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THE OPTIMAL SIZE OF A TAX COLLECTION AGENCY

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ABSTRACT

This paper addresses the optimal degree of law enforcement regarding tax evasion. It derives the conditions that characterize the optimal size of a tax collection agency, and then provides a simple interpretation of the conditions in terms of excess burden. The paper clarified earlier findings that suggest that the optimal size should be set higher than a simple cost-benefit calculation would indicate. It concludes with a numerical example that illustrates the optimality condition and demonstrates that a policy based on a naive cost-benefit analysis of the tax collection agency could result in a substantial overcommitment of resources.

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In recent years there has been considerable concern about the erosion of tax revenues due to increased tax evasion. Several alternative strategies have been suggested to deal with this problem, including reducing marginal tax rates so as to reduce the incentive to evade, increasing the punishment for evasion, and expanding the resources of the Internal Revenue Service in order to increase the likelihood of detecting and prosecuting instances of tax evasion. One proponent of the third strategy, the Commissioner of the Internal Revenue Service, recently testified before a Congressional subcommittee that for every additional dollar allocated to his agency's budget, it could return ten dollars in additional tax collections.[1] Although the Commissioner undoubtedly interpreted these figures as evidence for an expanded IRS budget, in the absence of further analysis it is not clear whether it is desirable to expand the tax collection agency in this circumstance.

Not much attention has been paid by public finance economists to the issue of the optimal degree of enforcement of the tax law, and those that have dealt with the issue do not speak with one voice. For example, in their textbook, Schultz and Harriss (1959) lamented the fact that "...although ample evidence indicates that additional funds spent on administration would yield many times their amount in added collections, ...even governments starved for funds refuse to provide enough to collect taxes under existing law." (p. 217) Their implicit condition for the optimal degree of enforcement is apparently that marginal tax revenue be equal to the marginal cost of collection. However, Shoup (1969) notes that although "it might at first appear that money should be appropriated for tax administration until the incremental dollar of cost yielded just one dollar's increase in revenue ..., this would be to overlook the fact that in tax administration real resources are being used up to implement a system of transfer payments, that is, taxes, not real output. That implementation is a valuable commodity, but its value is not necessarily to be reckoned in terms of the dollars taken in ..." (p. 433). The first explicit analytical treatment of this issue is in the seminal paper of Sandmo (1981), who apparently espoused the view that the optimal size of the tax collection agency is even larger than simple cost-benefit analysis would indicate, and that at the optimum "marginal cost [should be] higher than marginal tax revenue." (p. 283).

The principal goal of this paper is to clarify this issue by deriving the conditions that characterize the optimal size of a tax collection agency in a simple model, and then providing a simple interpretation of the conditions in terms of excess burden. We then construct a numerical example to illustrate the insights to be gained from our analysis. The paper is arranged as follows. Section 1 presents a simple model of optimal government policy when labor supply decisions are fixed. Section 2 expands the model to the case with variable labor supply, and provides an interpretation in terms of excess burden. In Section 3 we compare our results to those obtained by Sandmo (1981), and reconcile the apparently conflicting results obtained in the two papers. Section 4 presents a numerical example of the analysis. We offer some concluding comments about promising directions for future research in Section 5.

1. Optimal Policy with Fixed Labor Supply

The problem of tax evasion is inherently one of choice under uncertainty. As modeled by Allingham and Sandmo (1972), a representative risk-averse household faces a given probability that an understatement of true tax liability will be detected and punished. The household maximizes expected utility by balancing at the margin the expected utility of an undetected evasion of tax liability with the expected utility of the penalty for evasion. A simple formulation of the household's optimization problem is

(1) $$\text{Max} \quad E(U) = (1-p)U[y-(T-g)] + pU[y-T-\pi g]$$

where y is actual (assumed to be all taxable) income, T is the true tax liability, g is the amount of tax understatement, p is the probability that the evasion will be detected and penalized, and π is the rate of penalty for tax evasion, assessed as a fraction of the evaded tax liability.

It is convenient, following Christiansen (1980), to restate expected utility in terms of "true" net income (c), defined as y-T. Equation (1) then becomes

(2) $$\text{Max} \quad E(U) = (1-p)U(c+g) + pU(c-\pi g)$$

The first-order condition for an optimum is

(3) $$(1-p)U'(c+g^*) = p\pi(U'(c-\pi g^*),$$

where g^* stands for the optimal level of tax understatement. Note that expected tax payments equal $T-(1-pF)g^*$, where $F = 1 + \pi$.

