Consumption Externality and Equilibrium Under-insurance

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Abstract

Relative consumption has been found to be crucial in many areas, such as asset pricing, the design of taxation and economic growth. This paper extends this line of research to the individual's insurance decision. We first define "keeping up with the Joneses" in the purchase of insurance, and find that jealousy does not necessarily give rise to "keeping up with the Joneses." We also identify several sufficient conditions that cause the optimal coverage in the private market to be less than the social optimum (equilibrium under-insurance). The consumption externality is found to be neither a sufficient nor a necessary condition for equilibrium under-insurance. We further show that a social welfare maximizing government could adopt a tax system to correct for the consumption externality and make individuals better off.

JEL classification: D11, D62, G22

Keywords: consumption externality, insurance, tax deduction

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1. Introduction

There has been a long debate in the literature over whether the government should intervene in the individual's choice of insurance if there exists a market for private insurance. Some papers (for example, see Besley, 1989) have shown that the government's intervention in the insurance market could improve social welfare, whereas certain other papers (see Kaplow, 1992a, 1992b; Selden, 1993; and Blomqvist and Johansson, 1997) have shown that the government's intervention in insurance may distort the incentive of the individual to purchase insurance in the private market and thereby reduce the social welfare.

On the other hand, recent studies have found that consumption externalities play an important role in an individual's decisions[1] and the government's intervention might increase social welfare under a consumption externality, e.g., Fisher and Hof (2000), Ljungqvist and Uhlig (2000), Dupor and Liu (2003), Alonso-Carrera, Caballé and Raurich (2004, 2005, 2006), Abel (2005) and Liu and Turnovsky (2005), Turnovsky and Monteiro (2007). Although the previous literature has provided many ingenious findings, as far as we know, none of them has ever analyzed the effect of the consumption externality on insurance. In this paper, we intend to fill this gap.[2]

This paper follows the framework of Dupor and Liu (2003) who linked the equilibrium over-consumption and jealousy. We analyze the relationship between consumption externality and equilibrium under-insurance, which describes the situation where the optimal coverage in the private market is less than the social optimum, as well

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[1] Some researchers focus on the influence of the consumption externality in asset pricing. See Abel (1990, 1999), Gali (1994), and Campbell and Cochrane (1999).
[2] To keep our focus on the consumption externality, we assume that no asymmetric information exists in the insurance market.

as whether under consumption externality government intervention in the private insurance market is a Pareto improving policy. In Dupor and Liu (2003), the utility of the individual is assumed to be a function of individual and per capita consumption, and individual labor. Since we intend to model the insurance market, we assume away endogenous labor supply for simplicity and add an assumption that the individual suffers a random loss following a Bernoulli distribution. Thus, we assume that the individual utility is a function of the consumption in the loss state, the consumption in the no-loss state, as well as the per capita consumption in the loss state, the per capita consumption in the no-loss state, and the average per capita consumption.

In the paper, we include three different reference points to measure jealousy (admiration) in the utility of the individual to build up a general model. We assume that the preference in terms of an individual's utility exhibits jealousy (admiration) in the per capita consumption in the loss state [the per capita consumption in the no-loss state, the average per capita consumption], if the marginal utility of the per capita consumption in the loss state [the per capita consumption in the no-loss state, the average per capita consumption] is negative (positive). Note that, in the paper, we allow the preference of the individual to exhibit jealousy in one state but admiration in the other state.

We further define "keeping up with the Joneses" as referring to the case where an individual increases the amount of his or her insurance, when the amount of the insurance per capita increases. We also define equilibrium under-insurance (over-insurance) as the case where the insured amount under the social optimum is larger (smaller) than the optimal amount of insurance that the individual chooses in the private market.

Notice that we do not assume that the individual utility function is measured by expected utility or is separable as is commonly assumed in the literature. Our results hold for a large set of individual preferences. In the paper, we first seek to determine whether the equilibrium in the private market under a consumption externality is socially optimal.

