

We also show that when an increase in the commission paid by a particular insurer triggers a more-than-proportional increase in the probability that it is offering a higher commission than its rival, the commission coming from vertical collusion is greater than the commission coming from insurer competition.

[6] See Holmstrom, 1979.

[7] This belief was formalized when an insurer attempted to solicit its policyholders directly and avoid paying renewal commissions to an agent who had purchased an agency in Yonkers, New York. The courts unheld the agent's property right to the client list. See Barrese and Nelson, 1992.

[8] There is another factor which the agency takes into account when selling a policy from a particular insurer: If insurer provides agents with equipment to assist in managing the agency, then the insurer may win increased loyalty from the agency. (See Barrese and Nelson, 1992). This policy reduces the agencies' selling costs and in our model is equivalent to paying a higher commission.

[9] Obviously, this argument applies only to non-compulsory insurance.

[10] We assume that insurance premiums have two basic components: the insurer's revenue and the commission to agencies. To isolate the commission competition effect from insurer revenue, we take the unit revenue to insurers as fixed. In Mexico the Comision Nacional de Seguros y Fianzas (the insurance market regulatory authority) regulates the unit revenue competition so that insurers are able to face insurance claims and avoid bankruptcy.

These results suggest that horizontal collusion is better from the consumer point of view since a lower premium is paid. However, lower premiums come accompanied by lower commissions, which is not necessarily good for the consumer given that it means that less consumers would purchase a policy. In other words, a higher commission increases the number of consumers that purchase a policy but each of them buys lower coverage. Thus, we argue that the optimal commission from the consumer's viewpoint may be greater than the commission under horizontal collusion, vertical collusion or insurer competition. Consumers are willing to pay higher premiums for insurance when the probability of having an accident, the degree of risk-aversion, or the average expected loss are "high enough".

There are too few papers in literature that take into account economic arguments for pricing insurance policies. Standard actuarial literature uses loading factor methods to find "optimal premiums" and does not take into account the demand for insurance. (See Bowers et al., 1997). Varian (1992) and Mas-Collel, Whinston and Green (1998) derive a market insurance demand assuming perfect competition to price insurance. The monopoly case is studied by Kliger and Levikson (1998). The oligopolistic case is analyzed by Powers and Shubik (1998) and Polborni (1998). These works take as the strategic or decision variable the premium without considering commissions to agencies. Barrese and Nelson (1992) introduce the principal-agent relationship to analyze the relative efficiency (in terms of distribution costs) of exclusive agents compared to independent agents. They found empirically that the exclusive agency system is more efficient than the independent agency system. However, they do not explain how the premiums and commissions are determined.

The paper is organized as follows: The next section presents the basic model including different market structures. The third section analyzes welfare effects and the last section presents some conclusions.

The Model

We consider three economic agents: The insurance consumer, insurers and agency insurers. We assume that the *consumer* owns a property that may be damaged or destroyed in the next accounting period. The amount of the loss is a random variable denoted by L. We assume that the distribution of L is known. Let $E(L) = \mu\overline{L}$ and $Var(L) = \sigma^2\overline{L}^2$ be the mean and the variance of L, respectively, where $\overline{L}$ is a scale parameter. Insurance organizations or *insurers* were established to help reduce financial consequences of property damage or destruction. The insurers issue contracts (policies) which promise to pay the owner of the property a defined amount equal to or less than the financial loss in case the property were damaged or destroyed during the period of the policy. Policies are distributed to consumers through *agency insurers*. Insurance is not compulsory. Thus, consumers

will purchase insurance only if they are persuaded by the agency. Thus, the agency's work consists of looking for potential clients to persuade them to purchase insurance, earning a commission from those sales. The agency's cost is private information: neither the insurer nor consumer have knowledge of this cost. We denote the agency's unit cost by θ. The insurers assume a density distribution $f(\theta)$ on θ.