Now we consider the problem faced by the government. The government chooses p and T and is constrained to raise a given amount of revenue to spend on, say, public goods.[2] The probability that the tax collection agency can detect an act of evasion depends on the amount of resources devoted to it; we denote its cost function as $a(p)$. We assume that, in choosing p and T, the objective of the government is to maximize the expected utility of the representative household. Thus the government's problem can be stated as

(4) $$\text{Max} \quad W = (1-p)U(c+g^*) + pU(c-\pi g^*) \quad \text{subject to } T-(1-pF)g^* = \bar{G} + a(p)$$

where $\overline{G}$ is the expected revenue requirement.

The first-order conditions of this problem with respect to p and T, respectively, are

(5) $[U(c+g^*) - U(c-\pi g^*)] - \tau[(\partial R/\partial p) - a'(p)] = 0$ and

(6) $(1-p)U'(c+g^*) + pU'(c-\pi g^*) - \tau[\partial R/\partial T] = 0$,

where R is the sum of expected revenues and penalties collected and τ equals, at a maximum, the marginal expected utility of relaxing the government revenue requirement by one dollar.

Consider equation (5). The first term in brackets is clearly positive, and it can be shown that τ is also positive. The second expression in brackets must then also be positive. Thus one conclusion we can draw from (5) is that at a maximum $\partial R/\partial p > a'(p)$, or by increasing p the tax collection agency could increase revenue by more than the cost of doing so.[3] This contrasts to the classic case of the tax farmer interested only in maximizing profits. In the tax farmer case, $\partial R/\partial p$ would equal $a'(p)$ and lead to a socially excessive amount of resources devoted to tax collection. Expression (6) implies that a maximum $\frac{\partial R}{\partial T}$ is positive, i.e., that the government should be on the increasing part of the "Laffer curve."

Further insight into the interpretation of equation (5) can be gained by deriving what we refer to as the excess burden of tax evasion. In the absence of any other uncertainty, it is always the case that the representative risk-averse household would prefer to pay its expected tax liability, $T-(1-pF)g^*$, with certainly compared to the alternative of paying $T-g^*$ with probability $(1-p)$ and $T+\pi g^*$ with probability p, which is the effective contingent tax schedule when evasion is considered. We define the excess burden of tax evasion, in utility terms, to be the difference in expected utility between the case of paying the revenue requirement with certainty and the alternative of paying it with uncertainty, or

$$(7) \quad EB = U(c+(1-pF)g^*) - [(1-p)U(c+g^*) + pU(c-\pi g^*)] ,$$

which is greater than zero as long as g^* is positive (which it will be if evasion is better than a fair gamble, or if $(1-pF)$ is positive). In this model the excess burden of evasion, EB , is simply the utility loss due to the fact of paying taxes as a lottery, rather than as a certainty. Note that this measure of excess burden is independent of the cost of administering the tax system (which is presumably positive in this model, or else no taxes would be paid). Of course, each individual believes himself to be better off by engaging in evasion. However, because the tax rates will be adjusted to raise the same amount of expected revenue, the representative household is clearly worse off in the end.

The total social cost of evasion is conveniently thought of as the sum of the excess burden of tax evasion, as defined above, and the administrative cost of limiting the amount of evasion, $a(p)$. Then the social optimization problem can be interpreted as minimizing the social cost of evasion.[4]

It is useful to derive the marginal excess burden with respect to a change in p . To do this, consider an experiment where the government increases p but returns the additional revenue thus gained by adjusting T enough so that total net revenue (including both taxes and penalties) is unchanged. In the appendix we show that this expression allows us to express (5) simply as

$$(8) \quad -(d(EB)/dp) = \tau a'(p),$$

where $-(d(EB)/dp)$ is the marginal excess burden of tax evasion with respect to p.

Thus there is a simple rule for the optimal size of the tax collection agency. It is that, at the margin, the cost of increasing p should equal the saving of excess burden due to the decline in the exposure to risk. The increased revenue to be gained from increasing the enforcement of the law does not enter the expression because this is merely a transfer among the economy's agents.

2. Optimal Policy with Variable Labor Supply

In this section we expand the individual decision problem to include the choice of how much labor to supply, which we assume must be determined before the state of the world (audited or not audited) is known. This additional dimension adds two new considerations to the problem. First, the proportional income tax is now distortionary at the margin of labor supply. Thus, any additional revenue raised by enforcing the tax law more aggressively due to reduced evasion allows a reduction in the distortionary tax on labor.[5] The second new consideration is that increasing uncertainty may itself cause labor supply to increase and thus tend to reduce the distortion at the labor supply margin. This possibility has been emphasized by Weiss (1976) and Stiglitz (1982), who characterized the utility functions for which, even in the absence of costly enforcement, some randomness in tax liability would be desirable.

When there is a distortionary labor income tax in addition to the presence of tax evasion, it is not meaningful to talk of the excess burden of either tax evasion or labor income taxation separately, but only the total excess burden of the system as a whole. It is, though, meaningful to talk of the marginal excess burden from changing a particular instrument of the government.