We then demonstrate how the government corrects for the consumption externality by providing tax deductions on the individual's net losses and insurance premium.

In the case where the utility of the individual is not related to average per capita consumption, we find that the individual will be underinsured if the marginal rate of substitution between the consumption in the loss state and the per capita consumption in the loss state is larger than that between the consumption in the no-loss state and the per capita consumption in the no-loss state. It is very important to notice that equilibrium under-insurance cannot be determined by only the jealousy preference. If the preference of the individual exhibits jealousy both in the loss state and in the no-loss state, the individual may not be under-insured. On the other hand, if the preference of the individual exhibits admiration in the loss state or in the no-loss state, then the individual may still choose to be under-insured. Thus, we show that jealousy is neither a sufficient nor a necessary condition for equilibrium over-insurance. Unlike Dupor and Liu (2003) who find, in a model of consumption and labor, that over-consumption exists if the individual is jealous, we find that, in the insurance model, equilibrium under-insurance may (or may not) exist, regardless of whether the preference of the individual exhibits jealousy or not.

In the case when the average per capita consumption is the only source of the consumption externality, we find that the optimum in the private insurance market is also a social optimum if the insurance price is actuarially fair. Moreover, we find that, if the insurance price is actuarially unfair, the individual will be under-insured when the utility of the individual exhibits jealousy. This result is similar to Dupor and Liu (2003).

To analyze how to reach a social optimum under a consumption externality, we focus on the case of equilibrium under-insurance. We propose that the government provide tax deductions to correct for the equilibrium under-insurance caused by the consumption externality. Specifically, we try to find the optimal tax deduction rates for the individual's net losses and insurance premium. We find that the optimal tax deduction rate on the individual's net losses can never be equal to the optimal tax deduction rate on the insurance premium. Furthermore, the optimal tax deduction rate on the individual's net losses is lower than the optimal tax deduction rate on the insurance premium.

The remainder of the paper proceeds as follows. The model is established in Section 2. "Keeping up with the Joneses" is then defined in Section 3. The condition of equilibrium under-insurance is derived in Section 4. This is followed by a further analysis of the optimal tax deduction in Section 5. Section 6 concludes the paper.

2. Model

Assume that there exist many identical individuals with the endowment W. They face a random loss L which follows a Bernoulli distribution with loss probability π. The individual can pay an insurance premium PQ to receive insurance coverage Q. In addition, assume that $1 > P \geq \pi$. Each individual has the same utility function

$$U(W_L, W_N, W_{AL}, W_{AN}, W_A), \qquad (1)$$

where W_L, W_N, W_{AL}, W_{AN}, and W_A are the consumption in the loss state, the consumption in the no-loss state, the per capita consumption in the loss state, the per capita consumption in the no-loss state, and the average per capita consumption, respectively. Thus,

$$\begin{aligned} &W_L = W - L + Q - PQ, \\ &W_N = W - PQ, \\ &W_{AL} = W - L + Q_A - PQ_A, \\ &W_{AN} = W - PQ_A, \text{ and} \qquad (2) \\ &W_A = W - \pi(L - Q_A) - PQ_A \end{aligned}$$

where Q_A is the per capita insurance coverage.

Assume that U is twice differentiable, $U_1 > 0$, $U_2 > 0$, for all W_L, W_N, W_{AL},

W_{AN}, and W_A. $U_3 < 0$ ($U_3 > 0$) denotes that the preference of the individual exhibits jealousy (admiration) in regard to the per capita consumption in the loss state. $U_4 < 0$ ($U_4 > 0$) denotes that the preference of the individual exhibits jealousy (admiration) in regard to the per capita consumption in the no-loss state. $U_5 < 0$ ($U_5 > 0$) denotes that the preference of the individual exhibits jealousy (admiration) in regard to the average per capita consumption. Assume that $U_1 + U_3 > 0$ and $U_2 + U_4 > 0$.

