Journal of Public Economics 49 (1992) 35–46. North-Holland

IRS as loan shark

Tax compliance with borrowing constraints

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Received December 1990, revised version received July 1991

This paper considers a simple dynamic model of tax compliance in which people may face binding borrowing constraints. The model leads to much different conclusions and policy recommendations than static models. In particular, the government cannot generate full compliance by setting the expected value of cheating to be negative. Also, it is possible for the government to set penalties in a way that will increase tax revenue over that of full compliance. The government can increase welfare by playing the role of 'loan shark' to people whose borrowing is constrained on the private market.

1. Introduction

One of the most widely studied capital market imperfections is adverse selection. Adverse selection arises because banks have incomplete information about an individual's ability or willingness to repay a loan. In order to protect themselves from excessive default, banks will either deny loans to some [Stiglitz and Weiss (1981)] or impose constraints on the size of loans [Jaffee and Russell (1976)]. An adverse selection problem exists, in part, because banks are legally restricted as to the type and amount of collateral that can be written into loan contracts [see Bester (1985)]. For instance, one cannot use one's time or human capital as collateral. If this were allowed, then the bank could write loan contracts that only 'safe' borrowers would accept. Indeed, such contracts exist in the underground; those who write such contracts are typically called *loan sharks.*

This paper studies tax compliance under the assumption that individuals facing binding borrowing constraints may use tax evasion to transfer resources from the future to the present. Even if a person finds tax evasion undesirable in the absence of borrowing constraints, it could become

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*I am grateful to Ian Gale, Roger H. Gordon, Thomas Holmes, John R. Lott, Joseph Ritter, Karl Scholz, Joel Sobel, and some referees for helpful comments.

desirable if a borrowing constraint is binding. Tax evasion, therefore, may be a high-risk substitute for a loan. However, the government has the authority and power to write more strict 'loan contracts' than private lenders. For instance, one cannot 'default' on unpaid taxes simply by declaring bankruptcy. The government can (and often does) punish cheaters with prison terms, claims on human capital, or claims on future assets. Hence the government is uniquely qualified to play the role of 'loan shark' for people who are liquidity constrained on the private market. As will be seen, such 'loan sharking' is incentive compatible in that only 'good' tax loans (that is, ones that can always be repaid) are made. This implies that, contrary to the standard results in the literature on tax compliance, it will not in general be desirable to enforce full compliance with the law, even if it is feasible and inexpensive to do so.

Section 2 presents a model of tax compliance with borrowing constraints. Section 3 considers the effects of audit schemes on tax revenues. Section 4 generalizes the model to uncertainty about future income. Section 5 is a conclusion.

2. Tax evasion in the presence of borrowing constraints

The first models of tax compliance are by Allingham and Sandmo (1972), Srinivasan (1973), and Yitzhaki (1974). It was noted early in this literature that the government could, in principle, enforce full compliance with the tax laws simply by setting penalties so high that the expected gain from cheating is negative [Kolm (1973)]. However, enforcing compliance through audits is costly and, moreover, there may be limits on the size of sanctions. Researchers have generally relied on these costs and limits to justify the assumption that cheating incentives exist, since they imply that enforcing full compliance could be prohibitively costly. These incentives are evident in the work of Reinganum and Wilde (1985, 1986), Border and Sobel (1987), Scotchmer (1987), and Sanchez and Sobel (1989), who consider risk-neutral tax-evaders, as well as in Townsend (1979) and Mookherjee and Png (1989), who consider risk-averse tax-evaders. All of these treatments are static and do not consider savings or borrowing constraints. The only fully dynamic examination of tax evasion, by Greenberg (1984), assumes perfect capital markets. This section considers a simple dynamic model with risk-averse agents and imperfect capital markets. The model is simplified to focus the most crucial dynamic of the problem: an individual who is unable to secure a loan may opt for tax evasion as a means of transferring resources from the future to the present.