In order to analyze this question, we first pose the household's decision problem, which is

$$(9) \quad \text{Max} \quad (1-p)U(c+g,L) + pU(c-\pi g,L)$$

where c is true after-tax income, or $(1-t)wL$, and g is the amount of tax understatement. The first-order conditions with respect to L and g are

$$(10) \quad w(1-t)[(1-p)U_1(c+g,L) + pU_1(c-\pi g,L)] + (1-p)U_2(c+g,L) + pU_2(c-\pi g,L) = 0$$

$$(11) \quad (1-p)U_1(c+g,L) = P\pi U_1(c-\pi g,L)$$

The problem facing the government is to set t and p to maximize the expected utility of the representative household, subject to raising $\bar{G}$ in revenue. We can write this problem as

$$(12) \quad \text{Max} \quad (1-p)U[c^*+g^*,L^*]+pU[c^*-\pi g^*,L^*] \quad \text{subject to } twL^*-(1-pF)g^* = \bar{G} + a(p).$$

The first-order conditions of this problem with respect to p and t, respectively, are

$$(13) \quad U[c^*+g^*,L^*] - U[c^*-\pi g^*,L^*] = \tau[(\partial R/\partial p) - a'(p)]$$

$$(14) \quad (1-p)U_1[c^*+g^*,L^*] + pU_1[c^*-\pi g^*,L^*] = \tau(\partial R/\partial t)$$

By substituting the expression for the marginal excess burden as derived in the appendix, we see that the interpretation of the condition for optimal p is unchanged from Section 1: that the reduction in the excess burden due to an increase in p should, at the margin, be equal to the marginal administrative cost of increasing p . What is different between the optimality condition in the fixed labor supply case and the variable labor supply case is only the interpretation of the marginal excess burden. Without further investigation, the marginal excess burden with respect to p in the variable labor supply case may be higher or lower than the marginal excess burden in the presence of an inelastic labor supply. The implication of Weiss (1976) and Stiglitz (1982) is that the marginal excess burden might be negative in the neighborhood of a value of p just high enough so that there is no evasion (i.e., $p = 1/F$). In this case the induced labor supply outweighs the disutility of the riskiness of tax payment. This implies that, even if enforcement of the tax laws was costless, the optimal p would not be so high as to completely discourage evasion. In the presence of costly enforcement, the optimal p is lower, at the p where marginal excess burden equals the marginal administrative cost. Note that at the optimum p , the marginal saving in excess burden from a further increase in p is positive, even though it may be negative for higher values of p .

3. Reconciliation with Sandmo

The finding that, at the optimum, the marginal revenue from increasing the size of the tax collection agency exceeds the marginal cost is apparently at odds with the conclusion drawn by Sandmo (1981) in the context of an essentially similar, though more complex, model than the one presented here. He claims that "marginal cost should be higher than marginal tax revenue," and that "the optimal probability of detection ... is higher than a simple cost-benefit analysis would seem to indicate." These claims are justified by a condition of the optimum that says, in Sandmo's words, that "the marginal cost of catching an additional evader should at the optimal be equal to the marginal tax revenue, computed along the compensated supply curves, plus a term reflecting the curvature of the utility function or the degree of risk aversion." (p. 283).

The apparent conflict between his result and ours is, though, only semantic in nature, and hinges on the precise meaning of the term "marginal tax revenue, computed along the compensated supply curves." Sandmo's usage of this term is not obvious and could lend itself to misinterpretation. The marginal tax revenue is calculated net of the money necessary to keep the evader at the same level of expected utility. Thus, there are two differences between this concept of marginal tax revenue and the usual uncompensated notion. The first difference is the usual purging of the income effects on behavior of the change in p. The second is the netting out of the funds required for the compensation.[6]

Sandmo's concept of marginal revenue is thus crucially different than the standard usage, and his statement that the probability of detection ought to be set higher than a simple cost-benefit calculation would indicate must be interpreted with great caution. This "simple" cost-benefit calculation must measure marginal tax revenue carefully, subtracting the funds the tax collection agency must disburse to ensure that the evading population is no worse off when the probability of audit increases. The numerical example presented in the next section shows clearly that conclusions based on an inappropriate notion of marginal revenue can lead to large errors in the optimal setting of p.

4. Numerical Example

In this section we develop a numerical example of the choice of the optimally sized tax collection agency. The purpose of the exercise is to show the contribution of the various components of the problem to the outcome.