The individual chooses Q to maximize $U(W_L, W_N, W_{AL}, W_{AN}, W_A)$, taking W_{AL}, W_{AN}, and W_A as given. Furthermore, it is assumed that $U(W_L, W_N, W_{AL}, W_{AN}, W_A)$ is concave in Q. Thus, the first-order condition in a symmetric equilibrium ($Q_A = Q$) is

$$(1-P)U_1 - PU_2 = 0.\text{[3]} \tag{3}$$

3. Keeping up with the Joneses

By means of Equation (3), we further define "keeping up with the Joneses" as $\frac{\partial Q}{\partial Q_A} > 0$. The following theorem defines "keeping up with the Joneses":

Theorem 1 $\frac{\partial Q}{\partial Q_A} > (=,<) 0$, if

$$(1-P)\left[(1-P)U_{13} - PU_{23}\right] - P\left[(1-P)U_{14} - PU_{24}\right] + (\pi - P)\left[(1-P)U_{15} - PU_{25}\right] > (=,<) 0$$

.

Proof

Define the right-hand side of Equation (3) as $\mathrm{H}(Q)$. Since the second-order condition holds, then $sign\{\frac{\partial Q}{\partial Q_A}\} = sign\{\frac{\partial H}{\partial Q_A}\}$.

$\frac{\partial H}{\partial Q_A} = (1-P)[(1-P)U_{13} - PU_{23}] - P[(1-P)U_{14} - PU_{24}] + (\pi - P)[(1-P)U_{15} - PU_{25}]$. Thus,

[3] Note that the second-order condition holds.

$$\frac{\partial Q}{\partial Q_A} > (=,<) 0 \text{, if}$$

$$(1-P)[(1-P)U_{13} - PU_{23}] - P[(1-P)U_{14} - PU_{24}] + (\pi - P)[(1-P)U_{15} - PU_{25}] > (=,<) 0 .$$

Q. E. D.

It is very important to recognize that, in the insurance market, the condition of "keeping up with the Joneses" is not the same as that of jealousy. The results are consistent with the finding in Dupor and Liu (2003) where the condition of "keeping up with the Joneses" is deemed to be different from that of jealousy in the model of labor and consumption. Lemmas 1 to 3 further characterize "keeping up with the Joneses" as shown below:

Lemma 1 *If* $U_{13} = U_{23} = 0$ *and* $U_{14} = U_{24} = 0$ [4]*, then*

(i) $\frac{\partial Q}{\partial Q_A} = 0$ *when* $P = \pi$.

(ii) $\frac{\partial Q}{\partial Q_A} > 0$ *when* $P > \pi$ *and* $U_2 U_{15} - U_1 U_{25} < 0$.

Proof From Theorem 1, given that $U_{13} = U_{23} = 0$ and $U_{14} = U_{24} = 0$, $\frac{\partial Q}{\partial Q_A} > (=,<) 0$, if $(\pi - P)[(1-P)U_{15} - PU_{25}] > (=,<) 0$. Thus, $\frac{\partial Q}{\partial Q_A} = 0$ when $P = \pi$. On the other hand, when $P > \pi$, $\frac{\partial Q}{\partial Q_A} > 0$ if $(1-P)U_{15} - P_1 U_{25} < 0$. Notice that $P = \frac{U_1}{U_1 + U_2}$ from Equation (3). Thus, $\frac{\partial Q}{\partial Q_A} > 0$ when $P > \pi$ and $U_2 U_{15} - U_1 U_{25} < 0$.