Representative Consumer

Given that the consumer is persuaded, she purchases insurance that will pay her a quantity αL, where α is the proportion of the maximum coverage, denoted by $\bar{L}$, that she decides to purchase. Let X be the consumer wealth and let $\pi=p+c$ be the price per dollar of coverage, where p is the basic price and c is the commission to the agency. Then, the cost of $\alpha\bar{L}$ amount of coverage is given by $\alpha\pi\bar{L}$. Therefore, the consumer's expected utility becomes:

$$U = E[u(X - \alpha\pi\bar{L} + \alpha L - L)]F(c) + E[u(X - L)](1 - F(c)) \qquad (1)$$

where $F(c)=Pr\{c \geq \theta\}$ is the cumulative distribution of $f(\theta)$, and $u(\cdot)$ is the consumer utility function. We assume that $u' > 0$ and $u'' < 0$, that is, the consumer is risk averse. Risk aversion implies that the consumer is willing to pay more than the mean of the loss in order to avoid the risk herself. To see this, note that the consumer is indifferent between paying a fixed amount $\alpha\pi\bar{L}$ to the insurer who will assume the random financial loss, and assuming the risk herself if $u(X - \alpha\pi\bar{L}) = E[u(X - L)]$. From the concavity of $u(\cdot)$ and Jensen's inequality we conclude that $\pi > \mu$.[11]

The first term in (1) represents the expected utility of a consumer who purchases a policy multiplied by the probability that she will purchase a policy. The second term is the expected utility of a consumer that does not purchase a policy multiplied by the probability that she will not purchase a policy. Then, expression (1) may be interpreted as the average of expected utility weighted by the probability that a policy will be purchased. Note that the greater the value of c, the greater the number of persuaded consumers. Given that the consumer is persuaded by the agency, she chooses α such that it maximizes (1). FOC is given by:

$$E[u'(X - \alpha\pi\bar{L} + \alpha L - L)(L - \pi\bar{L})] = 0 \qquad (2)$$

Solving for $D \equiv \alpha\bar{L}$, we obtain the insurance demand function of persuaded consumers: $D = D(\pi)$, which represents the quantity of dollars of coverage that the persuaded consumer purchases at price π.

[11] See Bowers et.al. (1997).

Agency Insurer

Considering that the agency may offer policies from any firm, he can manipulate the information about the characteristics of insurers when he is trying to sell a policy. He will prefer to sell the policy of the insurer who pays him the greater commission. This behavior implies that the other insurer's commission is private information for a specific insurer. Each insurer assumes a distribution *g(c)* on the other insurer's commission. Then, the probability that the insurer *i*, who offers a fee c_i, sells a unit of coverage is given by:

$$\Pr\{c_i > c_j\}\Pr\{c_i > \theta\} = G(c_i)F(c_i) \tag{3}$$

where $G(\cdot)$ is the cumulative distribution of $g(\cdot)$. That is, in order to sell a unit of coverage, the commission that insurer *i* offers must be greater than the commission of insurer *j* and the agency cost. The total coverage that company *i* sells becomes:

$$q_i = D(p + c_i)F(c_i)G(c_i) \tag{4}$$

That is, insurer *i* covers a percentage given by $F(c_i)G(c_i)$ of the total demand at price $p + c_i$.

Competition among Insurers

Assume two insurers. Insurer *i* sells a quantity of coverage q_i, *i=1,2*, defined by (4). Each insurer has an administrative cost per unit of coverage, which without loss of generality can be assumed to be zero. The expected revenues are given by πq_i, the expected total commissions paid to the agency is given by $c_i q_i$, and expected claims are given by $\alpha E(L)G(c_i)F(c_i)$. Then, the expect profits of firm *i* are given by: $\Pi_i = (\pi - c_i)q_i - \alpha E(L)G(c_i)F(c_i)$. Given that $D \equiv \alpha\bar{L}$ and $E(L) = \mu\bar{L}$, the expected profits become:

$$\Pi_i = (p - \mu)D(p + c_i)G(c_i)F(c_i) \tag{5}$$

In some countries, the state regulates the value of p in order to ensure that insurers are able to face all insurance claims.[12] Thus, insurers can not use p as strategic variable. In this case, we assume that insurers compete using commissions as the strategic variable. The FOC of insurer *i* is given by:

$$\Pi_i' = \Pi_i\left(\frac{g}{G} + \frac{f}{F} + \frac{D'}{D}\right) = 0 \tag{6}$$