We consider a case with variable labor supply, in which utility in any state is a Cobb-Douglas function of consumption and leisure. This implies that, for given leisure, the individual exhibits constant relative risk aversion with respect to lotteries over consumption. The maximand in this case is

$$(15) \qquad (1-p)\alpha C_1^{\alpha}(1-L)^{\beta} + p\alpha C_2^{\alpha}(1-L)^{\beta} \text{ where } C_1 = wL(1-t)+g \text{ and } C_2 = wL(1-t)-\pi g$$

Manipulation of the first-order condition implies that

$$(16) \quad L^* = \alpha/(\alpha+\beta)$$

$$(17) \quad E^* = [L^*(1-t)(A-1)]/[t(1+\pi A)] \text{ , where } A = [(p\pi)/(1-p)]^{\frac{1}{\alpha-1}} \text{ and } g^* = twE^*.$$

Here E^* is the amount of evasion expressed in equivalent units of labor supply.

The indirect expected utility function is

$$(18) \quad V = k\ [(1-t)(1+\pi)/(1+\pi A)]^{\alpha}[(1-p)A^{\alpha} + p] \text{ where } k=\alpha[\beta/(\alpha+\beta)]^{\beta}[\alpha/(\alpha+\beta)]^{\alpha}w^{\alpha}.$$

The government's problem is to choose p and t to maximize V subject to the constraint that revenue equal some fixed requirement plus the funds necessary to support its chosen level of tax law enforcement, that is

$$(19) \quad tw[L^*-(1-pF)E^*] = \bar{G} + a(p)$$

Note that in this case labor supply is independent of both p and π , as well as the wage rate and the marginal tax rate. Furthermore, the first-order condition for the optimal choice of p is identical to the case of fixed labor supply (when the fixed L is the same as the optimal L in the Cobb-Douglas case). Thus, the introduction of an elastic labor supply with the accompanying efficiency cost of a distorting labor income tax does not alter the optimal size of the tax collection agency. The intuition behind this result is as follows. Although an increase in p allows the government to reduce t, the effective tax on labor income also depends on the expected profitability of evasion, as this is a way to reduce the effective tax on labor. Thus, a decrease in t and an increase in p does not, with a fixed revenue requirement, reduce the expected effective marginal tax on labor. Moreover, in the Cobb-Douglas case, the fact that there is a dispersion of effective marginal tax rates across states does not affect labor supply, given the expected effective tax rate.[7]

Because this is a highly stylized model of the problem at hand, our parameterization of the example does not attempt to mirror observed data.[8] As an illustration we have chosen $\pi=1$, $\alpha=-1$, $\beta=-2$ (so that L^* will be 1/3), $w=60{,}000$ (to represent an annual per capita wage), $a=1000p + 5000p^2$, and $\bar{G}=5000$ (or one-fourth of wage income). Note that with $\pi=1$, the probability of detection must be less than 0.5 in order for there to be any evasion at all.

In Figure 1 we present a graphical interpretation of the optimum problem. The curve labelled FO represent those pairs of p and t which satisfy the first-order conditions for p and t. Each point on this curve represents an optimum for some given revenue requirement. Note that this curve has a small negative slope, implying that the optimal probability of detection declines when more revenue must be raised. This result depends on two aspects of the example. First of all, the penalty for detected evasion is a multiple of the tax understatement. Thus, a higher value of t not only increases the tax saving from a dollar of income understatement, it also increases proportionately the penalty for detected evasion. Thus, as has been stressed by Yitzhaki (1974), increases in t have no substitution effect on evasion, only income effects. The assumption of constant relative risk aversion implies that, with lower income due to higher t, risk taking in the form of evasion will be reduced. With lower evasion, the marginal saving in excess burden from increases in p decline. Thus, when more revenue must be raised, a lower p is called for. This is not a generally applicable result, and depends on the implict assumption that the purposes for which the government raises revenue do not serve to increase welfare (or, more precisely, do not have any income effects).

The curve labelled GG represents those pairs of p and t which raise the required expected revenue. The negative slope indicates that these instruments are substitutes for revenue raising purposes. The intersection of the FO and GG curves reveals the optimal combination of marginal tax rate, t, and size of tax collection agency, p. In this case, $p^* \cong 0.36$, $t^* \cong 0.34$, $L^* \cong 0.33$, and $E^* \cong 0.09$.

The comparative statics of the problem are revealing. An increase in the revenue requirement, $\bar{G}$, moves the GG curve to the right, increasing the optimal t but decreasing the optimal p. This is due to the income effect of reduced private income, which lowers the incentive to evade income. Reducing the marginal cost of enforcing the tax law raises the FO curve and moves the GG curve to the left, resulting in higher optimal p and a lower optimal t. This is a shift toward the now relatively less expensive instrument. Increasing the amount of risk aversion lowers the FO curve and shifts the GG curve to the left. This results in an unambiguous decline in the optimal value of p , but t may either increase or decrease. Increased risk aversion, because it reduces the amount of evasion, also reduces the social return to combatting it through enforcement.