Q. E. D.

Lemma 1 discusses the case where the individual's utility function is additively separable between own consumption in both states and per capita consumption in the loss

[4] $U_3 = U_4 = 0$ implies that $U_{13} = U_{23} = 0$ and $U_{14} = U_{24} = 0$.

state, and between own consumption in both states and per capita consumption in the no loss state. It shows that individuals will never try to "keep up with the Joneses" under an actuarially fair premium. If the premium is not fair, the condition for "keeping up with the Joneses" becomes $U_2 U_{15} - U_1 U_{25} < 0$, which is equivalent to $\frac{\partial\left(\frac{U_1}{U_2}\right)}{\partial W_A} < 0$ since $U_2 > 0$. Thus, even if individuals exhibit jealousy due to the increase in the average wealth level ($U_5 < 0$), they may or may not increase their demand for insurance when other people increase their purchase of coverage. This is an example that shows that only jealousy can not ensure that the individual will "keep up with the Joneses."

Lemma 2 *If* $U_{15} = U_{25} = 0$ [5]*, then* $\frac{\partial Q}{\partial Q_A} > 0$ *when* $U_2[U_2 U_{13} - U_1 U_{23}] - U_1[U_2 U_{14} - U_1 U_{24}] > 0$.

Proof If $U_{15} = U_{25} = 0$, then $\frac{\partial H}{\partial Q_A} = (1-P)[(1-P)U_{13} - PU_{23}] - P[(1-P)U_{14} - PU_{24}]$.

Notice that $P = \frac{U_1}{U_1 + U_2}$ from Equation (3). Thus,

$\frac{\partial H}{\partial Q_A} = \left(\frac{1}{U_1 + U_2}\right)^2 \left(U_2\left(U_2 U_{13} - U_1 U_{23}\right) - U_1\left(U_2 U_{14} - U_1 U_{24}\right)\right)$. After rearrangement, we can find that $\frac{\partial H}{\partial Q_A} > 0$, if $U_2[U_2 U_{13} - U_1 U_{14}] - U_1[U_2 U_{23} - U_1 U_{24}] > 0$.

Q. E. D.

Lemma 2 analyzes the case where the individual's utility is additively separable between own consumption in both states and average per capita consumption. Note that $U_2[U_2 U_{13} - U_1 U_{23}] - U_1[U_2 U_{14} - U_1 U_{24}] > 0$ can be further rewritten as

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[5] $U_5 = 0$ implies $U_{15} = U_{25} = 0$.

$U_2 \frac{\partial\left(\frac{U_1}{U_2}\right)}{\partial W_{AL}} - U_1 \frac{\partial\left(\frac{U_1}{U_2}\right)}{\partial W_{AN}} > 0$. Thus, the condition of "keeping up with the Joneses" is correlated with whether an increase in W_{AL} and/or W_{AN} increases the marginal rate of substitution between individual consumption in the loss state and in the no-loss state. For example, if $\frac{\partial\left(\frac{U_1}{U_2}\right)}{\partial W_{AL}} > 0$ and $\frac{\partial\left(\frac{U_1}{U_2}\right)}{\partial W_{AN}} < 0$, then the condition of "keeping up with the Joneses" always holds.

Lemma 3 *If* $U_{15} = U_{25} = 0$ *and* $U_{14} = U_{23} = 0$, *then* $\frac{\partial Q}{\partial Q_A} > 0$ *when* $U_2^2 U_{13} + U_1^2 U_{24} > 0$.

Proof The condition may be easily derived from Lemma 2.

$U_{14} = U_{23} = 0$ means that the individual's utility is additively separable between own consumption in the loss state and per capita consumption in the no-loss state, and between the individual's consumption in the no-loss state and the per capita consumption in the loss state. The condition shows that if $U_{13} > 0$ and $U_{24} > 0$, then we could observe "keeping up with the Joneses" in this case.

4. Equilibrium Under-Insurance

A benevolent social planner takes $Q_A = Q$ as given and chooses Q to maximize $U(W_L, W_N, W_{AL}, W_{AN}, W_A)$. Thus, the first-order condition for a social optimum is

$$(1-P)U_1 - PU_2 + (1-P)U_3 - PU_4 + (\pi - P)U_5 = 0. \quad (4)$$

Assume that the second-order condition of Equation (4) holds. The following theorem states the relationship between the optimum in the private market and the social optimum:

Theorem 2 The equilibrium of the private insurance market is smaller than (equal to, larger than) the social optimum, if $(1-P)U_3 - PU_4 + (\pi - P)U_5 > (=,<)0$.

