Tax Evasion and Relative Contribution*

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Abstract

This paper analyzes the relationship between tax rate levels and tax evasion in a context where the utility of a taxpayer depends on both his own consumption and his relative position with respect to the average declared income of the economy. In this framework, if the taxpayer declares an amount of his income greater (smaller) than the average of the economy, his utility will decrease (increase). I show that if the externality from the others' declared income is large enough, then an increase in the tax rate leads to more evasion.

Key words: Tax evasion, relative tax contribution.

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1. Introduction

The sign of the relationship between the tax rate level and the amount of income declared by taxpayers is one of the questions that still is not resolved nowadays. Allingham and Sadmo (1972) introduced the portfolio approach to solve the individual tax evasion problem and showed that, under decreasing absolute risk aversion, the sign of the relationship between the amount of declared income and the tax rate is ambiguous when the fine imposed on caught evaders is proportional to the amount of income concealed from the tax authority. However, Yitzhaki (1974) found that a rise in the tax rate increases the amount of declared income under decreasing absolute risk aversion when the fine paid by an audited evader is proportional to the amount of evaded taxes. This modification of the original model generates thus an unambiguous result which has not been supported by the empirical evidence, since several studies have documented that higher tax rates tend to stimulate tax evasion.[1] Many authors, such as Beck and Jung (1989), Landskroner, Proush and Swary (1990), Wrede (1995), Lee (2001), and Panadés (2001), among others, have searched for alternative models aimed at explaining this evident contradiction between the empirical findings and the theoretical ones.[2]

The objective of this paper is to present another alternative framework where it is possible to obtain a negative relationship between declared income and tax rate levels in equilibrium. To this end, I modify the basic portfolio model of tax evasion by assuming that the utility of a taxpayer depends on both his consumption and his relative position with respect to the average declared income of the economy.

Several economic models have used the assumption that the relative position of an individuals in his community affects his felicity. The most relevant example can be found in the theory of asset pricing where some authors have assumed that one of the arguments of the utility function of an agent is the ratio between his private consumption and the average consumption of the economy (see Galí (1994) and Abel (1999)). This departure from the traditional formulation of the utility function allows these authors to obtain a possible resolution of the equity premium puzzle posed by Mehra and Prescott (1985).[3] This kind of "keeping up with the Joneses" feature is

[1] Clotfelter (1983) and Poterba (1987) report a positive relation between tax rate and undeclared income using a real income data base.

[2] Slemrod (1985) and Klepper, Nagin and Spurr (1991) cast some doubts on the results obtained by some of these authors, since they argue that it is not possible to distinguish between the effect of the tax rate on evaded income and the overall effect of other variables that are also relevant for the problem under consideration.

[3] Several recent papers in macroeconomics have analyzed the dynamic effects of introducing relative consumption as an argument in the utility function (see Ljungqvist and Uhlig (2000), Carroll, Overland, and Weil (1997) and de la Croix (1998)).

also present in our tax evasion problem since individuals will care about their relative tax contribution. More precisely, I will assume that a taxpayer derives negative utility from paying more taxes than the average taxpayer.

In this context, when a taxpayer declares an amount of his income greater (smaller) than the average of the economy, his utility will decrease (increase). The introduction of this externality from the others' declared income generates an additional negative effect on a taxpayer's willingness to report his true income. This new effect could offset the positive income effect associated with an increase in the tax rate. In this case, I will show that, when the tax rate increases, taxpayers could end up reporting less income under decreasing absolute risk aversion.

The next section presents a model of tax evasion where the relative tax contribution affects the utility of taxpayers. Section 3 performs the corresponding comparative statics exercise. The final section offers some concluding remarks.

2. The Model

Let us consider the standard Allingham and Sadmo (1972) model of tax evasion. There is a continuum of agents who are identical ex-ante. Each individual has an exogenously true income y which is subjected to a flat tax rate $\tau \in (0,1)$. Let be x the amount of income declared by the taxpayer. The tax authorities audit the tax reports with an exogenous probability $p \in (0,1)$ and, if such an investigation takes place, the true income y is always discovered. In this case, the taxpayer has to pay a proportional fine $\pi > 1$ on the amount of evaded taxes. This specification of the tax evasion problem is thus the same as that of Yitzhaki (1974).

I assume that taxpayer's utility depends on both his contingent consumption and his relative position with respect to the average declared income in the economy. In particular, I assume that the utility of a taxpayer diminishes when he is declaring an amount greater than the average of the other taxpayers. This kind of externality accruing from the others' reported income captures the idea that taxpayers care about their relative position in the economy. Note that, since tax rates are flat, we could replace the assumption that individuals care about their relative report with the equivalent assumption that they care about their relative position in terms of voluntary tax contributions.