Figure 2 illustrates the determinants of the optimal choice of p , for a given value of t, 0.325. The upward sloping line is the marginal resource cost of increasing p , which according to our assumptions is 1000 + 10000p. The higher of the two downward sloping curves is the marginal revenue with respect to p . The lower downward sloping curve is the saving in marginal excess burden with respect to p, (-d(EB)/dp), divided by the marginal utility of income so as to express all three relationships in terms of dollars. According to our expression (A-7), the optimal p is given by the intersection of the a' line and the (-d(EB)/dp) curve. It is interesting to note from this graph that, as expected, at the optimum $\partial R/\partial p$ exceeds a'(p). Furthermore, a policy which, according to "simple cost-benefit analysis", sets p such that $\partial R/\partial p$ was equal to a'(p) would substantially overcommit resources to the tax collection agency. In this example, p would be set at 0.41 instead of 0.37, and the budget of the collection agency would be 1250.5 instead of the optimal budget of 1054.5.

5. Conclusion

The rule for the optimal size of a tax collection agency derived here is based on simple models of the individual's decision problem and the government's objectives. Before this rule can be used directly as a guide to policy, both aspects of the problem must be expanded.

With respect to the individual decision problem, the assumption that the probability of detection is fixed must be generalized. In fact, the probability of detection depends on the character and magnitude of the evasion, and on the resources expended by the evader in reducing the likelihood of detection. These resources are another social cost of evasion. How a recognition of these additional costs would affect the optimal size of the tax collection agency is not, however, clear. Increased enforcement could conceivably increase the degree to which individuals try to avoid detection.

The optimization problem should also be expanded to include many types of individuals, with different opportunities to evade and different tastes. This feature would allow study of the horizontal and vertical equity aspects of tax evasion.[9]

The final step toward application of this model is the development of empirical counterparts to key parameters of the model. More information is needed on the actual responsiveness of evasion to the probability of detection and the severity of punishment,[10] the current extent of evasion as well as the likelihood that a given act of evasion will be detected, and the cost function of the tax collection agency. These are the critical pieces of information needed to construct an example like that of Section 4 which is more than just an illustration.

Varying the size of the tax collection agency is not the only possible policy response to the problem of tax evasion. Alternatively, the penalty for tax evasion may be increased. Another possible response is to change the tax law itself so that the opportunities and incentives are decreased. One potentially valuable direction for research is to develop an integrated approach to the optimal government policy toward tax evasion.

APPENDIX

Derivation of the marginal excess burden

We define the excess burden of a tax system which raises a given amount of revenue to be the increase in utility that could be achieved if the same revenue could be raised using lump-sum taxes and in the absence of evasion. We assume that evasion is prevented by an effective and costless enforcement structure, so as to distinguish the excess burden of evasion from the total social cost of evasion. Let $V(Z,w(1-t),F,p)$ be the indirect expected utility function, where Z represents lump-sum income (or, if negative, a lump-sum tax), $w(1-t)$ is the after-tax wage rate, F is the rate of penalty on detected evasion, and p is the probability of detection. The utility level achieved by an efficient tax system is $V(-\bar{G},w,F',p')$ where $p'F'>1$, and $\bar{G}$ is the required revenue. The utility level achieved by a tax system which must use income taxation, which has evasion, and which raises the same revenue is given by $V(0,w(1-t),F,p)$ where $\bar{G}=twL^*-(1-pF)E^*$ and $pF<1$. Then the excess burden is defined as

$$\text{(A-1)} \quad EB = V(-\bar{G},w,F',p') - V(0,w(1-t),F,p) .$$

For a given $\bar{G}$, the first term is constant with respect to either p or t. Hence

$$\text{(A-2)} \quad d(EB)/dp = -\partial V(0,w(1-t),F,p)/\partial p \Big|_{R=\bar{G}}$$

where R is gross tax revenue.

Let $R_t=\partial R/\partial t$, $R_p=\partial R/\partial p$, $V_t=\partial V/\partial t$, and $V_p=\partial V/\partial p$. Then

(A-3) $$(\partial t/\partial p)\Big|_{R=\bar{G}} = -R_p/R_t$$

and

(A-4) $$d(EB)/dp = -[V_p - V_t R_p/R_t]$$

It is straightforward to show that the left-hand side of equations (13) and (14) in the text are $-V_p$ and $-V_t$, respectively. Thus, the first-order conditions for optimal p and t in the presence of administrative cost can be written as

(A-5) $$V_p = -\tau[R_p - a'(p)]$$

and

(A-6) $$V_t = -\tau R_t \ .$$

Some substitution and rearrangement of (A-4), (A-5), and (A-6) yields

(A-7) $$-[dEB/dp] = \tau a'(p) \ .$$

This condition says that, at the optimum, the saving in excess burden due to an increase in p, valued in dollars, should be equal to the marginal resource cost of increasing p, or that the marginal social cost with respect to p is zero.