Proof

Let Q^* denote the interior solution of Equation (3). Define the right-hand side of Equation (4) as $\Gamma(Q)$. Thus, $\Gamma(Q^*) = (1-P)U_3 - PU_4 + (\pi - p)U_5$. Thus,

$\Gamma(Q^*) > (=,<)0$ if $(1-P)U_3 - PU_4 + (\pi - P)U_5 > (=,<)0$. If the second-order condition holds, then $\Gamma(Q^*) > (=,<)0$ implies that the equilibrium in the private insurance market is smaller than (equal to, larger than) the social optimum.

Q. E. D.

Lemmas 4, 5, and 6 further elaborate Theorem 2.

Lemma 4 *Given that* $U_3 = U_4 = 0$,

(i) *the equilibrium in the private insurance market is socially optimal, if the price of the insurance is actuarially fair (* $P = \pi$ *).*

(ii) *the equilibrium in the private insurance market is smaller than the social optimum, if the price of the insurance is not actuarially fair (* $P > \pi$ *) and* $U_5 < 0$.

Proof If $P = \pi$, then Equation (3) is identical to Equation (4) in the case of $U_3 = U_4 = 0$. Thus, the equilibrium of the private insurance market is socially optimal. On the other hand, if $P > \pi$ and $U_5 < 0$, then $\Gamma(Q^*) = (\pi - P)U_3 > 0$ given that $U_3 = U_4 = 0$.

Q. E. D.

Lemma 4 discusses the case where individuals only take the average wealth level into account while making interpersonal comparisons. In Lemma 4, we first show that, under the consumption externality, the equilibrium of the private insurance market is socially optimal, if the price of the insurance is actuarially fair. The intuition is straightforward. If the price of the insurance is actuarially fair, the per capita average consumption is fixed. Since the decision regarding the insurance is not related to the source of the consumption externality, the actuarially fair price eliminates the consumption externality. In our model, it is not necessary for the individual to purchase full insurance when the price of the insurance is actuarially fair. Thus, the actuarially fair price makes the equilibrium in the private market socially optimal even if the optimal equilibrium in the private insurance market does not represent full insurance.

In Lemma 4, we show that, under a consumption externality, the optimal insurance quantity that a jealous individual purchases in the private market is lower than the corresponding socially optimal insurance quantity if the price of the insurance is not actuarially fair. Note that an increase in the amount of the insurance decreases the per capita average consumption when the price of the insurance is not actuarially fair. Since the preference of the individual exhibits jealousy, an increase in the insurance amount increases the utility of the individual through the consumption externality. Thus, when the individual makes the insurance decision in the private market, the individual will under-insure the loss because he or she ignores the consumption externality.

Lemma 5 *If* $U_5 = 0$, the equilibrium in the private insurance market is smaller than the social optimum, if $\frac{U_3}{U_1} > \frac{U_4}{U_2}$.

Proof If $U_5 = 0$, $\Gamma(Q^*) = (1-P)U_3 - PU_4$. Notice that $(1-P)U_1 = PU_2$ from Equation (3). Since $U_1 > 0$, $U_2 > 0$, by dividing the two sides of $(1-P)U_3 > PU_4$ by

$(1-P)U_1$ and PU_2, we can find that $\Gamma(Q^*) > 0$ if $\frac{U_3}{U_1} > \frac{U_4}{U_2}$. ***Q. E. D.***