The preferences of a taxpayer are represented by an additive expected utility function

$$E\left[U\left(\tilde{C}, \frac{x}{\overline{x}}\right)\right] = (1-p)u\left(C^N\right) + pu\left(C^Y\right) + V\left(\frac{x}{\overline{x}}\right),$$

where $C^N = y - \tau x$ denotes the consumption in the case that the taxpayer is not audited, $C^Y = y - \tau x - \pi\tau(y-x)$ is the consumption when the taxpayer is audited, and $\overline{x}$ is the average declared income of the economy.

I assume that the Bernouilli utility u satisfies $u' > 0$ and $u'' < 0$. Moreover, for tractability, I will also assume a linear functional form for the function V,

$V\left(\frac{x}{\overline{x}}\right) = -\gamma\left(\frac{x}{\overline{x}}\right)$, where the parameter $\gamma > 0$ measures the importance of the relative tax contribution.[4] Taking as given the average report $\overline{x}$, each individual chooses the amount x of declared income in order to maximize

$$(1-p)u\left(C^N\right) + pu\left(C^Y\right) - \gamma\left(\frac{x}{\overline{x}}\right). \tag{2.1}$$

The first-order condition for the maximization of (2.1) is

$$-\tau(1-p)u'\left(C^N\right) + \tau(\pi-1)pu'\left(C^Y\right) - \gamma\left(\frac{1}{\overline{x}}\right) = 0. \tag{2.2}$$

The second-order condition,

$$D \equiv (-\tau)^2(1-p)u''\left(C^N\right) + \tau^2(\pi-1)^2pu''\left(C^Y\right) < 0,$$

is clearly satisfied since $u'' < 0$.

To obtain the restrictions on the parameter values of the model yielding an interior solution, I evaluate the first order condition at $x = 0$ and $x = y$. Since (2.1) is a concave function of x, the following two conditions should be met in order to obtain an optimal report such that $x \in (0, y)$:

$$\tau(\pi-1)pu'\left[y(1-\tau\pi)\right] > \tau(1-p)u'(y) + \gamma\left(\frac{1}{\overline{x}}\right),$$

and

$$p\pi < 1.$$

I restrict thus my analysis to a parameter configuration where the previous two inequalities are satisfied.[5]

3. Effects on Tax Evasion of Changes in the Tax Rate

As a first step towards examining the sign of the relation between reported income and tax rates, we need to find the equilibrium of this economy. As all taxpayers are identical, in equilibrium it holds that $\overline{x} = x$. As a consequence, the first-order condition (2.2) becomes in equilibrium

$$-\tau(1-p)u'\left(C^N\right) + \tau(\pi-1)pu'\left(C^Y\right) - \gamma\left(\frac{1}{x}\right) = 0,$$

which can be rewritten as

$$-\tau(1-p)xu'\left(C^N\right) + \tau(\pi-1)pxu'\left(C^Y\right) - \gamma = 0. \tag{3.1}$$

[4] The results obtained in this paper would also hold under a concave specification of the function V, like $V\left(\frac{x}{\overline{x}}\right) = -\gamma\left(\frac{x}{\overline{x}}\right)^\alpha$, with $\alpha \in (0,1)$, under a restriction on the value of the parameter α.

[5] Note that if we assume $\lim_{C\to 0} u'(C) = \infty$, then $\tau\pi > 1$ becomes a sufficient condition for reporting a strictly positive income.

Therefore, when the externality on average declared income is present, the effect of an increase in the tax rate on reported income is given by the following expression, which is obtained from implicitly differentiating (3.1) :

$$\frac{\partial x}{\partial \tau} = \frac{(1-p)xu'\left(C^N\right)-\tau(1-p)x^2u''\left(C^N\right)-(\pi-1)pxu'\left(C^Y\right)+\tau(\pi-1)px(x+\pi(y-x))u''\left(C^Y\right)}{Dx-\tau(1-p)u'(C^N)+\tau(\pi-1)pu'(C^Y)}. \tag{3.2}$$

The following proposition gives us the sign of the previous derivative:

Proposition 1. *Assume that the utility function exhibits decreasing absolute risk aversion (DARA) and* $\pi\tau < 1$. *Then, there exists a real number* $\gamma^* > 0$ *such that* $\dfrac{\partial x}{\partial \tau} < 0$ *for all* $\gamma \geq \gamma^*$.

Proof. See the Appendix.

