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Stricter Enforcement May Increase Tax Evasion

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Abstract

This paper shows that stricter enforcement may increase tax evasion. Individuals vote on a linear income tax which is used to finance lump sum transfers. Stricter enforcement may make redistributive taxation more attractive to the decisive voter. The tax rate and transfer may rise which in turn may increase tax evasion. An example shows that this result can actually occur. The paper also discusses the interaction between voting on taxes and the choice of audit rate by a budget maximizing bureaucrat.

JEL classification: H26, D72.
Keywords: Tax evasion, enforcement, voting.

1 Introduction

Following Allingham and Sandmo (1972) the literature has analyzed tax evasion as a gamble by taxpayers, where the odds depend on enforcement by the tax authority. From this model, the proposition that stricter enforcement – through increased auditing frequency or larger fines – decreases tax evasion follows straightforwardly. For instance, higher detection probabilities reduce the marginal benefit of evasion and therefore make evasion less attractive.[1] In extensions to this model, stricter enforcement may increase evasion through taxpayers' labor supply responses. For instance, with a backward bending labor supply curve, it may be that with stricter enforcement individuals will evade more (Cowell, 1985).

In this paper, I argue that stricter enforcement may *increase* tax evasion. I present a model where voters decide on a linear income tax. Total proceeds are used to finance lump sum grants. Taxpayers may choose to evade taxes, and, hence, pay tax on their declared income. When enforcement becomes stricter, taxpayers would evade less, for given tax rates. If richer individuals evade particularly large amounts, stricter enforcement puts a larger burden on them. Hence, lower income voters may prefer higher taxes since the tax system becomes more progressive. In this case, while stricter enforcement in itself reduces evasion, the effects of the increased tax rate (and transfer) may offset this effect, since higher taxes and transfers may make evasion more attractive.

The model combines a standard tax evasion model with a majority voting model of redistributive income taxes. The tax evasion model was pioneered by Allingham and Sandmo (1972) and Yitzhaki (1973). The latter type of model was explored by Romer (1975), Roberts (1977) and Meltzer and Richard (1981). A model similar to the present one is presented by Roine (1999), but he looks at (legal) tax avoidance instead of evasion. Hence, enforcement plays no role in his model. His focus is also on the redistributive

[1] The earlier literature assumed that enforcement is exogenous. There are more recent treatments which assume that enforcement is determined by the tax authority maximizing against taxpayers. See Andreoni, Erard, and Feinstein (1998) for a survey of this and other issues in tax compliance.

properties of the voting model.[2] The interplay between public goods supply and tax evasion is studied by Cowell and Gordon (1988) and Falkinger (1991). Two experimental studies on tax evasion and voting are presented by Alm, Sanchez, and de Juan (1995) and Feld and Tyran (2002). Their focus is on the influence of voting on social norms of tax compliance.

The paper proceeds as follows. The next section presents the model. The voting game is introduced in section 3. Section 4 contains the comparative statics. Section 5 presents a numerical example. The choice of audit rate is endogenized in section 7, where bureaucrats are assumed to set audit rates to maximize their budget. The last section concludes the paper.

2 The Model

Individuals have utility $u(c)$, defined over total consumption, c, with $u' > 0, u'' \leq 0$. The absolute degree of risk aversion is $\rho(c) := -u''(c)/u'(c)$. I will assume for most of this paper that $\rho'(c) \leq 0$, i.e. absolute risk aversion is non-increasing in income. An individual is identified by her gross income level, y, which is assumed to be exogenous. Income is distributed on the interval $[0, 1]$, according to a cumulative distribution function $\Phi(y)$ with density $\phi(y)$. Total population is normalized to one, so aggregate and average income is $\bar{y} = \int_0^1 y\phi(y)dy$. The distribution is assumed to be skewed to the right, so median income, y_m, is less than $\bar{y}$.

Income is subject to tax at a constant rate t. Tax revenue is used to finance a lump-sum transfer g to every individual. Individuals are assumed to pay taxes on their declared income. Thus, taxes are paid voluntarily only if the expected fine for evasion is high enough. Letting e denote the amount of evasion, declared income is $y - e$.

