

# Taxpayer, Tax Evader, and Income Taxation\*

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This paper analyzes the number of tax evaders by focusing on the individual's moral stigma which implies the feeling of guilt accompanying tax evasion. When the income tax rate rises, we conclude that the number of tax evaders increases even if the amount of tax evasion per capita shrinks.

## 1 Introduction

Over the past few years, several studies have discussed the number of tax evaders. Watson (1985) took the lead in their investigations. He pointed out that the preceding works such as Allingham and Sandmo (1972) had ignored the interaction between tax evasion and labor markets, while they had provided a number of useful insights about a tax evader's behavior. He considered the two labor sector model: the sector where tax evasion is assumed to be possible and the other in which it is not. He investigated the number of workers in the tax evadable sector in order to see the above interaction. Applying the analysis of Watson (1985), Jung et al. (1994) showed that the effect of income tax on the number of workers in the tax evadable sector depends on the Arrow-Pratt measure of relative risk aversion and the income level in the equilibrium<sup>1)</sup>. Pestieau and Possen

(1991) considered that a tax evader has his or her uncertain pretax income, and they confirmed the importance of the measure of relative risk aversion for the number of workers in each sector.

However, very few studies have focused on how many people actually evade taxes in the tax evadable sector. All of the self-employed should not always be tax evaders. What is important in discussing tax evasion is to show how many people evade paying taxes and how much of their earnings they disguise.

To answer the above problems, we introduce the notion of a non-pecuniary cost of evasion such as moral stigma. We obtain the following results. First, we reconcile an inconsistency between the theoretical findings and the empirical findings. In reality there are honest taxpayers who report their true income to tax authorities while the standard model predicts that any taxpayer evades as long as the tax evasion

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\* Received for publication September 17, 2003. Revision accepted for publication November 8, 2004.  
(Editor)

game is in his or her favor. Second, we show the effects of policy instruments on the number of tax evaders in the viewpoint which is different from the preceding works. The number of tax evaders increases even if the amount of tax evasion per capita shrinks when the income tax rate rises. We will be able to conclude as follows from our discussion. In determining a policy regarding income taxation, we should consider the question whether we had better decrease the amount of tax evasion per capita or we had better decrease the number of tax evaders.

This paper is organized as follows. Section 2 introduces our model. In section 3, the individual's behavior regarding tax evasion is analyzed. In section 4, we discuss the number of tax evaders. Section 5 closes the paper with some concluding remarks.

## 2 The model

Individuals are distributed uniformly about the parameter  $n$  over  $[0, \bar{n}]$ . This parameter can be regarded as the marginal disutility of tax evasion. For example, if  $n=0$ , the individual has no morals, and he or she strongly attempts to evade paying taxes. On the other hand, if  $n=\bar{n}$ , the individual shows the strongest possible compliance with the government, and will declare his or her income the most honestly. Each individual derives his or her utility from private consumption and disutility

from cheating. We have the preference for the individual who is denoted by  $n$  as follows,

$$V(C^n) = EU(C^n) - n(y - x^n), \quad (1)$$

where  $C^n$  is private consumption, and  $EU(C^n)$  denotes the expected utility of consumption.  $y$  is the actual income which is given exogenously. We assume that the marginal disutility of tax evasion which each individual has is constant, and that an individual disutility of tax evasion depends on the individual's evaded income.  $EU(C^n)$  is denoted as

$$EU(C^n) = (1-p)U(C^{\bar{n}}) + pU(C^{\underline{n}}), \quad (2)$$

where  $p$  is the audit rate,  $0 \leq p \leq 1$ . The individual consumes  $C^{\bar{n}}$  if he or she is not audited. But if the individual is audited, the government gets to know the exact amount of his or her actual income, and the individual consumes  $C^{\underline{n}}$  which is less than  $C^{\bar{n}}$ .  $C^{\bar{n}}$  and  $C^{\underline{n}}$  are given by

$$C^{\bar{n}} = y - tx^n, \quad (3)$$

$$C^{\underline{n}} = y - tx^n - ft(y - x^n), \quad (4)$$

where  $t$  is the general income tax rate,  $1 > t > 0$ .  $x^n$  is the declared income of individual  $n$ ,  $0 \leq x^n \leq y$ , and the fine rate  $f$  is imposed on the evaded tax if the individual is audited. We assume that  $f$  is exogenously given and  $f > 1$ .