2.1. Borrowing constraints with full tax compliance

This model focuses on a subset of taxpayers who are all indistinguishable in the current period, but who will nonetheless be different in the future. The application of this to a number of such subsets is straightforward. Assume that these people live for only two periods, and in the first period they each receive taxable income w_1. In the second period there is no taxable income, but each individual i receives an untaxed bequest w_{2i}. For the present, we will assume that the bequest is known with certainty to each individual, but not to the bank. (In section 5 we will consider stochastic bequests.) This is the reason for the imperfect capital markets. People who expect large bequests would like to borrow in the first period, using the bequest as collateral. But since the bank cannot verify the size of the bequest ex ante, it cannot be used as collateral. As is well known, it is optimal in this setting for the bank to limit the size of loans; if it were to offer loans of unlimited size there would be an adverse selection problem, that is, people with small bequests would accept loans with the anticipation of default. We assume that the bank can perfectly assess first-period income, so that all people with income w_1 will be allowed to borrow only up to a fixed amount, say L^*. Without loss of generality, let $L^*=0$.

Preferences are assumed to be additively separable and identical across individuals. Letting c_{ki} be consumption of person i in period k, define utility as

$$U_i = u(c_{1i}) + v(c_{2i}),$$

where $u', v' > 0$ and $u'', v'' < 0$. Let t be the marginal tax rate, and let $\bar{w} = w_1(1-t)$ be the after-tax income with full compliance. Again for simplicity, assume that the interest rate is zero. Also, assume that preferences and endowments are such that if people were not borrowing constrained, and loan defaults were not allowed, then they would optimally choose both c_1 and c_2 positive. Finally, use $m(c_1, c_2) = u'(c_1)/v'(c_2)$ to indicate the marginal rate of substitution between current and future consumption.

Consider someone who expects bequest w^* such that $m(\bar{w}, w^*) = 1$. This person maximizes utility by consuming his endowment each period. By concavity, therefore, someone with bequest $w_{2i} < w^*$ would have $m(\bar{w}, w_{2i}) < 1$ and would like to save, while someone with $w_{2i} > w^*$ would have $m(\bar{w}, w_{2i}) > 1$ and would like to borrow. By assumption, people cannot get loans. Hence, all those for whom $w_{2i} \geqq w^*$ face a binding borrowing constraint. We will refer to all i such that $w_{2i} \geqq w^*$ as constrained, and all others as unconstrained.

2.2. The evasion–compliance decision

Now suppose that the government cannot observe w_1 directly, but instead relies on people to self-report their incomes. The government enforces compliance through random audits.[1] We assume, however, that there is a delay between the time the report is made and the time the audits occur. At the beginning of period 1 the individual determines how much to under-report income, if at all. At the beginning of period 2 the government will randomly audit a fraction p of all reports.[2] Hence, people can consume the benefits of cheating immediately, but they do not run the risk of being audited until period 2. This assumption is of crucial importance to this exercise, and is the feature of the evasion–compliance decision that we wish to explore.

To formalize this, let w_i^{r} be the reported income, and let $x_i = w_1 - w_i^{\mathrm{r}}$ be the amount of under-reporting. Hence, for $x_i \geqq 0$ the person will have consumption in period 1 of $c_{1i} = w_1 - w_i^{\mathrm{r}} t - s_i = \bar{w} + tx_i - s_i$, where $s_i \geqq 0$ is savings. If the person is audited in period 2, we assume that the government always learns the true period 1 income. If there is cheating, the person must pay the evaded tax tx_i, plus a fine of γ for every dollar unreported, γx_i. In this case the cheater *loses* and has consumption $x_{2i}^{\mathrm{L}} = w_{2i} + s_i - (t+\gamma)x_i$. If, on the other hand, the person is not audited in period 2, so that the cheater *wins*, then consumption will be $x_{2i}^{\mathrm{W}} = w_{2i} + s_i$. Hence, if a person under-reports a dollar of income, then he will get t today, but with probability p will lose $t+\gamma$ next period. Therefore, the expected value of each dollar of cheating is $\mu = t - p(t+\gamma)$.

The choice problem is then

$$\max_{x_i, s_i} \; U_i = u(c_{1i}) + (1-p)v(c_{2i}^{\mathrm{W}}) + pv(c_{2i}^{\mathrm{L}})$$

$$\text{s.t. } 0 \leqq x_i \leqq w_1,$$

$$0 \leqq s_i.$$

The first-order conditions for this problem are

$$u'(c_{1i})t - pv'(c_{2i}^{\mathrm{L}})(t+\gamma) \leqq 0, \tag{1}$$

$$-u'(c_{1i}) + (1-p)v'(c_{2i}^{\mathrm{W}}) + pv'(c_{2i}^{\mathrm{L}}) \leqq 0, \tag{2}$$

where (1) holds with equality if $x_i > 0$, and (2) holds with equality if $s_i > 0$. Let (x_i^*, s_i^*) represent the solution to (1) and (2).