I assume the following structure. At the first stage, individuals vote on the tax rate, and at the second, they decide how much of their income to declare for given tax rate and transfer. Enforcement policy, namely, the probability of detection and the penalty schedule, are under the control of the tax authority. The tax rate, however, is chosen democratically. The assumption

[2] See Borck (2002) for an analysis of the redistributive properties in a variant of the present model.

that enforcement parameters are effectively chosen by government agencies which are not perfectly controlled by voters seems a reasonable approximation to reality. In a different context, Gordon and Wilson (1999) analyze the choice of tax rate by voters, arguing that expenditures are under the control of a bureaucracy. In section 7, this type of model will be used to explore the interaction between voters and bureaucrats, but for now the audit rate is assumed to be exogenous.

Suppose that individuals are audited with exogenous probability p, in which case they have to pay tax on the amount evaded plus a penalty which is related to the amount of evasion. In particular, the penalty function is of the form $S = ((1-a) + at)se$, where s is the penalty rate. For $a = 0$, this conforms with the form assumed in Allingham and Sandmo (1972), while $a = 1$ corresponds to the form assumed by Yitzhaki (1973) and subsequent papers.[3]

Let $b = ((1-a) + at)$. Consumption in the state where the individual is audited is then $c_d = (1-t)y - bse + g$. If the individual is not audited, consumption is $c_n = (1-t)y + te + g$. The expected return to evasion will be denoted $r := (1-p)t - pbs$. For $a < 1$, there is a tax rate, $\hat{t} = \frac{(1-a)ps}{1-(1+as)p}$ where $r = 0$. I will assume throughout that $0 < \hat{t} < 1$.

For given tax rate, an individual's maximization problem is

$$EU = \max_e pu((1-t)y - bse + g) + (1-p)u((1-t)y + te + g).$$

The first order condition for an interior optimum is

$$(1-p)tu'_n - pbsu'_d = 0, \tag{1}$$

where $u'_i := u'(c_i)$.

Letting $\hat{e}$ be the solution to (1), the optimal amount of evasion is $e^* = \min\{y, \max\{0, \hat{e}\}\}$. Note that for $r > 0$, every individual will evade some taxes.[4]

[3]The reason for this form is that in the example, it turns out that for $a = 1$ the median voter's preferred tax rate is 1, making comparative statics uninteresting.

[4]In reality, some individuals do not evade even for positive expected return, and furthermore, some individuals overreport their taxes even though this is clearly irrational in the standard model.

The optimal amount of evasion (assuming an interior solution) is decreasing in p and s: stricter enforcement reduces the marginal benefit of evasion and thus leads to less evasion for each taxpayer, given an exogenous tax rate. For $r'(c) \leq 0$, evasion is non-decreasing in income. The effect of an increase in the tax rate is ambiguous for $a < 1$: there is a substitution effect – i.e., the higher tax rate increases the marginal return to evasion and therefore makes evading more attractive – and an offsetting income effect – the lower net income implied by a higher tax rate makes evasion less attractive, given decreasing absolute risk aversion. However, when $a = 1$, the substitution effect is zero and evasion falls with a higher tax rate (Yitzhaki, 1973).

3 Voting

Each individual is assumed to vote for the tax rate which maximizes her utility, subject to the government's budget constraint (GBC):

$$g = t\bar{y} + (pbs - (1-p)t)\bar{e}, \tag{2}$$

where $\bar{y}$ and $\bar{e}$ are aggregate income and evasion.

Differentiating equation (2) with respect to t gives the slope of the budget constraint:

$$\left.\frac{dg}{dt}\right|_{GBC} = \frac{\bar{y} + (pas - (1-p))\bar{e} + (pbs - (1-p)t)\bar{e}_t}{((1-p)t - pbs)\bar{e}_g}.$$

Individuals' preferences over tax policy differ with respect to their income. Specifically, define an individual's induced indifference curve as that combination of t and g which yields some expected income, $\overline{EY}$. The slope of an indifference curve, σ, i.e., the individual's marginal rate of substitution between t and g is:

$$\sigma = \left.\frac{dg}{dt}\right|_{\overline{EY}} = \begin{cases} y & \text{if} \quad r < 0 \\ y - \frac{(1-a)s}{(1-a(1-t))s+t}e & \text{if} \quad r > 0 \text{ and } e^* = \hat{e} \\ by \leq \frac{t}{s+t}y & \text{if} \quad r > 0 \text{ and } e^* = y \end{cases}, \tag{3}$$

use having been made of (1).

An individual's optimal tax rate – provided an interior solution exists – must satisfy the necessary condition that the slope of the budget constraint equals the slope of an indifference curve.

