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The deadweight gain of insurance taxation when risky activities are optional ☆

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ABSTRACT

Some risky activities are optional, for example motoring. Participation in them is most attractive for good risks, creating a tendency for advantageous selection in the associated insurance market. Taxing insurance consequently yields deadweight gains when type is hidden. Results are strengthened if optimism is present. Finally, endogenising participation implies that the standard "positive correlation" test for the presence of policy relevant asymmetric information may fail.

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1. Introduction

Insurance mitigates individual risk. So does opting out of risky activities. Examples of such avoidable pursuits are motoring, pet ownership, growing risky crops, travelling, owning fragile high-value items and entering risky occupations. Existing hidden-type models of insurance, most notably Rothschild and Stiglitz (1976), henceforth *RS*, have ignored the possibility of avoidance. This paper shows that the opportunity to opt out of risky activities has significant implications for public policy. The reason is that bad risks have least to gain from participation in the risky activity, introducing an element of advantageous selection into the insurance market. Under these circumstances, a general insurance tax has efficiency benefits. It curbs the entry of bad risks, whose presence imposes a negative externality on good risks. An insurance tax may even yield Pareto gains, though the main point of the paper is that the marginal cost of raising public funds through general insurance taxation is *below* unity. A dollar raised through insurance taxation improves the net of tax terms offered to the insured which costs them less than a dollar. This efficiency effect implies that even regressive taxation may raise welfare. If the tax proceeds are used to fund a public good, there may be gains even if the willingness to pay of the beneficiaries is below the cost of provision and the beneficiaries are better off than the payers.

The theoretical literature on insurance market intervention mostly builds on the insight of *RS* (pp. 643–645) that, in a separating equilibrium, cross subsidization of policies may generate a Pareto improvement. A number of papers have devised schemes to implement this possibility. One way is to require a small amount of mandatory cover as Wilson (1977) and Dahlby (1981) show. Crocker and Snow (1985) demonstrate that Pareto efficient redistribution can sometimes be effected through a tax on incomplete-cover contracts and a subsidy to full-cover policies. A system of tradeable permits to sell low-cover policies similarly implements this outcome, as analyzed by Bisin and Gottardi (2006). The qualification in all these cases is that a firm able to issue a menu of offers can replicate the Pareto improving scheme and therefore devise a profitable deviation. So it can be argued that an equilibrium requires a reason that the Pareto gain cannot be realized by private action. This will be further discussed in Section 3.2.

All these papers involve an increase in the cost of partial cover relative to full cover. A case for increasing the cost of insurance in

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general is a side result of de Meza and Webb (2001). The assumptions are heterogeneous risk preferences, moral hazard, and claim processing costs. More risk-tolerant types take fewer precautions and place less value on insurance. An insurance tax discourages these bad risks from buying insurance (though not from engaging in the risky activity), thereby improving the terms available to the good risks. The de Meza and Webb configuration involves possible but special assumptions. Bad risks having least to gain from participating in the risky activity, as analyzed here, seem a much more generic phenomenon.[1]

The remainder of this paper unfolds as follows. A simple model in which it is possible to choose whether to undertake the risky activity is specified in Section 2. The implications of this optional participation model for the efficiency of insurance taxation are examined in Section 3. In particular, the marginal cost of public funds (*MCPF*) raised through an insurance tax, is calculated, along with the possibility of Pareto gain when the revenue is redistributed in the form of a lump-sum subsidy. Comparison is made with the welfare effects of requiring mandatory full insurance cover for those engaged in the risky activity. Numerical examples are also presented to show that welfare effects may be large. Some natural extensions to the model are sketched in Section 4. The empirical relevance of asymmetric information to insurance has been challenged in recent years. Section 4 shows that when risky activities are optional, existing tests are inadequate to reveal the presence of asymmetric information. Finally, brief conclusions are drawn.

2. The model

In most respects the model follows *RS*. Individuals differ in their competence in some risky activity. *H* types have probability π_H of suffering an accident which causes them financial loss, *D*, whilst for *L* types the loss probability is π_L with $\pi_L < \pi_H$. These probabilities are private information. The proportion of the low to high risk types in the population is *n*, which is publicly known.

