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# The welfare effect of income tax deductions for losses as insurance: Insured- versus insurer-sided adverse selection☆

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ABSTRACT

Kaplow (1992) shows in a complete-information environment that allowing income tax deductions for losses as partial insurance is undesirable in the presence of private insurance markets. This paper elaborates on Kaplow's finding by studying two extreme types of asymmetric information structures in private insurance markets: Either the insured or insurers possess superior information. It is shown that our derived result is consistent with Kaplow's if the insured have superior information; however, Kaplow's negative conclusion with respect to the income tax deduction will be overturned if insurers have superior information instead. A policy implication from our finding is that whether or not to allow an income tax deduction for losses needs to be more refined and, specifically, it should be tailored to the "adverse selection" information structures of private insurance.



## 1. Introduction

In an important paper, Kaplow (1992) asks the question: Should the government allow income tax deductions for uninsured losses as partial insurance? He shows that a tax system without such deductions Pareto dominates a tax system with the deductions. The intuition underlying Kaplow's result is that the availability of income tax deductions as partial insurance will distort and crowd out the purchase of private insurance, leading individuals to expose themselves to more risk than otherwise.

Most OECD countries allow some form of tax deductions for personal losses such as medical expenses and casualty losses.[1] In view of this fact, Kaplow's negative conclusion with regard to the income tax deduction deserves careful study.

Kaplow (1992) addresses his question in a complete-information environment, but argues that his finding remains robust in the presence of adverse selection.[2] In this paper, we elaborate on Kaplow's argument by studying two extreme types of adverse selection in private insurance markets.

The so-called "adverse selection" in the insurance literature typically follows the seminal work of Rothschild and Stiglitz (1976). That is, those who are insured possess superior information to insurers, in the sense that the insured know the loss probabilities they face, but the insurers do not. Put differently, the insured's loss probabilities are their private information, unknown to the insurers. Recently, the issue of informed insurers has attracted considerable attention. This literature empirically detects some "adverse selection" information structures contradicting that of Rothschild and Stiglitz (1976). For example, Chiappori and Salanié (2000), Dionne et al. (2001) and Saito (2006) find no evidence of asymmetric information à la Rothschild and Stiglitz (1976) in the automobile insurance market.

Cohen and Siegelman (2010) survey the recent evidence on this issue. They explain the mixed findings by suggesting that, in some insurance markets or for some products, those who are insured may not always have an information advantage over insurers and, quite plausibly, insurers may actually possess better information regarding the insured's loss probabilities than the insured themselves. For example, consider the development of Event Data Recorders and GPS systems. These enable insurers to have access to extremely good information about the driving characteristics of insured drivers and, as a result, it provides a powerful predictor for insurers to forecast and differentiate the risk types of the insured in the automobile insurance market.

On the basis of the evidence, Villeneuve (2000, 2005) and Seog (2007, 2009) take the initiative in exploring the theoretical consequences if

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[1] See OECD (1990).

[2] Kaplow (1991) showed that a tax system without such deductions Pareto dominates a tax system with the deductions in the presence of moral hazard.

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insurers possess superior information instead. In the same vein, this paper takes the initiative in exploring what will happen to Kaplow's (1992) negative conclusion if insurers rather than those insured are to possess superior information.

Our derived result is consistent with Kaplow's (1992) if the insured have superior information with regard to their risk type; however, Kaplow's negative conclusion with respect to the income tax deduction will be overturned if insurers have superior information instead.

All else equal, the high-risk type is put at a disadvantage relative to the low-risk type due to the lower expected wealth *a priori*. As such, redistribution, if there is any, should be from the low-risk to the high-risk type, and insurance, if there is any, should give the high-risk type a priority to insure over the low-risk type. In the absence of income tax deductions, the existing literature on competitive insurance markets has shown that the high-risk type will fully insure when the insured have superior information (see Rothschild and Stiglitz, 1976), but they are unable to buy any private insurance when insurers have superior information (see Seog, 2007, 2009). Allowing the income tax deduction is *de facto* a compulsory form of insurance imposed by the government. This compulsory insurance cannot enhance the high-risk individuals' insurance coverage at the margin as they have already obtained their first-best contract in the former information structure. Nevertheless, it "corrects" the high-risk individuals' inability to buy any private insurance in the latter information structure. This is the key to our finding regarding the welfare effect of allowing the income tax deduction for losses.

Our paper is related to the issue in Crocker and Snow (1985) since they show that a tax-for-subsidy may be welfare improving in an adverse selection context. Their tax scheme requires that low-risk individuals be taxed to subsidize high-risk individuals. In this paper, the income tax deduction plays a similar role as a tax scheme in Crocker and Snow (1985).

The remainder of the paper is organized as follows. Section 2 presents our model. Section 3 reports the corresponding insurance equilibrium under different "adverse selection" information structures. Section 4 examines the welfare implications and Section 5 concludes.