A majority voting equilibrium can be shown to exist if the single crossing property holds, that is, if the indifference curves of two individuals cross once and only once, or, alternatively, if σ is either always decreasing or always increasing in income.[5] Consider figure 1, which shows the government budget constraint and the indifference curves of two voters, y_1 and $y_2 < y_1$. Suppose individual 2 is the median voter. If the single crossing property holds as in the figure, than exactly fifty percent of voters have indifference curves which are steeper than y_2; these individuals therefore prefer a lower tax rate than the median voter. Likewise, half of the voters have flatter indifference curves than y_2 and thus prefer higher tax rates. There would in this case be no majority for taxes which are either higher or lower than that preferred by the median voter.

Obviously, σ is increasing in y when evasion is zero. For positive levels of evasion, however, it cannot be shown in general that σ is either increasing or decreasing in y, unless $a = 1$ which implies $\sigma = y$.[6] For $a < 1$, however, this will not hold and therefore a majority voting equilibrium cannot be shown to exist in general. Note, however, that single crossing is a sufficient condition. Equilibria may exist even if single crossing does not hold.

In the example, it turns out that an equilibrium does exist. I will henceforth assume this to be the case. I will also assume σ to be increasing in y, which implies higher income individuals prefer marginally lower taxes. It can then be shown that the equilibrium corresponds to the optimal tax rate and transfer of the voter with median income, y_m.[7]

[5] See Gans and Smart (1996) for a discussion of this approach.

[6] Also, if utility exhibits constant absolute risk aversion ($u = -e^{-rc}$), optimal evasion is independent of income which implies $\sigma_y = 1$.

[7] Borck (2002) shows that an equilibrium does not necessarily exists when there is a lump sum penalty in addition to the tax surcharge. Moreover, if σ were decreasing in income, equilibrium existence cannot be proven since preferences satisfy single crossing in the region where individuals do not evade and in the region where they do evade separately, but not in both together.

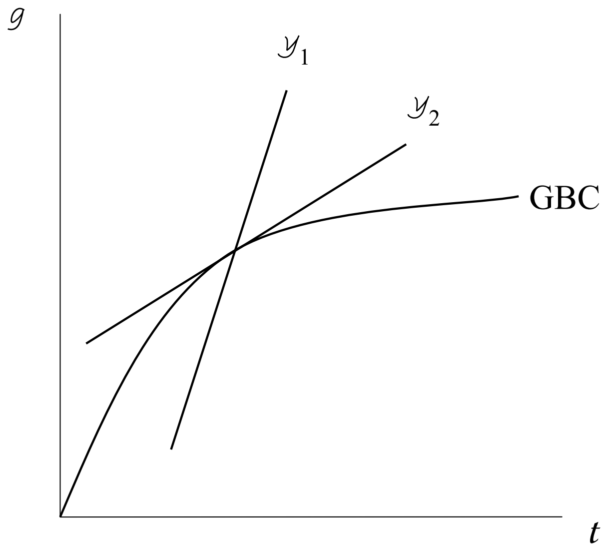

Figure 1:

4 Comparative Statics

Suppose the probability of detection is exogenously increased. Obviously, for given tax rate, this would lead to less evasion. But since the tax rate is endogenous, we have to consider the change of the tax rate as well.

Specifically, an increase of p has two effects: first, assuming $e_{tp} = e_{gt} = e_{gp} = e_{gg} = 0$ and that $\bar{e}_t$ is not too negative, the slope of the government budget constraint will get steeper. This can be seen by differentiating (2):

$$
\begin{aligned}
\frac{d}{dp}\left(\frac{dg}{dt}\right) &= [\{(1-p)t - pbs)\bar{e}_g\}\{(1+as)\bar{e} + (pas - 1 + p)(\bar{e}_p + \bar{e}_g g_p) \\
&+ ((1-a+at)s+1)t\bar{e}_t\} - \{\bar{y} + (pas - (1-p))\bar{e} \\
&+ (pbs - (1-p))t\bar{e}_t\}\{(-t - (1-a+at)s)\bar{e}_g\}] \\
&\quad [((1-p)t - pbs)\bar{e}_g]^{-2}, \qquad (4)
\end{aligned}
$$

where

$$g_p = \frac{(t+bs)\bar{e} + (pbs - (1-p)t)\bar{e}_p}{((1-p)t - pbs)\bar{e}_g} > 0.$$

If $\bar{e}_t$ is not too negative, both the first and second terms within curly brackets in (4) are positive, the third is positive and the fourth negative, making the whole expression positive.