Lemma 5 focuses on the cases where individuals care about other people's wealth levels at the loss and no-loss states, but not the average wealth level while making interpersonal comparisons. Our results differ from those of Dupor and Liu (2003) who found that, in the model of consumption and labor, jealousy causes the individual to over-consume. From Lemma 5, we find that, in the insurance model, given that $U_5 = 0$, jealousy is neither a sufficient nor a necessary condition for the individual to be under-insured. Notice that $\frac{U_3}{U_1} > \frac{U_4}{U_2}$ may not hold when $U_3 < 0$ and $U_4 < 0$. $\frac{U_3}{U_1} > \frac{U_4}{U_2}$ can still hold when $U_3 > 0$ or $U_4 > 0$. Interestingly, $\frac{U_3}{U_1} > \frac{U_4}{U_2}$ always holds if $U_3 > 0$ and $U_4 < 0$. In other words, if the preference of the individual exhibits admiration in regard to the per capita consumption in the loss state and jealousy in the per capita consumption in the no-loss state, then the individual always under-insures his own loss.

It is very important to recognize that, in the insurance market modeled in this case, there are two sources of consumption externality, one from the loss state and the other from the no-loss state. On the other hand, in the labor-consumption market described by Dupor and Liu (2003), there is only one source of consumption externality. Thus, Dupor and Liu (2003) only need the condition of jealousy to determine the sign of over-consumption, whereas we need to compare two marginal rates of substitution to determine the results of the consumption externality in the insurance market.

Lemma 6 *If* $P = \pi$, the equilibrium in the private insurance market is smaller than the social optimum, if $(1-P)U_3 - PU_4 > 0$ or $\frac{U_3}{U_1} > \frac{U_4}{U_2}$.

Proof If $P = \pi$, $\Gamma(Q^*) = (1-P)U_3 - PU_4$. Thus, from Lemma 5, it is obvious that the condition for equilibrium under-insurance in this case is the same as in Lemma 5.

Q. E. D.

Lemma 6 provides an important result in that, under an actuarially fair premium, the social planner might think that the individuals are either under- or over-insured. Thus, a social welfare maximizing government would have an incentive to design a mechanism to "correct" the coverage level, even if the insurance price in the private market is actuarially fair.

Furthermore, we would like to show that a government might make individuals better off by forcing those individuals to deviate from full coverage when the relative wealth level could influence the individuals' utility. Assume that $U(W_L, W_N, W_{AL}, W_{AN}, W_A) = \pi u(W_L, W_{AL}, W_{AN}, W_A) + (1-\pi) u(W_N, W_{AL}, W_{AN}, W_A)$, where u denotes the utility function in both the loss and no-loss states. It is easy to show that the optimum in the private market is full insurance if the insurance price is actuarially fair ($P = \pi$). In this case, we know that the equilibrium in the private market is larger than the social optimum if $(1-\pi)U_3 - \pi U_4 < 0$. Thus, even though the individuals purchase full coverage, the optimum in the private market is not socially optimal and the government may have an incentive to push the individual away from full coverage in order to improve social welfare.

5. Optimal Tax Deduction

In this section, to analyze the intervention of the government, we will focus on the cases where equilibrium under-insurance exists, i.e., $(1-P)U_3 - PU_4 + (\pi - P)U_5 > 0$. Assume that the government could provide individuals with a tax deduction. Two types of tax deduction prevail in the insurance market. The first one is a tax deduction for the insurance premium and the other is a tax deduction for the individuals' net losses. Suppose that the government chooses to provide a tax deduction for both the individuals' net losses and the insurance premium with tax deduction rates of $1 \geq t_1 \geq 0$ and $1 \geq t_2 \geq 0$, respectively. The tax deduction is financed by a lump-sum tax K. Thus,