This result tells us that an increase in the tax rate leads to less reported income in equilibrium when the external effect from the others' report is large enough. The intuition behind Proposition 1 lies in the combination of two opposite effects. First, we have the effect associated with an increase in the tax rate. When the fine is imposed on the amount of evaded taxes, the penalty rate increases proportionally with τ and, therefore, there is no incentive to substitute evasion for honesty. Thus, we are left with a pure income effect, and the sign of this effect depends on the behavior of the taxpayer's index of absolute risk aversion. In particular, this income effect is positive under DARA since, when the wealth diminishes as a consequence of an increase in the tax rate, the absolute risk aversion goes up and, thus, the taxpayer tends to evade less in order to reduce his risk exposure.

Second, we have the effect associated with the variation of the relative declared income. An increase in the amount of his declared income places a taxpayer in a worse relative position with respect to the other taxpayers and, thus, his utility diminishes. Therefore, the externality from the others' reports makes taxpayers to reduce the amount of their reported income.

The sign of expression (3.2) depends on the importance of the two effects discussed above. In particular, Proposition 1 tells us that if the externality effect, as measured by the value of the parameter γ, is large enough, it will offset the income effect and, therefore, an increase in the tax rate will result in less tax evasion. Note that this negative relation between x and τ agrees with the aforementioned empirical findings. Notice that in Yitzhaki (1974) the sign of the derivative (3.2) was unambiguously positive under DARA, while I have obtained the opposite result under sufficiently strong externalities.

It is important to remark the relevance of the assumption $\pi\tau < 1$. The fee paid by an audited taxpayer is implausibly large when $\pi\tau > 1$ and, in this case, it can be shown that, under the assumption of DARA and relative risk aversion larger than one, the income effect always offsets the externality effect. Therefore, we recover the original result of Yitzhaki in this scenario.

The see whether the effect of an increase in the tax rate on tax evasion is sensitive to the penalty structure, let us consider the case in which the penalty rate $\hat{\pi}$ is imposed on the amount of unreported income, as in Allingham and Sadmo (1972). Needless to say, most of the real tax systems around the world impose fines on the amount of evaded taxes rather than on the amount of income concealed from the tax authority. In what follows, I will carry out the same analysis as I did under the (much more realistic) penalty specification of Yitzhaki. Note that the two penalty structures are directly related since $\pi = \widehat{\pi}\tau$.

The consumption when the taxpayer is not audited is again $C^N = y - \tau x$, but the consumption if the inspection takes place will be

$$C^Y = y - \tau x - \hat{\pi}(y - x),$$

where $\hat{\pi} > \tau$.[6] The first-order condition (2.2) becomes now

$$-\tau(1-p)u'\left(C^N\right) + (\hat{\pi} - \tau)pu'\left(C^Y\right) - \gamma\left(\frac{1}{\overline{x}}\right) = 0. \tag{3.3}$$

The second-order condition

$$\widehat{D} \equiv (-\tau)^2 (1-p)u''\left(C^N\right) + (\hat{\pi} - \tau)^2 pu''\left(C^Y\right) < 0,$$

is also satisfied by the assumption of concavity of u.

In this case the conditions on parameter values required for an interior solution of the previous problem are

$$(\hat{\pi} - \tau)pu'\left[y(1-\hat{\pi})\right] > \tau(1-p)u'(y) + \gamma\left(\frac{1}{\overline{x}}\right),$$

and

$$p\hat{\pi} < \tau.$$

I restrict again my analysis to a parameter configuration where the previous two inequalities hold.

Applying the equilibrium condition $x = \overline{x}$ on (3.3), we get

$$-\tau(1-p)xu'\left(C^N\right) + (\hat{\pi} - \tau)pxu'\left(C^Y\right) - \gamma = 0. \tag{3.4}$$

The impact of a tax increase on declared income is given by the sign of the following derivative obtained from implicit differentiation of (3.4) :

$$\frac{\partial x}{\partial \tau} = \frac{(1-p)xu'\left(C^N\right) - \tau(1-p)x^2u''\left(C^N\right) + pxu'\left(C^Y\right) + (\hat{\pi}-\tau)px^2u''\left(C^Y\right)}{\widehat{D}x - \tau(1-p)u'(C^N) + (\hat{\pi}-\tau)pu'(C^Y)}. \tag{3.5}$$

The following proposition provides the sign of expression (3.5) :

[6] This penalty formulation requires that $\hat{\pi} > \tau$ since, otherwise, tax evasion would not be punished.

Proposition 2. *Assume that the utility function exhibits decreasing absolute risk aversion (DARA) and* $\hat{\pi} < 1$*. There exists a real number* $\gamma^{**} > 0$ *such that* $\dfrac{\partial x}{\partial \tau} < 0$ *for all* $\gamma \geq \gamma^{**}$.

Proof. See the Appendix.