Intuitively, since individuals will evade less, for given tax rate and transfer, each percentage increase in the tax rate raises more revenue. Second, however, the individual indifference curve also gets steeper. This can be seen by differentiating (3) on noting that $e_p < 0$. Since evasion is reduced for given t and g, each individual has a lower marginal willingness to raise taxes for redistribution.

Since both the budget constraint and the indifference curve become steeper, a voter's optimal tax rate may either rise or fall. Not much more can be said at this point. However, one can get a result for how the effect of p impacts voters with differing income levels. Namely, it turns out that the increase in the slope of the indifference curve gets larger with larger income if absolute risk aversion is decreasing in income. To prove this, note that

$$\sigma_{yp} = -\frac{(1-a)s}{(1-a+at)s+t} e_{yp}.$$

Differentiating (1), using the definition of ρ and (1) gives

$$e_{yp} = \frac{(1-t)(bs+t)(b\rho_d'\rho_n s + \rho_d\rho_n' t)(bsu_d' + tu_n')^2}{bst(b\rho_d s + \rho_n t)^3 u_d' u_n'}.$$

This expression is negative if $\rho' < 0$ for all c, i.e., if absolute risk aversion is decreasing in income. That is, lower income voters are more likely to prefer a higher tax rate when the probability of detection rises. Intuitively, when p rises, the costs of redistribution fall to a larger extent on high income voters who evade more (assuming decreasing absolute risk aversion). Lower income voters are more likely to prefer a higher tax rate as a result.

In the following, assume that the median voter's optimal tax rate rises with an increase in audit probability. The total effect of an increase in audit probability on aggregate evasion is:

$$\frac{d\bar{e}}{dp} = \bar{e}_p + \left(\bar{e}_t + \bar{e}_g \frac{dg}{dt}\right) \frac{dt}{dp}.$$

There are then three effects on evasion. First, the direct effect implies that – for given t and g – evasion will fall. Second, however, the tax rate increases. Depending on the specific comparative statics, this may decrease or increase evasion, other things equal. Third, the increase in the transfer increases net income which increases evasion, other things equal, assuming decreasing absolute risk aversion. As a result of the rising tax rate and transfer, evasion may even increase. The example in the next section shows that this may be the case.

A similar comparative statics exercise can be performed with respect to the penalty rate s. Differentiating (3) yields $\sigma_s > 0$, and the slope of the budget constraint increases as well. The sign of σ_{sy} is ambiguous. Therefore, one cannot say whether the equilibrium tax rate increases or decreases with an increase in the fine. Whether an increase of the tax rate is more likely the higher median income is also ambiguous. In the example in the next section, however, the effect of the fine rate is analogous to that of the audit probability in that the equilibrium tax rate and aggregate evasion increase.

5 A Numerical Example

For simplicity, let there be three voters, with income $y_1 = 1, y_2 = 2, y_3 = 3.5$. Let $a = 0.4$ and $s = 0.2$. Utility is $u = \log c$, which exhibits decreasing absolute risk aversion. Optimal evasion, at an interior solution, is given by $\hat{e} = \frac{r((1-t)y+g)}{bs+t}$. Inserting into (3) shows that the single crossing property does not hold. However, it can be checked that the median income earner is indeed decisive. In order to do this, insert the optimal tax rate of the median income earner into the utility functions of voters 1 and 3 and check that no tax rate exists which is preferred by both.[8]

For $p = 0.1$, we find $t = 0.013602, g = 0.0294489$, and $\bar{e} = 0.527035$. Increasing p to 0.2 increases the tax rate to $t = 0.021752$, g rises to 0.0470867, and $\bar{e}$ to 0.560051.

[8]Details are available from the author.

However, we also find that the relation between p, t, and $\bar{e}$ is not monotonic. For $p = 0.05$, we find $t = 1$, $g = 0.496091$, and $\bar{e} = 5.33163$. The reason for this result is somewhat specific to the present functional forms. In particular, it turns out that for both values of p, there is a rather large range of tax rates where all voters evade all of their income. At some t, however, the richest voter starts evading less than his entire income. Hence, the budget constraint gets steeper. Since this tax rate is lower for lower p, the median voter actually prefers the highest possible tax rate for the lower probability of detection.

Letting $p = 0.1$ again and increasing the fine rate to 0.25, we find $t = 0.0170908, g = 0.0369929$, and $\bar{e} = 0.52849$. Thus, the effect of the fine rate is analogous to that of the audit rate.