## 2. Model

The model extends Kaplow (1992) to incorporate either the essence of Rothschild and Stiglitz (1976, hereafter RS), or the essence of Villeneuve (2000, 2005) and Seog (2007, 2009) (hereafter, VS).[3]

All individuals have an initial endowment of $w_0$, but they incur the loss $d$ if an accident occurs. There are two types of individuals: a fraction $0<\gamma<1$ faces a high probability $p_h$ of having the accident, while the remaining fraction $1-\gamma>0$ faces a low probability $p_l$. A contract $C_k=(\alpha_k,\beta_k)$ is offered by an insurer to individual $k$ ($k=l$, $h$), where $\alpha_k$ is the premium and $\beta_k$ is the insurance coverage.

Following Kaplow (1992), we assume that the government may allow income tax deductions for uninsured losses and that the resulting expected revenue loss is financed by a lump-sum tax $\tau$. Thus, once an individual $k$ incurs the incidence of the accident, she receives a tax benefit equal to the income tax rate $t\in[0, 1)$ multiplied by the magnitude of her uninsured loss $(d-\beta_k)$; however, she must pay the lump-sum tax $\tau$ if $t>0$. The tax deduction *de facto* acts as a compulsory insurance imposed by the government, where $t(d-\beta_k)$ is the insurance coverage and $\tau$ is the premium charged.

Following RS and VS, we assume that insurance markets are perfectly competitive and that all insurers are risk neutral. In a competitive equilibrium with free entry, an insurer's expected profit must be zero. This implies that the contracts provided in markets will be actuarially fair for both risk types in the case of a separating equilibrium, that is,

$$\alpha_k = p_k\beta_k, k = l, h. \tag{1}$$

In the presence of both competitive private insurance markets and the government's provided compulsory insurance, an individual $k$'s expected utility is given by:

$$EU_k = (1-p_k)U(w_k^{na}) + p_kU(w_k^{a}), k = l, h, \tag{2}$$

where $w_k^{na}=w_0-\alpha_k-\tau$ and $w_k^{a}=w_0-\alpha_k-\tau-d+\beta_k+t(d-\beta_k)$, which represent the individual $k$'s resulting wealth in the no-loss and the loss state, respectively. As is standard, we assume that $U'>0$ and $U''<0$.

In this paper, our aim is to explore the welfare effect of allowing tax deductions for losses under different "adverse selection" information structures. For simplicity and as a stark contrast, we consider two extreme kinds. The first one is the situation where the insured possess superior information regarding their risk type (the insured-sided adverse selection). This is the case addressed by RS. The other is the opposite situation where insurers possess superior information regarding the insured's risk type (the insurer-sided adverse selection). This is the case addressed by VS. We are particularly interested in answering the question: What would happen to Kaplow's (1992) negative conclusion if insurers rather than those insured were to possess superior information?

## 3. Equilibrium

In this section we derive the corresponding equilibrium under each extreme type of "adverse selection."

### 3.1. Insured-sided adverse selection

Suppose that the insured have superior information regarding their risk type. That is, the insured know the loss probabilities they face, but the insurers do not. This is the "adverse selection" considered by RS. Following the equilibrium concept used in RS, it is known that if an equilibrium exists, then it must be a separating one. Henceforth, we focus on the separating contract

#### 3.1.1. Equilibrium choice of type $p_h$

Given the income tax $t$, the high-risk type's choice of contracts is determined by the problem:

$$\text{Max}_{\alpha_h,\beta_h} \quad EU_h = (1-p_h)U(w_h^{na}) + p_hU(w_h^{a}), \tag{3}$$

$$s.t. \quad \alpha_h = p_h\beta_h. \tag{4}$$

Substituting Eq. (4) into Eq. (3), the first-order condition for $\beta_h$ is as follows[4]:

$$(1-p_h-t)U'(w_h^{a}) = (1-p_h)U'(w_h^{na}). \tag{5}$$

Eqs. (4) and (5) together yield the equilibrium contract for the high-risk type $C_h^*\equiv(\alpha_h^*(t,\tau), \beta_h^*(t,\tau))$. If $t>0$,[5] type $p_h$ individuals will buy partial insurance due to $U'(w_h^a)>U'(w_h^{na})$, that is, $\beta_h^*<d$. On the other hand, if $t=0$, then we get $U'(w_h^a)=U'(w_h^{na})$, which implies that type $p_h$ individuals will buy full insurance, that is, $\beta_h^*=d$.

[3] While Villeneuve (2000) considers an informed monopolistic insurer, Villeneuve (2005) considers competitive informed insurers. Seog (2007) considers competitive informed insurers as in Villeneuve (2005), and Seog (2009) extends Seog (2007) to the case where each side of the insurance market has superior information about some risks.

[4] The second-order condition is: $\partial^2EU_h/\partial(\beta_h)^2 = (1-p_h-t)^2U''(w_h^a) + p_h(1-p_h)U''(w_h^{na})<0$.

[5] To ensure an interior solution, it is clear from Eq. (5) that $t$ must not be too high.