## 3 The individual's behavior

Although we are concerned with the number of tax evaders, before we turn to this discussion, it will be useful to discuss the behavior of the individual who avoids

paying taxes.

Consider an individual who is denoted by  $n$ . If the individual intends to evade taxes, he or she choose  $y > x^n > 0$ . According to Allingham and Sandmo (1972), we have the conditions for an interior solution of tax evasion as

$$\frac{\partial V(C^n)}{\partial x} \Big|_{y=x} = -\frac{\partial U}{\partial C}(1-pf)t + n < 0$$

and

$$\frac{\partial V(C^n)}{\partial x} \Big|_{x=0} = -\left( (1-p)\frac{\partial U}{\partial C_N} \Big|_{x=0} + p(1-f)\frac{\partial U}{\partial C_A} \Big|_{x=0} \right) t + n > 0,$$

where  $C \equiv y(1-t) = C_N \Big|_{y=x} = C_A \Big|_{y=x}$ . These conditions can be rewritten as

$$pf < 1 - \frac{n}{t(\partial U/\partial C)} \quad (5)$$

and

$$pf > \left( p + (1-p)\frac{\partial U/\partial C_N \Big|_{x=0}}{\partial U/\partial C_A \Big|_{x=0}} - \frac{n}{\partial U/\partial C_A \Big|_{x=0}} \right) \quad (6)$$

(5) and (6) show that the alternative to tax evasion for each individual also depends on the parameter  $n$ . For example, if  $n=0$ , (5) becomes  $pf < 1$ . On the other hands, it may become  $pf < 1 - \frac{\bar{n}}{t\partial U/\partial C}$  if  $n=\bar{n}$ . This implies that he or she may declare honestly even if  $pf$  is sufficiently small.

If the individual denoted by  $n$  evades taxes, he or she chooses a declared income in order to maximize the expected utility subject to (5) and (6). The first-order condition for the individual's problem is given by

$$t\left(- (1-p)\frac{\partial U}{\partial C_N} + p\frac{\partial U}{\partial C_A}(f-1)\right) + n = 0. \quad (7)$$

In preceding works, the individual's evading behavior depends on risk preference and policy instruments<sup>2)</sup>. Equation (7) shows that the individual's behavior also depends on the parameter  $n$  in our model.

#### 4 The number of tax evaders

The above discussion teaches us that a parameter  $n$  is an important factor in an individual's evading behavior. With the discussion of the above section in mind, we will now take a look at the number of tax evaders in the economy.

Now, let  $n_1$  denotes an individual who satisfies  $pf = 1 - \frac{n}{t\partial U/\partial C}$ . If an individual's  $n$  is higher than  $n_1$ , he or she does not evade taxes. To the contrary, an individual who has less  $n$  than  $n_1$  evades taxes. Thus we can express the number of tax evaders as

$$\int_0^{n_1} dn = n_1. \quad (8)$$

We can see easily that the number of tax evaders is decided according to the following equation.

$$pf = 1 - \frac{n_1}{t\partial U/\partial C}. \quad (9)$$

Using (8) and (9), we can obtain the following results<sup>3)</sup>,

$$\frac{dn_1}{dp} = -tf\frac{\partial U}{\partial C} < 0, \quad (10)$$

$$\frac{dn_1}{dt} = (pf-1)\frac{\partial U}{\partial C}\left(1 - tf\frac{\partial^2 U/\partial C^2}{\partial U/\partial C}\right) > 0. \quad (11)$$