6 The Choice of Audit Rates by Bureaucrats

Up until now, I have assumed the audit probability to be exogenous, for instance, because it is controlled by a bureaucratic agency. However, if this is the case, it will be useful to assume the agency to pursue its own objectives.[9] In particular, assume the tax authority is a Niskanen-type bureaucrat aiming to maximize his budget.[10] With respect to timing, we distinguish two possible cases: either, the bureaucrat goes first, or voters choose the tax rate before the bureaucrat sets the enforcement strategy. While the first case conforms more closely with the basic model presented above, the second case has the advantage that one can analyze voters' incentives to constrain the bureaucracy by the choice of tax rate.

[9] There is a growing literature on optimal audit policies, where optimality is defined either as budget maximization or maximization of social welfare (see, e.g., Andreoni, Erard, and Feinstein, 1998 and Slemrod and Yitzhaki, 2000, and the references therein). In all of these models, however, the tax rate is exogenous. The focus is usually the use of audit rules to make taxpayers reveal their type.

[10] A model where voters choose taxes and bureaucrats expenditures is presented by Gordon and Wilson (1999) and Wilson and Gordon (2001). In their models, voters can constrain the bureaucracy both by the choice of tax structure and by voting them out of office if voter utility falls below a certain threshold.

6.1 Bureaucrat moves first

Suppose the bureaucracy sets the audit probability before voters choose the tax rate. For given p, voters' problem is exactly like before. The bureaucrat recognizes that her choice of tax rate influences the tax rate.

Let $a = 1$, and assume that the bureaucrat incurs a resource cost of $c(p)$, with $c' > 0, c'' \geq 0$. The bureaucrat simply maximizes total tax revenue minus transfers. The difference between revenue and expenditure may be interpreted as "waste" from the voters' point of view. From the bureaucracy's view, large discretionary budgets are assumed to increase their self esteem and thus utility.

The bureaucrat's problem is then:

$$\max_p R = t\bar{y} + (ps - (1-p))t\bar{e} - g - c(p)$$

If t were endogenous, the first order condition would be

$$F := (1+s)t\bar{e} + (ps - (1-p))t\bar{e}_p - c' = 0. \tag{5}$$

When the tax rate is influenced by the audit rate, the first order condition is

$$(1+s)t\bar{e} + (ps - (1-p))t\bar{e}_p - c' + (\bar{y} + (ps - (1-p))\bar{e})\frac{dt}{dp} = 0. \tag{6}$$

Comparing (5) and (6) shows that if the tax rate increases with the audit rate, endogeneity of the tax rate creates an additional incentive for a revenue maximizing bureaucrat to raise taxes: each dollar spent on auditing then creates additional revenue through the ensuing increase in the tax rate.

6.2 Voters move first

Assume now that the timing is reversed: At the first stage, individuals vote on the tax rate. At the second stage, the bureaucrat chooses the audit rate, and finally, at the last stage individuals choose how much to pay in taxes, given the tax system and the enforcement parameters. The individual problem therefore has the same structure as assumed before.

The tax authority's problem is to maximize revenue for given t, g, and the first order condition is (5). This gives the equilibrium audit probability, $p(s, t, g, \bar{y})$. Differentiating (5) w.r.t. t and g, assuming $e_{tp} = e_{gp} = 0$, gives:

$$\begin{aligned} p_t &= -\frac{(1+s)\bar{e} + (ps - (1-p))\bar{e}_p + (1+s)t\bar{e}_t}{F_p} \qquad (7) \\ p_g &= -\frac{(1+s)t\bar{e}_g}{F_p} \qquad (8) \\ \text{where} \quad F_p &= (s+t)\bar{e}_p + (ps-(1-p))t\bar{e}_{pp} - c''. \end{aligned}$$

Assume that $e_{pp} \geq 0$ so the second order condition is fulfilled. Then $p_g > 0$, and $p_t > 0$ if $e_t > 0$. If marginal tax revenue (as function of the audit probability) rises with the tax rate, then the bureaucrat will react by increasing the tax rate.