[1]Insurance against audits is assumed to be unavailable, perhaps due to legal constraints.

[2]The qualitative results of this section will all hold in the more general case in which the probability of detection increases with cheating, that is $p = p(x)$ with $p'(x) > 0$. This will be demonstrated in footnotes 3, 5 and 6 below.

We can now use this model to characterize cheating. First, let s_i' be the optimal level of savings under full compliance, that is, s_i' solves (2) when x_i is contrained to be zero. Then a necessary and sufficient condition for $x_i^* > 0$ is that the left-hand side of (1), evaluated at $(0, s_i')$, is positive: $u'(\bar{w} - s_i')t - pv'(w_{2i} + s_i')(t+\gamma) > 0$. Rearranging this, $x_i^* > 0$ if and only if $m(\bar{w} - s_i', w_{2i} + s_i') > p(t+\gamma)/t = 1 - \mu/t$. However, for all i such that $w_{2i} \leqq w^*$ we know that $m(\bar{w} - s_i', w_{2i} + s_i') = 1$, and for all i such that $w_{2i} > w^*$ we know that $s_i' = 0$ and $m(\bar{w}, w_{2i}) > 1$. Hence, if $\mu > 0$, then $1 - \mu/t < 1$ and *everyone* will cheat. If $\mu = 0$, then $1 - \mu/t = 1$ and only those who face binding borrowing constraints will cheat. Let w^c solve $m(\bar{w}, w^c) = 1 - \mu/t$. Then if $\mu < 0$, only those liquidity constrained people with $w_{2i} > w^c$ will cheat.[3]

This finding is very much at odds with the previous literature on tax evasion. As indicated earlier, it has generally been conjectured that μ must be positive for cheating incentives to exist. We see now that this depends on the existence of perfect capital markets. If people are liquidity constrained, they may be willing to take unfair gambles in order to transfer income from the future to the present.[4] Furthermore, the more severely constrained they are (that is, the greater w_{2i}) the lower the μ they are willing to tolerate. This means that the government cannot simply eliminate cheating by setting enforcement such that $\mu = 0$. Even if the government sets $p = 1$, so that everyone is audited, it still does not guarantee full compliance: someone with a sufficiently high w_{2i} may be willing to pay the penalty in order to increase consumption in period 1.

2.3. The effects on savings

First consider $\mu \leqq 0$. To examine cheating in this case, begin by restricting $s_i = 0$, and then solving (1) for its optimal x, say x_i'. Then at x_i' we have

$$u'(\bar{w} + tx_i') = v'(w_{2i} - (t+\gamma)x_i')\,\frac{p(t+\gamma)}{t}. \tag{3}$$

A necessary and sufficient condition for $s_i^* > 0$ is for the left-hand side of (2) to be positive when it is evaluated at $(x_i', 0)$. Evaluating (2) at $(x_i', 0)$ and substituting from (3) yields

$$-u'(\bar{w} + tx_i') + (1-p)v'(w_{2i}) + pv'(w_{2i} - (t+\gamma)x_i')$$

[3]When $p = p(x)$, we add to the left-hand side of (1) the quantity $\delta(w) = p'(x)[v(c^{\mathrm{W}}) - v(c^{\mathrm{L}})] > 0$. It can be shown that there is a $\mu^* = \delta(w^*)$ such that $x_i > 0$ for all i if $\mu > \mu^*$. When $\mu \leqq \mu^*$, then there exists some $w^c \geqq w^*$ such that $x_i \geqq 0$ if and only if $w_{2i} \geqq w^c$.