Let c^{IC} be the solution to (6). We can get a nice equation from (6) by defining $\eta_g = cg/G$, $\eta_f = cf/F$ and $\varepsilon = -cD'/D$, which respectively are the elasticity of

[12] For example, in Mexico the Comisión Nacional de Seguros y Fianzas (CNSF) regulates the premiums of new products issued by insurance companies.

the probability that the insurer is offering a higher commission than its rival, the elasticity of the probability that the commission covers the agency's private cost, and the elasticity of demand. Thus, the FOC is equivalent to:

$$\eta_g + \eta_f = \varepsilon \tag{7}$$

This expression indicates that the optimal commission is reached when the percent increase in the probability of selling a unit of coverage due to a percent increase in commission equals the elasticity of the demand.

Condition (7) indicates that c^{IC} depends on η_g and η_f. That is, the commission depends on the way in which a change in the commission changes the probability that the insurer is offering a higher commission than his rival and the agency cost. These changes may be more than proportional ($\eta_g > 1$) or less than proportional ($\eta_g < 1$). The change is more than proportional when the distribution is uniform and less than proportional when the distribution is exponential. In the case of a normal distribution the elasticities depend on the parameters of the distribution.

Collusion among Insurers (Horizontal Collusion)

Assume now that the two insurers choose a common commission such that they maximize the aggregated profits:

$$\Pi_{HC} = (p - \mu)D(\pi)F(c) \tag{8}$$

The FOC of this problem is given by:

$$\Pi'_{HC} = \Pi_{HC}\left(\frac{f}{F} + \frac{D'}{D}\right) = 0 \tag{9}$$

Let c^{HC} be the solution of (9). In terms of elasticities we obtain:

$$\eta_f = \varepsilon \tag{10}$$

By comparing equation (6) and (9), we can state next proposition:

Proposition 1*. The premium when insurers compete is greater than the premium under horizontal collusion.*

Proof: Assume that $c=c^{HC}$. Then from (9) $\Pi'_{HC} = 0$ and $f/F + D'/D = 0$. Substituting into (6), $\Pi'_i > 0$. Thus a small increase in c from $c=c^{HC}$ triggers an increase in profits of firm *i*. Thus, $c^{IC}>c^{HC}$ and $\pi^{IC} > \pi^{HC}$.

This result contrasts with standard results from economic theory in which competition triggers lower prices than monopoly or collusion. Competition among insurers causes insurers to increase the commissions they offer to agencies in order to encourage agencies to promote its policies. It is clear that under horizontal collusion, the consumer benefits by paying lower premiums, but the lower commission also reduces the number of consumers who purchase a policy, since the

agency reduces its efforts. We discuss below the trade-off between these two effects on consumer welfare.

Collusion between Agency and Insurer (Vertical Collusion)

Suppose that the agency and insurers collude. This case is equivalent to a monopoly with exclusive agents, where the monopoly does not know the agency's cost. The optimal commission is that which maximizes the sum of insurer and agency profits:

$$\Pi_{VC} = \Pi_{HC} + (c-\theta)D(\pi)F(c) \tag{11}$$

From FOC, we can find the optimal commission, which we denote by c^{VC}, by solving:

$$\Pi'_{VC} = \Pi'_{HC} + (c-\theta)DF\left(\frac{f}{F}+\frac{D'}{D}+\frac{1}{c-\theta}\right) = \Pi_{VC}\left(\frac{f}{F}+\frac{D'}{D}+\frac{1}{\pi-\mu-\theta}\right) = 0 \tag{12}$$

From equations (12) and (9) we can state the next proposition:

Proposition 2. *The premium under Vertical Collusion is greater than the premium under Horizontal Collusion.*

Proof: Let be $c=c^{HC}$. Then from (9) $\Pi'_{HC} = 0$ and $f/F + D'/D = 0$. Substituting into (12) we get $\Pi'_{VC} = DF > 0$. Thus, a small increase in the commission from $c=c^{HC}$ triggers an increase in Π_{VC}. Thus, $c^{VC} > c^{HC}$ and $\pi^{VC} > \pi^{HC}$.