Note that the same interpretation applies if taxes are lump sum in nature, as in Section 1 of this paper.

FOOTNOTES

1. See the testimony of Commissioner Roscoe L. Egger, Jr., before the House Subcommittee on the Treasury, Postal Service, and General Government Appropriations, February 27, 1984.

2. Note that we also assume that the penalty for tax evasion is not an instrument subject to choice by the government. Models which include this dimension of choice inevitably conclude that an optimal policy features a large penalty and a small probability of conviction such that no offenses are committed. This strategy implies a zero social loss, because fines are transfers with no resource cost, while maintaining a tax collection agency does entail resource costs. What limits the penalty for tax evasion is a presumption that the penalty should be commensurate to the seriousness of the crime. This kind of consideration lies outside of our modeling effort. An excellent discussion of this issue is contained in Stern (1978).

3. Note that Sandmo (1981) comes to the same conclusion in his expression (48), p. 278. See Section 3 of this paper for a reconciliation of Sandmo's findings and the results presented here.

4. See Yitzhaki (1979) for a similar interpretation of the optimal coverage of excise taxation.

5. Although, the decreased profitability of evasion may itself be a disincentive to supplying labor.

6. To see this more clearly, note that dR/dp is, in Sandmo's model and notation, equal to

$$(F\text{-}1) \quad tw^e(\partial L^e/\partial p) - b + \theta w^e E + p\theta w^e(\partial E/\partial p)$$

The difference between this and what he refers to as "marginal tax revenue, computed along the compensated supply curves" is then

$$\text{(F-2)}\quad tw^e[(\partial L^e/\partial p) - (\partial L^e/\partial p)\Big|_{b\text{-comp}}] + p\theta w^e[(\partial E/\partial p)\Big|_{b\text{-comp}} - (\partial E/\partial p)] - b + \theta w^e E$$

where w^e is the wage rate, L^e is labor supply reported to the tax authorities, E is unreported labor supply, θ is the penalty rate for evasion , and b is a payment from the government to the individual payable only in the detected state. The terms in brackets reflect the difference in behavioral response due to income effects. The term $-b + \theta w^e E$ is the amount of compensation paid in the "detected" state needed to keep the expected income of an evader constant, and is equal to the increased expected penalty paid, holding E and L^e constant. It is alos approximately, but not exactly, equal to the amount of funds, payable in the "detected" state, needed to fully compensate an evader for a unit increase in p . Because the evader is risk-averse, a payment of somewhat less than $-b + \theta wE$, received in the state with higher marginal utility, is required. The reduction in the required payment is approximated by $(U_{cc}/2U_c)(C_1{}^e-C_2{}^e)^2$. This can be demonstrated by first forming $V_p{}^e/V_b{}^e$ from Sandmo's (22) and (24), which is $[(U(C_2{}^e,L^e + E) - U(C_1{}^e,L^e + E)]/\tau_2^e$ Then substitute $pU_c(C_2{}^e,L^e + E)$ for τ_2^e from (14). Finally, using the Taylor expansion following (59), we obtain

$$\frac{V_p^e}{V_b^e} = \frac{U(C_1{}^e,L^e+E)-U(C_2{}^e,L^e+E)}{U_c(C_2{}^e,L^e+E)} = [(-b+\theta w^e E) + \tfrac{1}{2}\,\frac{U_{cc}(C_2{}^e,L^e+E)}{U_c(C_2{}^e,L^e+E)}\,(C_1{}^e-C_2{}^e)^2].$$

7. Of course, because increasing p requires real resources, there is not a fixed revenue requirement. An increase in p then will be accompanied by an increased expected effective tax rate. This qualification, though, applies equally to the case of fixed labor supply.

8. One particularly difficult problem in parameterization is the determination of p . We know the proportion of returns audited by the IRS and the number of convicted evaders, but not the extent of undetected evasion. The penalty for evasion is also problematic, as it varies according to whether the evasion is due to negligence or fraud, and may include a sizable, but difficult to measure, psychic component.

9. Sandmo (1981) considers two groups of individuals, one with the opportunity to evade and the other without this opportunity.

10. See Clotfelter (1983) for a pioneering empirical investigation of the determinants of income tax evasion.

REFERENCES

Allingham, A. and A. Sandmo, "Income Tax Evasion: A Theoretical Analysis," Journal of Public Economics, I (November 1972), 323-338.

Christiansen, V., "Two Comments on Tax Evasion," Journal of Public Economics, XII (June 1980), 389-393.