$$W_L = W - (L - Q)(1 - t_1) - PQ(1 - t_2) - \mathrm{K},$$

$$W_N = W - PQ(1 - t_2) - \mathrm{K},$$

$$W_{AL} = W - (L - Q_A)(1 - t_1) - PQ_A(1 - t_2) - \mathrm{K},$$

$$W_{AN} = W - PQ_A(1 - t_2) - \mathrm{K}, \text{ and}$$

$$W_A = W - \pi(L - Q_A)(1 - t_1) - PQ_A(1 - t_2) - \mathrm{K}.$$

The individual chooses Q to maximize $U(W_L, W_N, W_{AL}, W_{AN}, W_A)$, taking W_{AL}, W_{AN}, W_A, t_1, t_2, and K as given. Again it is assumed that $U(W_L, W_N, W_{AL}, W_{AN}, W_A)$ is concave in Q. The first-order condition in the private insurance market is

$$[1 - t_1 - P(1 - t_2)]U_1 - [P(1 - t_2)]U_2 = 0. \tag{8}$$

Notice that Equation (8) can never become Equation (4) if $t_1 = t_2$. Thus, we can conclude that a tax deduction cannot correct the consumption externality if $t_1 = t_2$. Thus, the optimal tax deduction rates will never set $t_1 = t_2$. By comparing Equation (8) with Equation (4), the optimal tax deduction that is set is

$$-t_1U_1 + Pt_2(U_1 + U_2) = (1 - P)U_3 - PU_4 - (\pi - P)U_5. \tag{9}$$

From Equation (9), $t_2 = \dfrac{(1 - P)U_3 - PU_4 - (\pi - P)U_5}{P(U_1 + U_2)} + \dfrac{U_1}{P(U_1 + U_2)}t_1 > 0$. The first term is positive under our assumption. In the second term, $\dfrac{U_1}{P(U_1 + U_2)}$ is also positive. Moreover, the government will never set $t_1 = t_2$ because in that case Equation (8) will equal Equation (3), which means that the tax deduction cannot correct the consumption externality. Since the intercept of t_2 is positive and the optimal tax deduction rates will never set $t_1 = t_2$, t_1 is always smaller than t_2, if the optimal tax deduction exists in the setting of $1 \geq t_1 > 0$ and $1 \geq t_2 > 0$.

Notice that, if $t_2 = 0$, Equation (9) can never hold when $1 \geq t_1 \geq 0$. Thus, the optimal amount of t_1 is larger than zero, only if the optimal amount of t_2 is larger than zero. Kaplow (1992) showed that providing a deduction for the individual's net losses is Pareto inferior, since it distorts the individual's incentive in regard to purchasing insurance in the private market. In our paper, we find that the tax deduction on individual net losses cannot be employed alone to fix the consumption externality but could be integrated with a tax deduction in relation to the insurance premium to correct for the consumption externality in the insurance market.

5. Conclusions

In this paper, we follow the framework of Dupor and Liu (2003) to analyze the relationship between a consumption externality and equilibrium under-insurance. In the case where the utility of the individual is not related to average per capita consumption, we find that the individual will be under-insured if the marginal rate of substitution between the consumption in the loss state and the per capita consumption in the loss state is larger than that between the consumption in the no-loss state and the per capita consumption in the no-loss state. We show that jealousy is neither a sufficient nor a necessary condition for equilibrium under-insurance. In the case when the average per capita consumption is the only source of the consumption externality and the insurance is actuarially unfair, the individual will be under-insured when the utility of the individual exhibits jealousy.

Since the consumption externality could break down the social optimum and the optimum in the private market, it provides room for the government to improve social welfare. We thus identify the conditions for an optimal tax deduction. To be specific, we show that, to correct for equilibrium under-insurance, the optimal tax deduction rate in regard to the individual's net losses should be lower than the optimal tax deduction rate related to the insurance premium.

Our paper contributes to the literature by linking the consumption externality with the equilibrium under-insurance. Our results can hold for a generally large set of individual preferences. We also provide workable mechanisms and identify the conditions to enable the government to reach a social optimum. Since we no longer assume asymmetric information and individual heterogeneity, including these factors in the model would be an obvious extension of our paper. A dynamic model with an endogenous labor supply could also be incorporated in a future study.

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