Proposition 2 indicates that a monopoly with exclusive agents pays higher commissions than a monopoly with independent agents. This result contrasts with standard results from economic theory in which vertical integration triggers lower prices than a bilateral double monopoly. Note that the surplus coming from vertical collusion goes to the agency. In fact, the insurer is worse off after collusion. Thus, if there are no transfers from the agency to the insurers, vertical collusion is not possible. In this case, since p is fixed, the only way for agency-insurer monopoly to excise its monopoly power is by increasing the commission.

It remains in this section to compare commissions under insurance competition and vertical collusion. In this case, the result is ambiguous as we show in the next proposition:

Proposition 3: *The commission under vertical collusion is greater than the commission under insurance competition if and only if:*

$$\frac{1-\eta_g}{\eta_g} > \frac{p-\mu-\theta}{c} \tag{13}$$

Proof: Let assume that $c = c^{IC}$. Thus, from (6) $\frac{f}{F}+\frac{D'}{D} = -\frac{g}{G}$. Substituting into (12), we have:

$$\Pi'_{VC} = \Pi_{VC}\left(\frac{1}{\pi-\mu-\theta} - \frac{g}{G}\right)$$

Then $c^{VC} > c^{IC}$ if $\Pi'_{VC} > 0$ or $\frac{1}{\pi-\mu-\theta} > \frac{g}{G}$, which after some algebra becomes (13).

Corollary: A sufficient condition for $c^{VC} < c^{IC}$ is that $\eta_g \geq 1$.

Proposition (3) indicates that the commission under insurance competition is greater or lower than commissions under vertical collusion depending on the value of η_g. As we note above, when the increase in commissions paid by one insurer triggers a more-than-proportional increase ($\eta_g > 1$) in the probability that he is offering a higher commission than the rival insurer, then it is profitable for insurer to pay a higher commission than the optimal commission under vertical collusion ($c^{VC} < c^{IC}$). On the other hand, a necessary but not sufficient condition for $c^{VC} > c^{IC}$ is that $\eta_g < 1$. Then, when an increase in the commission offered by an insurer triggers a less-than-proportional increase in the probability of offering a higher commission than its rival, the commission under vertical collusion may be greater than the commission offered under insurance competition.

Consumer Welfare

As we note above, the results in propositions 1 and 2 contrast with classical literature in two ways. Classical literature argues that competition and vertical integration triggers lower prices. We have found the opposite results: competition and vertical integration increase prices. These results suggest that horizontal collusion is better for the consumer, due to the fact that she pays a lower premium. However, a lower commission is not necessarily good for consumers since that a lower number of consumers will purchase a policy. In other words, a higher commission increases the number of consumers that purchase a policy but each of them buys a lower coverage. Thus, we argue that the optimal commission from the consumer's viewpoint may be greater than the commission under horizontal collusion, vertical collusion or insurer competition. To examine that possibility, we characterized the commission that maximizes the consumer welfare defined by (1). Taking the derivative of U with respect to c and using (2), the FOC becomes:

$$U' = V\left\{\frac{f}{F} - \frac{E[u'(\widetilde{X})]D}{E[u(\widetilde{X}) - u(X-L)]}\right\} = 0 \qquad (14)$$

where $V=U-E(X-L)$ and $\widetilde{X} = X + (L - \pi\overline{L})D(\pi)/\overline{L} - L$ comes from substituting $\alpha = D(\pi)/\overline{L}$ into the equation representing the wealth of an insured consumer. Let

c^U be the value of c that solves (14). The conditions under which $c^U > c^{HC}$, is given in the next proposition:

Proposition 4. *The optimal premium from the point of view of consumer is greater than the optimal premium under horizontal collusion if and only if:*

$$E[u(\tilde{X}) - u(X - L)] > \frac{cDE[u'(\tilde{X})]}{\varepsilon} \tag{15}$$

Proof: Let us assume that $c = c^{HC}$. Then, from (9) we have that $f = -FD'/D$. Substituting into (14), we obtain:

$$U' = -FE[u(\tilde{X}) - u(X - L)]\left(\frac{D'}{D} + \frac{E[u'(\bar{X})]D}{E[u(\bar{X}) - u(X - L)]}\right)$$

Then, $c^U > c^{HC}$ if $U' > 0$. This condition means that a small increase in c from $c = c^{HC}$ triggers an increase in U and results in (15).

Condition (15) indicates that it is profitable for the consumer to pay a higher premium than the optimal premium from horizontal collusion (and from proposition 1 and 2, than the optimal premiums coming from insurer competition and vertical integration) when the increase in the expected utility due to the purchase of insurance (left hand size of expression 15) is greater than a certain minimum (right hand size of expression (15). In order to get a better idea of when this might occur we look at some specific functional forms. Assume that the utility function of the consumer is given by $u(w) = -\exp\{-rw\}$ and L follows a normal distribution with $E(L) = \mu\bar{L}$ and $Var(L) = \sigma^2\bar{L}^2$. The Arrow-Debrew absolute measure of risk aversion is given by the parameter r. It is straightforward to show that the demand for insurance becomes:

$$D(\pi) = \bar{L} + \frac{\mu - \pi}{r\sigma^2} \tag{16}$$

and condition (15) becomes:

$$\frac{1}{2h} > \frac{e^{-h}}{1 - e^{-h}} \tag{17}$$

where $h = \frac{r^2\sigma^2D^2}{2}$. The expression (17) is equivalent to $rD\sigma > 1.5851$ or from (9) and (16) $\frac{F}{\sigma f} > 1.5851$. Then, the condition under which the optimal commission from the consumer viewpoint is greater than the commission coming from horizontal collusion depends on the values of the parameters of the model. Assume that $f(c) = \frac{1}{\bar{\theta} - \underline{\theta}}$. Then condition (17) becomes:

$$r\bar{L}\sigma - \frac{\bar{\theta} + p - \mu}{\sigma} > 3.1704 \tag{18}$$

From (18) we conclude that the consumer is willing to pay a greater premium than the premium coming from horizontal collusion when the risk-aversion, r, and/or the variance of potential loss, σ, and/or the average unexpected loss, μ, are "high enough" and/or the mark-up to insurance and agency is "low enough". In other words, the optimal premium from consumer viewpoint is greater than the premium coming from horizontal commission, vertical collusion or insurer competition when the consumer is "too" risk averse, the expected loss is "too" high or the probability of an unexpected event is "too" high.

Summary and Conclusions

In this paper we have analyzed insurance competition when the insurers sell insurance through agency insurers. We have taken into account the following principal-agent problems: the agency has more information than the insurer about consumer preferences, the level of agent effort and selling costs are not known by the insurer, and agencies will prefer to sell the policy which gives them the highest commission. Different market structures where considered: a duopoly who competes in commissions, collusion among insurers with agencies remaining independent and collusion between insurers and agencies. We have shown that insurance competition and vertical integration trigger higher premiums than horizontal collusion with independent agencies. Our results contrast with standard result from economic theory in which predict that competition and vertical integration trigger lower prices than a monopoly. Thus, under horizontal collusion the consumer pays lower premiums. However, we have found that the high premiums from competition and vertical integration are not necessarily bad for consumers. We have shown that the optimal commission from consumer viewpoint may be greater than the optimal commissions coming from horizontal collusion, vertical collusion or insurer competition, when the consumer is "too" risk averse, the expected loss is "too" high or the probability of an unexpected event is "too" high. This paper is our first theoretical approach to the role of agencies in insurance markets. Some possible perverse effects of commissions to agencies have not been considered. For example, competition by commissions may encourage agents to sell policies to "high risk" people, and thus increase the risk of bankruptcy for insurers. This situation will be examined in future research.

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