[4]A similar observation has been made by Lott (1990) with respect to imperfect markets for human capital and criminal activity by the poor.

$$=(1-p)\{v'(w_{2i})-v'(w_{2i}-(t+\gamma)x_i')\}+\frac{\mu}{t}\,v'(w_{2i}-(t+\gamma)x_i'). \tag{4}$$

By risk aversion $v'(w_{2i})\leqq v'(w_{2i}-(t+\gamma)x_i')$, and since $\mu<0$ by assumption, we see that (4) is always negative. Hence, $(x_i^*,s_i^*)=(x_i',0)$ for all those with $w_{2i}>w^c$: if the expected value of cheating is negative, then cheaters will never use their evaded taxes to increase savings. If $\mu<0$ and a cheater wants to transfer consumption from the present to the future, then the least-cost way to do this is to reduce cheating. Hence, cheating and savings should never coincide.[5]

Next consider $\mu>0$. Now unconstrained people will both cheat and save. However, some constrained individuals will also use their cheating to finance some savings. To see this, look again at (4) above. Let w^s be the second period income at which this exactly equals zero:

$$-u'(\bar{w}+tx_i')+(1-p)v'(w^s)+pv'(w^s-(t+\gamma)x_i')=0.$$

Substitute from (3) and rearrange to find

$$\frac{u'(\bar{w}+tx_i')}{v'(w^s)}=1+\frac{\mu}{\gamma}.$$

Since $u'(\bar{w})>u'(\bar{w}+tx_i')$, this implies that $m(\bar{w},w^s)>1$, which in turn implies that $w^s>w^*$. As is obvious without proof, w^s is unique. It follows that all those with $w_{2i}<w^s$ will find it optimal to save, including some people who are initially liquidity constrained. Hence, cheating frees up the borrowing constraint for some people, and turns them into savers. However, the most severely liquidity constrained will remain constrained, even with cheating.[6]

In summary, if the expected value of cheating is negative, $\mu<0$, only the severely liquidity constrained people will cheat: for each μ there will exist a $w^c>w^*$ such that $x_i^*>0$ if and only if $w_{2i}>w^c$. If the expected value of cheating is positive, $\mu>0$, then everyone will cheat. Cheating will also relax the liquidity constraint for some people. For every μ there will exist a $w^s>w^*$

[5]When $p=p(x)$ we must add $-\delta/t<0$ to the right-hand side of (4). Hence, these identical results follow for $\mu\leqq\mu^*$.

[6]When $p=p(x)$ add $-\delta/\gamma$ to the above expression. Recall that at $w_{2i}=w^*$, then $\delta=\mu^*$. Hence, results similar to the above hold when $\mu>\mu^*$.

such that $s_i^* > 0$ if and only if $w_{2i} < w^s$. Only the severely liquidity constrained will still face a binding constraint.

3. Revenue maximizing enforcement

If a person is caught cheating, then the taxes and penalty due on this cheating may exceed the wealth the individual holds. If we think of cheating as a loan, then we could say that the person has 'defaulted'. It is customary to assume that the payment is constrained to be no larger than the residual wealth, and so such default is possible. Here we assume that punishments are not constrained to monetary wealth, but may include claims on other assets, such as time or human capital. For instance, the government can require community services, jail sentences, or it can revoke privileges or licenses. Just how such non-monetary penalties are admitted into a theoretical model, however, is a matter of great concern and debate. Theorists have long recognized that once one allows that the government can detain, jail, or even kill deviants, then the cost-efficient way to enforce compliance is to spend a minimum amount on detection, and to inflict the maximum possible penalty [Becker (1968)]. At the optimum, therefore, all criminal activity will be deterred [see Stern (1978) and Furlong (1987)]. However, recent studies indicate that more 'reasonable' penalties may actually be more efficient [Shavell (1987, 1991), Mookherjee and Png (1992)], and if guilt or innocence is determined through juries and the 'reasonable doubt test', then Andreoni (1991b) shows that optimal penalties may be those that 'fit the crime'. Furthermore, Becker (1968), Polinksky and Shavell (1984), and others show that monetary fines should always be exhausted before non-monetary penalties – which are generally more costly to administer – are imposed.

For these reasons, assume that if the person can afford to pay a monetary fine, then the person is required to do so. However, if the person cannot pay a monetary fine, then the person will receive a non-monetary penalty. We will assume that the non-monetary penalty is just severe enough that a marginal dollar of cheating that would result in non-monetary penalties cannot yield a larger marginal utility than the last dollar of cheating that would result in a monetary fine. Allowing a stronger marginal punishment from non-monetary penalties would yield the same qualitative prediction, but any weaker marginal punishment from non-monetary penalties could make someone who is deterred from a small amount of cheating prefer a large amount of cheating instead, just as in the moral hazard problem in credit markets. Hence, allowing weaker punishments from non-monetary penalties would result in theoretical predictions that are no different from the case in which no non-monetary penalties are allowed. Stated differently, we want to assume that the non-monetary penalties are just sufficient to keep the person's budget set convex. For simplicity, we will operationalize this by always evaluating the utility function after an audit at $c_i^{\mathrm{L}} = w_{2i} + s_i - (t+\gamma)x_i$, even if $c_i^{\mathrm{L}} < 0$. Hence, $c_i^{\mathrm{L}} < 0$ will now be interpreted as consumption under a non-monetary penalty.