Equation (10) implies that the number

of honest taxpayers decreases if the audit rate rises. Equation (11) shows that the number of tax evaders increases when the tax rate rises. Preceding works point out that the effect of taxation on the individual's evading behavior depends on the difference between  $R(C_A^*)$  and  $R(C_N^*)$ . For example, Yitzhaki (1974) shows that the amount of tax evasion decreases with the tax rate on the constant or decreasing measure of absolute risk aversion, but such effect is ambiguous if the measure of absolute risk aversion is increasing<sup>4)</sup>. Our result and the indication in preceding works show the following proposition.

#### Proposition

Let us pay attention to the number of taxpayers who avoid paying taxes. First, strengthening the audit decreases the number of tax evaders. Second, the number of tax evaders increases with the tax rate even if the amount of tax evaded per capita shrinks.

Our discussion above implies that the audit rate has the effect of suppressing tax evasion. When the audit rate rises, each individual declares more honestly, and the number of tax evaders decreases. On the other hand, when a tax rate increases, the number of tax evaders increase even if the amount of tax evaded per capita shrink. This result is caused by the difference between the factors deciding whether an individual evades taxes or not and those

deciding the amount of individual's tax evasion. The latter depends on whether the measure of absolute risk aversion increases or decreases, but the former does not.

#### 5 Concluding remarks

By introducing the parameter which reflects the feeling of guilt caused by tax evasion, we investigate about two purposes. First, we analyze an individual's decision-making problem concerning the choice of whether or not he or she evades paying taxes. Second, we show how the number of tax evaders depends on policy instruments.

This paper shows that the alternative about whether an individual evades taxes or not does not depends on whether the measure of absolute risk aversion increases or decreases while the amount of individual's tax evasion depends on it. Hence there may be a state in which the number of tax evaders increases even if the amount of tax evasion per capita shrinks. This indication suggests the following: In determining a policy regarding income taxation, we need to consider the question whether we should decrease the amount of tax evasion per capita or we should decrease the number of tax evaders.

In this paper, we assume that every individual's income level is identical and exogenous. This assumption is worthy of further scrutiny. Three problems remain to be dealt with in detail. First, if each

individual's income is decided endogenously, we must consider not only illegal tax evasion but also the choice of leisure time as legal tax evasion<sup>5)</sup>. Second, we should consider that the ease with which an individual is able to avoid paying taxes varies among different work sectors. Third, we should consider that the policy instruments may differ among individuals<sup>6)</sup>. All these points need to be discussed.

## Appendix

Here, we show how equation (11) can be derived. Differentiating (9) yields

$$\left( (pf-1) \frac{\partial U}{\partial C} - (pf-1)ty \frac{\partial^2 U / \partial C^2}{\partial U / \partial C} \right) dt = dn_1$$

We obtain equation (11) by arranging this differentiation.

## Notes

- 1) They have discussed by assuming that the pre-tax income in each sector depends on the allocation of workers between the sectors.
- 2) We can obtain the result of comparative statics by the same method as Allingham and Sandmo (1972) and Yitzhaki (1974). Since we concern the number of tax evaders, we does not explain their results in detail. See Allingham and Sandmo (1972), Yitzhaki (1974), Yaniv (1994) and Lin and Yang (2001) about the effect of policy instruments on an individual evading behavior.
- 3) In Appendix, we show how equation (11) can be derived.
- 4) Whether Yitzhaki's suggestion is proper or not for the real world is open to discussion. See

- Balassone and Jones (1998) about this problem.
- 5) Cowell (1985) discusses the individual's behavior of tax evasion by internalizing labor time.
- 6) The tax authority may select the suitable enforcement effort according to the individual's characteristics. Clotfelter (1983) pointed out that the individual's evading behavior is various on the differences of age and occupation etc.

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