Clotfelter, C., "Tax Evasion and Tax Rates: An Analysis of Individual Returns," Review of Economics and Statistics, LXV (February 1984), 363-373.

Sandmo, A., "Income Tax Evasion, Labour Supply, and the Equity-Efficiency Tradeoff," Journal of Public Economics, XVI (December 1981), 265-288.

Schultz, W. and C.L. Harriss, American Public Finance, (Prentice-Hall, Englewood Cliffs, N.J.: 1959).

Shoup, C., Public Finance, (Aldine Publishing Co., Chicago: 1969).

Stern, N., "On the Economic Theory of Policy Towards Crime," in J.M. Heineke (ed.), Economic Models of Criminal Behavior (North-Holland Publishing Co., Amsterdam: 1978).

Stiglitz, J., "Utilitarianism and Horizontal Equity: The Case for Random Taxation," Journal of Public Economics, XI (June 1982), 1-33.

Weiss, L., "The Desirability of Cheating Incentives and Randomness in the Optimal Income Tax," Journal of Political Economy, LXXXIV (December 1976), 1343-1352.

Yitzhaki, S., "A Note on 'Income Tax Evasion: A Theoretical Analysis'," Journal of Public Economics, III (May 1974), 201-202.

__________, "On the Excess Burden of Tax Evasion," Falk Institute Discussion Paper No. 7813, Jerusalem, October 1978.

__________, "A Note on Optimum Taxation and Administrative Costs," American Economic Review, LXIX (June 1979), 475-480.

Figure 1

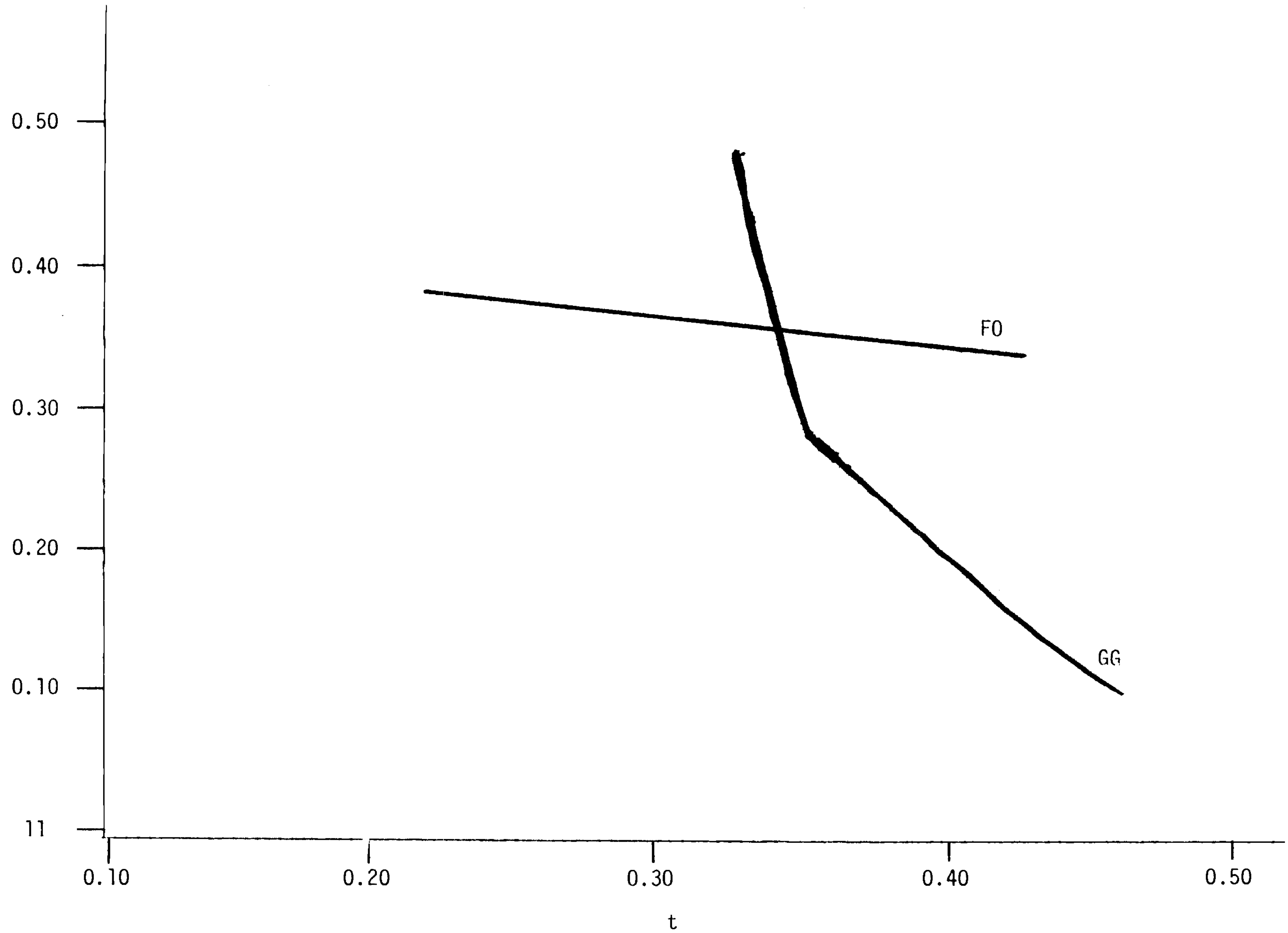
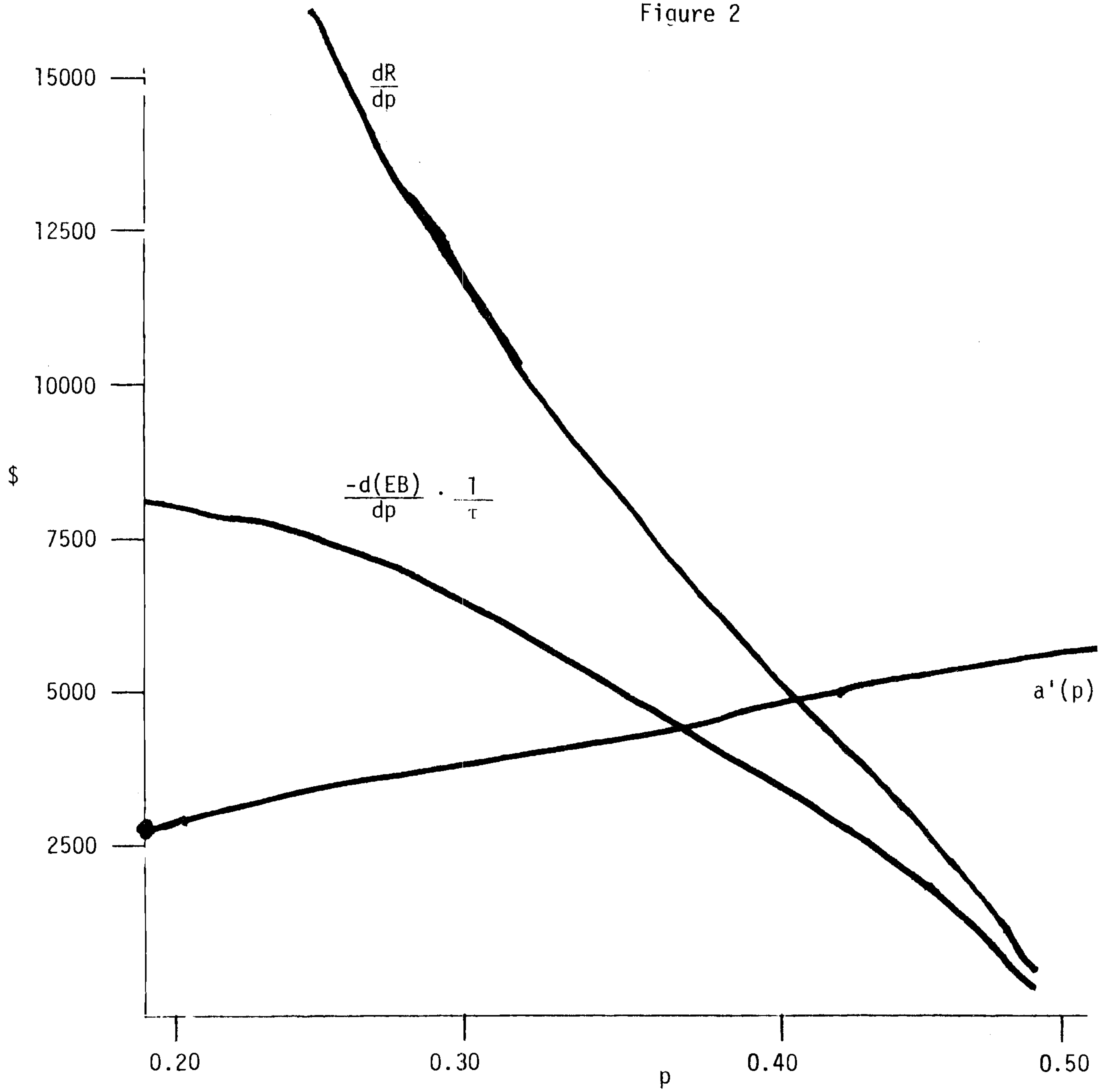


Figure 2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12500
10000
$
7500
5000
2500
dR/dp
-d(EB)/dp · 1/τ
a'(p)
0.20
0.30
0.40
0.50
p