Both types have the same concave utility function, $U(M, R)$ where *M* is consumption of private goods and services and $R \in \{0,1\}$ is an indicator variable equal to 1 if the individual engages in the risky activity and 0 otherwise. We sometimes work with the special case $U(M, 1) = B + u(M)$, where *B* is the utility benefit from participating in the risky activity. All individuals have income endowment, $\overline{M}$.[2]

An insurance contract involves premium, *P*, and net of premium payment, *I*, if a financial loss occurs. There are two or more risk-neutral insurance companies engaging in Bertrand competition. The game is that the companies make simultaneous contract offers. Individuals then choose whether to engage in the risky activity and which policy to buy.[3]

2.1. Equilibrium

For the same reason as in *RS*, there cannot be a pure-strategy pooling equilibrium. Marginally lowering cover and reducing the premium will profitably separate out types. Three types of equilibrium are possible. When the risky activity provides little benefit, neither type participates in it. If the risky activity is sufficiently attractive both types may participate, in which case there is a separating equilibrium in which the *Hs* are fully insured and the *Ls* choose incomplete insurance, essentially the *RS* equilibrium. The condition for *Hs* to be better off participating is $U(M, 0) < U(M - \pi_H D, 1)$. This also guarantees that *Ls* participate as they are better off than *Hs* in an *RS* equilibrium.

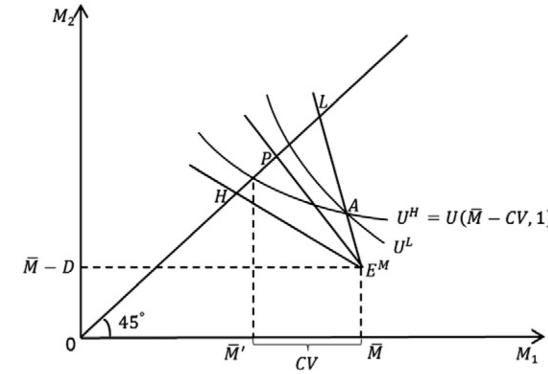

Fig. 1. Separating Equilibrium.

The equilibrium in which *Ls* participate and *Hs* do not is designated as partial participation (*PP*) equilibrium. Such an equilibrium requires $U(M - \pi_H D, 1) < U(M, 0) < U(M - \pi_L D, 1)$. That is, since it is always feasible to offer full, actuarially fair, insurance to an *H* type engaging in the risky sector, the expected utility from taking such an offer must be less than not engaging in the risky activity. Moreover, the best that an *L* can achieve from participation is full, fair insurance so this offer must dominate non participation. Such an offer would also attract the *Hs* so it cannot be part of a *PP* equilibrium. The offer taken by the *Ls* must involve partial cover so as not to attract *Hs*.

Fig. 1 displays a *PP* equilibrium. Participation involves the possibility of an accident, the occurrence of which lowers income by *D*. Those engaging in the risky activity therefore have income endowment E_M with M_1 good-state income and M_2 bad. The actuarially fair offer curve for the *Ls* is E^ML, of the *Hs* is $E^M H$ and the pooling offer curve is $E^M P$. Non participation with income *M* delivers the same utility as participation with full insurance at premium *CV*, which is therefore an index of the benefit of the risky activity. If driving is a perfect substitute for other spending, i.e. $U(M, 1) = U(M + B)$, $CV = B$. An equilibrium is shown in which *L* types participate and obtain partial insurance at *A*, whilst *H* types are marginally better off not participating than at *A*. This is a least-cost separating equilibrium. Formally, it is the zero expected-profit contract that maximizes the expected utility of the low risks subject to the high risks weakly better off rejecting the contract. Contract *A* is preferred by the *Ls* to any contract along the pooling offer line, $E^M P$. So there is no incentive to break the equilibrium with a pooling offer.

At the end of Section 3.1 we examine an initial equilibrium in which *B* is sufficiently high that both types participate in the initial equilibrium.

3. The mitigated burden of insurance taxation

The basic intuition of the deadweight gain is illustrated in Fig. 2. An initial *PP* equilibrium is at *A*, with the participation constraint of the *Hs* binding the *Ls*. The introduction of a lump-sum insurance tax of *t* shifts down the zero-profit offer curve for the *Ls*.[4] Specifically, the purchase of a zero-cover policy results in a shift of consumption from E^M to E_t^M, but leaves the incremental cost of cover unchanged. The new offer curve is therefore parallel to the old, resulting in a new equilibrium at *B*.[5] To maintain the *L's* insurance cover with the tax, involves the offer at *C*. For *Hs*, the increased premium associated with the offer is strictly inferior to non participation. As a result, cover can be increased without

[1] Avoidance is a form of precautionary or preventative activity, but it has special properties. Suppose types differ in their cost of precautionary effort. As in *RS*, the equilibrium correlation between risk and cover will be positive. There is no element of advantageous selection and in its essentials the analysis of an insurance tax is as in *RS*.

[2] This assumes that the only financial cost of the risky activity is those arising from an accident. This is convenient but not crucial.

[3] In a dynamic setting, experience rating is a screening device that should in principle diminish the effect of hidden types. This mechanism will not be very effective if clients have much higher discount rates than companies.

[4] The figure assumes that it is the company that directly pays the tax. Proceeds are used to provide a public good that enters the utility function additively.

[5] The indifference curve of the *Ls* through *B* must pass above E^M for insurance still to be taken.

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