Voters are forward looking and choose the tax rate, taking into account the bureaucrat's reaction. The problem is

$$\max_t pu((1-t)y - ste + g) + (1-p)u((1-t)y + te + g),$$

and the first order condition

$$\begin{aligned} G &:= pu'_d \left(-y - se + \frac{dg}{dt}\right) + (1-p)u'_n \left(-y + e + \frac{dg}{dt}\right) \\ &+ (u_d - u_n)\left(p_t + p_g \frac{dg}{dt}\right) = 0. \qquad (9) \end{aligned}$$

Comparing (9) to the optimality condition with exogenous audit probability shows the additional terms $(u_d - u_n)\left(p_t + p_g \frac{dg}{dt}\right)$. Assuming p_t to be positive, $u_d < u_n$ implies the incentives for taxation are reduced. Since the bureaucrat reacts to the higher tax rate by more intense auditing, voters' utility is reduced. Lower tax rates safeguard against the exploitation of voters by self interested bureaucrats. However, from the voters' viewpoint, taxes are inefficiently low.[11]

6.3 Comparative Statics

What is the effect of an increase in audit costs on taxes, audit probability, and evasion? While the answer is straightforward in the first model presented above (bureaucracy moves first), it is not as simple in the second one

[11] See also Sanchez and Sobel (1993), who show that government provides a smaller budget to a tax authority than the authority finds optimal.

(voters move first). Suppose that audit costs are linear: $c(p) = cp$. Then, differentiating (5) or (6) with respect to c, the marginal benefit of increasing audits falls for the tax authority in both models.

In the first model, it follows that (a) the tax authority reduces the audit rate, and (b) voters react by reducing the tax rate, assuming $\frac{dt}{dp} > 0$. The effect on evasion is then analogous to the effect of an exogenous reduction in p as analyzed in Section 4 above. In particular, if stricter enforcement were to increase tax evasion due to the tax rate effect, higher marginal auditing costs would reduce audit rate which would reduce the optimal tax rate and therefore lead to less evasion. Conversely, lower auditing costs would lead to more enforcement and more evasion.

In the second model, the comparative statics are more complex. Differentiating (9) gives

$$\begin{aligned} G_p &= u_d'\left(-y - se + \frac{dg}{dt}\right) - u_n'\left(-y + e + \frac{dg}{dt}\right) \\ &+ \left[\left(-y - se + \frac{dg}{dt}\right) pu_d'' + \left(-y + e + \frac{dg}{dt}\right)(1-p)u_n''\right]\frac{dg}{dp} \\ &+ (pu_d' + (1-p)u_n' + p_g(u_d - u_n))\frac{d^2g}{dtdp}. \end{aligned} \tag{10}$$

Examining (10), if $-y - se + \frac{dg}{dt} > 0$, the first line is positive (since $u_d' > u_n'$ from $c_d < c_n$), the second line is negative since $\frac{dg}{dp} > 0$, and the sign of the third line is ambiguous. In sum, while the tax authority would reduce the audit rate, for given tax rate, this may lead voters to prefer a lower or higher tax rate. It may be that the lower audit rate leads voters to prefer a higher tax rate which in turn may increase tax evasion. Thus, the effect of an increase in marginal auditing costs depends on the exact nature of the interaction between taxpayer-voters and the tax authority.

7 Conclusion

In this paper, I have argued that stricter enforcement policies on tax evasion, such as increasing the probability of audit, may actually *increase* evasion. The reason is that for individuals who do not evade a large portion of their income, stricter enforcement makes taxation more attractive. Higher tax rates and transfers, in turn, may lead to more evasion. If the indirect effect through the tax rate and transfer dominates the direct effect, total evasion rises.

Estimating structural models of tax evasion is notoriously difficult, not least because of the difficulty in obtaining reliable data. Even accounting for this, however, past studies have sometimes found seemingly paradoxical results. For instance, Witte and Woodbury (1985) did not find a significant effect of audit rates on compliance. However, they treated the audit rate as exogenous, which produces biased and inconsistent estimates if audit rate and compliance are both endogenous. Dubin, Graetz, and Wilde (1990) recognized this problem and used two-stage least squares estimation, allowing the audit rate to be endogenous. They find the predicted positive effect of audits on compliance.

However, if the tax rate is endogenous as well, this result would not be unbiased either. In the short run, one might argue that taxpayers treat the tax rate as given. However, when using data from multiple years, one should recognize the potential endogeneity of the tax rate. Future empirical work should test for this endogeneity.

The model presented here may also yield other insights. In general, voting equilibria with tax evasion or avoidance may not exist (Borck, 2002; Roine, 1999). Further, when they do exist they may have interesting properties. In Borck (2002), examples are presented where the equilibrium tax rate is such that income is effectively redistributed from the middle class (who pay taxes) to the poor (who also pay taxes) and the rich (who do not pay taxes). Thus, the choice of tax rate by voting may have consequences which are not entirely obvious.

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