The cost to the government of enforcing the law will depend on whether there are any non-monetary penalties. We assume that all audits have identical fixed costs, but that there are variable 'punishment costs' that are zero for monetary fines, and positive (and non-decreasing) for non-monetary penalties.

Next we can ask when non-monetary penalties will be used. First suppose that $\mu \geqq 0$. Then it is not difficult to imagine cases where some people may expose themselves to the risk of non-monetary penalties. Suppose, for instance, that p is extremely small, and that γ is large, but finite. Then x will also be large. Hence, some, if not all, will be taking the risk of a non-monetary punishment. As we vary the values of p and γ it is impossible to rule out non-monetary penalties in general. Hence, if $\mu > 0$ we must assume that some punishment costs may occur.

Next suppose that $\mu < 0$. Since only the liquidity constrained will cheat, we need only consider those with $w_{2i} \geqq w^*$. First, we know that someone with w_{2i} such that $w^* \leqq w_{2i} \leqq w^{\mathrm{c}}$ will choose $x_i = 0$. So, at w^{c} we know $c_i^{\mathrm{L}} \geqq 0$. Next, we can ask how cheating will grow as we increase w_{2i} from w^{c}. A sufficient condition for $c_i^{\mathrm{L}} > 0$ is that $\mathrm{d}c_i^{\mathrm{L}}/\mathrm{d}w_{2i} > 0$ for all $w_{2i} \geqq w^{\mathrm{c}}$. Since $c_i^{\mathrm{L}} = w_{2i} - (t+\gamma)x_i^*$, this requires that

$$\frac{\partial x_i^*}{\partial w_{2i}} < \frac{1}{t+\gamma}. \tag{5}$$

To find the expression for $\partial x_i^*/\partial w_{2i}$, totally differentiate the first-order condition (1), and rearrange to find

$$\frac{\partial x_i^*}{\partial w_{2i}} = \frac{1}{u''t^2/pv''(t+\gamma) + t + \gamma} < \frac{1}{t+\gamma}.$$

Hence the sufficient condition (5) is met. This implies that if $\mu < 0$, then cheaters who are detected will *always* have resources to pay the penalty, hence there will never be any costs of punishment. It is interesting to note that this result does not rely on having excessive penalties, or on having μ infinitely negative. All that is required is that there exist a $w^{\mathrm{c}} > 0$, and that the non-monetary penalties are sufficient to keeep the budget set convex.[7]

We are now ready to characterize, in broad terms, an audit policy that will

[7]This finding depends on the fact that w_{2i} is known with certainty in period 1. This point is addressed in section 4 below.

maximize tax revenue net of auditing costs. It is nearly immediate from the above that such a policy will set $\mu \leqq 0$. If $\mu > 0$, then there will be some tax revenue lost to cheating and, moreover, there may be some punishment costs. If $\mu < 0$, on the other hand, there will be no punishment costs and, as a result, every dollar of cheating will actually *raise* revenue for the government. In this model, as in other models that allow the expected value of criminal behavior to be negative, it is feasible to set μ infinitely low. That is, we could choose $\gamma = \infty$ and $p > 0$. However, it can be shown [Andreoni (1989)] that it is not optimal to do so. This is because with $\mu < 0$ every dollar of cheating *creates* additional revenue. Therefore the government should set γ such that the expected revenue gained by increasing the penalty on every dollar evaded should be exactly offset by the expected revenue loss from discouraging cheating. Hence, it will not in general maximize tax revenues to perfectly enforce tax compliance.