We also obtain in this case that, if the importance for taxpayers' utility of the relative tax contribution is sufficiently large, then an increase in the tax rate results in less reported income in equilibrium. It should be noticed that in this context there exists a substitution effect, since fines do not longer depend on the tax rate and, hence, an increase in the later generates incentives to substitute evasion for honesty . This effect strengthens those already present for the case where fines were proportional to the amount of evaded taxes. Therefore, it should not be surprising that the kind of result of Proposition 1 survives to this alternative modelization of the penalty structure.

4. Concluding Remarks

In this paper I have made a new attempt to explain the apparent contradiction between the results obtained by the traditional models of tax evasion and the empirical evidence about the reaction of taxpayers to changes in tax rate levels. While the theory predicts that reported income increases with tax rates, the empirical evidence runs in the opposite direction. An obvious strategy to resolve this contradiction is to endow the basic model with new elements aimed to better capture some features of taxpayer behavior. Along this line of research, in this paper I have considered an equilibrium model where the utility function of a taxpayer depends both on the amount of his own consumption and on his relative tax contribution. My analysis shows that an increase in the tax rate could induce taxpayers to raise the amount of unreported income provided this taxpayer attaches sufficiently high marginal disutility to paying an amount of taxes larger than the average contribution of the other taxpayers.

A. Appendix

Proof Proposition 1. Substituting (3.1) into (3.2) , we have that

$$\frac{\partial x}{\partial \tau} = \frac{-\gamma\left[\frac{1}{\tau}+(x+\pi(y-x))R_A\left(C^Y\right)\right]-\tau(1-p)xu'\left(C^N\right)\left[(x+\pi(y-x))R_A\left(C^Y\right)-xR_A\left(C^N\right)\right]}{Dx+\gamma\left(\frac{1}{x}\right)}, \tag{A.1}$$

where $R_A(C) = \dfrac{-u''(C)}{u'(C)}$ is the Arrow-Pratt index of absolute risk aversion. The numerator of (A.1) is unambiguously negative under DARA since, $x + \pi(y - x) > x$. The denominator of (A.1) will be positive if

$$\gamma > -Dx^2. \tag{A.2}$$

Since DARA implies that $u''' > 0$, it is immediate to see that a sufficient condition for (A.2) is

$$\gamma \geq \gamma^*,$$

where $\gamma^* = y^2 \left[-u'' \left(y \left(1 - \tau\pi\right)\right)\right] \left[(1 - p) + p(\pi - 1)^2\right]$. ■

Proof of Proposition 2. Substituting (3.4) into (3.5) , we get

$$\frac{\partial x}{\partial \tau} = \frac{-\gamma x R_A\left(C^Y\right)+(1-p)xu'\left(C^N\right)+pxu'\left(C^Y\right)-\tau(1-p)x^2u'\left(C^N\right)\left[R_A\left(C^Y\right)-xR_A\left(C^N\right)\right]}{\widehat{D}x+\gamma\left(\frac{1}{x}\right)}. \tag{A.3}$$

Under DARA, the numerator of (A.3) will be negative if

$$\gamma > \frac{(1 - p)xu'\left(C^N\right) + pxu'\left(C^Y\right)}{xR_A\left(C^Y\right)}. \tag{A.4}$$

A sufficient condition for (A.4) is

$$\gamma \geq \frac{u'\left(y(1 - \hat{\pi})\right)}{R_A\left(y\right)}, \tag{A.5}$$

since I have assumed that the index of absolute risk aversion is decreasing and $u'' < 0$. The denominator is positive if

$$\gamma > -\widehat{D}x^2.$$

Since the assumption of DARA implies that $u''' > 0$, it is easy to check that a sufficient condition for obtaining a positive denominator in expression (A.3) is

$$\gamma \geq y^2 \left[-u'' \left(y \left(1 - \hat{\pi}\right)\right)\right] \left[\tau^2(1 - p) + p(\hat{\pi} - \tau)^2\right].$$

Note that, using the fact that $p\hat{\pi} < \tau < \hat{\pi}$, it is straightforward to see that

$$\tau^2(1-p) + p(\hat{\pi} - \tau)^2 < \hat{\pi}^2 \left(1 + p - 2p^2\right).$$

Then, the condition

$$\gamma \geq Max \left\{ \frac{u'\left(y(1-\hat{\pi})\right)}{R_A(y)} \ , \ y^2 \left[-u''\left(y(1-\hat{\pi})\right)\right] \hat{\pi}^2 \left(1 + p - 2p^2\right) \right\} \equiv \gamma^{**}$$

implies that $\dfrac{\partial x}{\partial \tau} < 0$. ■

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