4. Uncertainty

It is important to ask whether these results generalize to the case of uncertainty about second-period income. Assume that second-period income is determined as $w_{2i} = \bar{w}_{2i} + \varepsilon_i$, for all i, where ε_i are random variables that have zero means and are independently and identically distributed $F(\varepsilon), \underline{\varepsilon} < \varepsilon < \bar{\varepsilon}$. The expected income $\bar{w}_{2i}$ is known in period 1, but ε_i will not be realized until period 2. Let c_{2i} now stand for expected second-period consumption. Then let $C_{2i} = c_{2i} + \varepsilon_i$. Further define a function $v(c_{2i})$ as

$$v(c_{2i}) = \int_{\underline{\varepsilon}}^{\bar{\varepsilon}} \upsilon(C_{2i})\, \mathrm{d}F(\varepsilon).$$

Clearly $v' > 0$ and $v'' \leqq 0$. Given the uncertainty about w_{2i}, the expected utility of i can now be expressed as $U_i = u(c_{1i}) + (1-p)v(c_{2i}^{\mathrm{W}}) + pv(c_{2i}^{\mathrm{L}})$. It follows without proof that all of the results of section 2 still hold, since they could all be established with the function $v(\cdot)$ rather than $\upsilon(\cdot)$. Notice, however, that there may be some non-monetary penalties here, even if $\mu < 0$. This could happen if a person experiences an improbably low ε at the time of an audit.

An interesting extension is to consider the effect of increases in risk. Suppose that ε_i is distributed according to $G(\varepsilon)$, where $G(\varepsilon)$ is derived from $F(\varepsilon)$ by a mean-preserving spread. Such differences in risk are at the heart of models of borrowing constraints [Stiglitz and Weiss (1981)]. Since non-monetary penalties allow the government to avoid the adverse selection problem, we get the usual result that increases in risk imply decreases in cheating.[8] Like the loan shark, the government avoids adverse selection and makes 'loans' to only the safest 'clients'.

5. Discussion and conclusion

The model in this paper is special in several ways. First, the dynamics are very simple. One natural way to extend these results is to consider many periods. This would raise the question of the optimal timing of audits and of the optimal timing of payments of evaded taxes and penalties. This line of research may suggest further roles for the IRS in smoothing consumption in the presence of borrowing constraints. A second unique feature of this model is the inclusion of non-monetary penalties. Non-monetary penalties play the role of collateral in the 'lending' arrangement. By simply letting non-monetary penalties be strong enough to keep the consumer's budget set convex, the government ensures that, unlike a private lender, it does not face an adverse selection problem. Third, this model takes a rather narrow view of the audit mechanism. Many studies indicate that the optimal audit mechanism should account for the level of income reported, with the lower reports being audited with greater frequency [see Sanchez and Sobel (1989) for a review]. To the extent that this is done it will diminish the positive role of the government in partially completing capital markets since the smaller reports may also be made by the most severely constrained individuals. If the audit policy is designed to maximize social welfare, therefore, it may moderate the extent to which small reports are audited more frequently.

This model also could be applied to the theoretical literature on tax amnesty [Alm and Beck (1990) and Andreoni (1991a)]. Tax amnesties allow cheaters to repay their evaded taxes with interest, but without penalties. Hence, amnesty turns tax cheating into a loan. If loans are available to people who choose to cheat, then by cheating they reveal that they prefer to hold cheating rather than to convert the cheating to a loan. However, people who prefer a loan but opt for cheating because of borrowing constraints would welcome a chance to convert cheating to a loan. Similar logic extends to the case of anticipated tax amnesties. One of the fears of amnesties is that if they are anticipated they may encourage cheating [Leonard and Zeckhauser (1987)]. In the above model, however, the only people who may increase cheating in anticipation of the tax amnesty are borrowing-constrained individuals, and all these individuals prefer to claim the amnesty when it is offered. Hence, the government would suffer no net revenue loss

[8]Specifically, as shown by Rothschild and Stiglitz (1970), increasing risk will increase $v'(c_i^{\mathrm{L}})$. It follows from the first-order condition (1) that x_i^* must be lower at every $\bar{w}_{2i}$. By the same reasoning, one can show that increasing risk will raise w^{c}. Hence, increasing risk implies that fewer people will cheat, and that all cheaters will cheat less.

due to an anticipated amnesty, and could easily increase tax receipts [see Andreoni (1989)].

This paper has shown that a simple dynamic model that allows people to evade taxes because of borrowing constraints can lead to much different conclusions and policy recommendations than static models. The government cannot generate full compliance simply by setting the expected value of cheating to be negative. Also the government can set penalties and audit probabilities in a way that will increase tax revenues over full compliance. In sum, the government can increase welfare by playing the role of 'loan-shark' to people whose borrowing is constrained on the private market.

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