Revenue-Seeking or Compliance-Maximizing?
— A Note on Enforcement Goals of Government Regulators

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Abstract

In this essay we analyze the interplay between regulatory goals of the EPA and self-reporting decisions of regulated polluting firms. We first consider the case of a bureaucratic EPA that aims at maximizing fine revenues, subject to costly enforcement and linear fine structure. It is shown that, in equilibrium, no inspection is worthwhile if a firm's reported emission exceeds a certain threshold level. As a result, all firms with actual emissions higher than this level will falsely report exactly this amount. As for firms reporting emission levels below this cut-off level, the EPA will randomly inspect them with a probability just high enough to discourage dishonesty. Alternatively, if the EPA is concerned with reporting compliance, a uniform audit policy should be adopted to induce full honesty.

Interestingly, both EPA objectives will generate identical net expected revenues. But in equilibrium, firms will incur more tax payment in the case of a compliance-oriented regulator. Total inspection costs will be higher as well. In this regard, our model suggests that revenue maximization is socially preferred to compliance maximization in terms of social costs saved. (JEL classification: H26, Q28, D82)

Keywords: Enforcement, compliance, self-reporting

1. Introduction

In many instances of government regulation and law enforcement, regulated agents are required to reveal their characteristics or behaviors. The government authority may then decide whether or not to conduct a verification audit after receiving the reported information. A typical example is the income reporting decision of tax payers. Other cases of this nature are abundant. In this note, the specific context we are concerned with is the self-reporting (hereinafter SR) behavior of polluting firms. According to Malik (1993), self-reporting is a commonly observed practice of environmental management in US: About 84% of water pollution sources and 28% of all air pollution sources are required to report their emission levels periodically.

In theory, it has been shown that optimal enforcement schemes with SR are socially superior to schemes without it. Kaplow and Shavell (1994), in particular, prove that for any enforcement scheme of fixed audit probability without SR, there exists an SR scheme under which agent behaviors remain the same but enforcement costs are reduced. Intuitively, the advantage of using SR comes from better utilization of the information content conveyed in the reporting process. Furthermore, Innes (1999) shows that SR enforcement regimes have additional advantages when there are ex-post benefits of remediation.

In the extant environmental economics literature, a few authors have proposed to analyze polluting firms' emission and reporting behaviors in response to Environmental Protection Agency (EPA) policies. A notable early study by Harford (1987) examines the responses of a risk-neutral profit-maximizing firm. Given EPA's emission allowance, firms have to decide how much violation to admit to the EPA as well as how much pollution to generate. Depending on severity of polluting and cheating penalties, firms may adopt an interior position (both polluting and lying) or be pushed into corner choices (complying with the emission standard and/or honestly reporting). No policy or welfare analysis is presented, however, in Harford (1987).

Subsequent studies by Malik (1993) and Swierzbinski (1994) both set up a principal-agent framework to analyze EPA's optimal monitoring policies. The former assumes that firms' emission levels are binary: they can be either "high" or "low". The goal of the EPA is to devise an inspection/penalty scheme to ensure truth-telling to minimize social costs. Swierzbinski, in contrast, considers the task of an EPA facing a finite number of polluters, whose "types" (real abatement costs) are private information. He shows that a risk-neutral EPA can offer an honesty-inducing menu to the firms, with one item in the menu for each possible type. Each item then consists of three elements: an upfront payment, the corresponding EPA audit probability, and an ex-post fine for firms inspected and caught under-reporting. In equilibrium, each firm will select the menu item designated for its true type, thereby revealing its real identity.

In both works cited above, the EPA is assumed to be a beneficent government regulator trying to maximize social welfare. This might not be true, however, in reality. As suggested by many institutional and public choice economists, government officials may very well have other objectives in mind besides acting purely in the public interest. The classical argument of Niskanen (1971) suggests that a government agency may be interested in a larger budget, an expanded staff, or simply more power for better career opportunities and political asset accumulation.

To analyze the interplay between regulatory objectives of the EPA and self-reporting decisions of polluting firms, we consider two possible EPA policy goals in this essay, and compare their effects.

First we assume a bureaucratic EPA that aims at collecting more fine revenues (net of enforcement costs).[1] It may be thought of as a Niskanen-type government agency, whose goal is not to improve social welfare, but to advance its own benefits. In the presence of non-trivial inspection costs, *a revenue-maximizing regulator will conduct an inspection only when its expected net return is positive.* Some enforcement models have indeed adopted such a view of regulatory authorities; e.g., Reinganum and Wilde (1985).

Alternatively, we may have a strict government regulator that seeks to fulfill its official duties. Loyal to its statutory role, such an EPA sets out to make the firms report truthfully. In other words, *a compliance-oriented EPA aims at securing as much honest reporting as possible, without running a budget deficit.* Some authors have also embodied similar ideas in their models. As an example, Jones and Scotchmer (1990) conceived a two-layered hierarchical government consisting of the Congress and the EPA. The EPA is assumed to focus solely on environmental quality, paying no attention to firms' abatement costs. The welfare-minded Congress then has to correct the EPA policy bias using budget-appropriating instruments (i.e., budget and rebate rate). With regard to the the EPA intent, our purpose is hence to explore, with a simple model, EPA policies under alternative objectives.

In addition to the aforementioned studies on environmental policies, an even larger

[1] This is in fact the standard assumption in the tax evasion literature, though some authors (e.g., Pestieau et al. (1998) and Kaplow-Shavell (1994)) have otherwise viewed the IRS as a social welfare maximizer.

tax compliance literature also exists.[2] Reinganum-Wilde (1988) is closely related in spirit to our work. Realizing that the IRS cannot proceed against all known violations, they investigate the effects of enforcement uncertainty on taxpayer compliance. In their model, the IRS knows exactly each taxpayer's real income, and tries to maximize its revenue net of enforcement cost (i.e., the Niskanen-type government agency). Some extent of cheating will hence be bypassed due to the costly collection process.[3] Only taxpayers who overstep the tolerance boundaries will be subject to enforcement sanction. Unlike their setting, this paper assumes an ill-informed government agency.

Before we proceed to the model details, a few aspects of our analysis require justification. First of all, we consider in this essay the case of proportional taxation. This can be defended on theoretical as well as practical grounds. Firstly, the qualitative features of our model will hold even if we relax the linearity assumption. As noted in Andreoni et al. (1998, page 826), what matters is really the form of strategic interaction, not the shape of the tax schedule. Secondly, though nonlinear fine structure does exist in some legal systems, linear taxation is predominantly more popular. Therefore our adoption of the latter is not just a concession to analytical tractability, but also for its ready applicability.[4]

Further, this essay focuses specifically on regulated firms' reporting decisions, *taking their production/pollution choices as given.* In tax evasion models, the assumption of exogenous income is quite natural. However, some may object to this assumption in the pollution control context because firms usually make pollution and reporting decisions simultaneously. This issue will be taken up later in the following section, and it will be shown that our assumption is plausible and innocuous. It simply allows us to isolate one aspect of firm choice from other independent firm behaviors.

This essay is organized as follows: The analytical framework is first laid out in Section 2. In this section, alternative EPA goals are discussed, along with the full-information first-best benchmark case. Policy implications are then drawn in Section 3. The final section summarizes our findings.

2. The Model

Consider a risk-neutral pollution-generating firm whose real emission level is w, which is to be taxed (or fined) at a fixed rate t if it is known to the EPA. Unfortunately, the EPA

[2] Andreoni-Feinstein (1998) provides an up-to-date survey of this literature.

[3] In fact, the amounts owed by many noncompliant taxpayers are too small to justify IRS collection efforts.

[4] For a recent treatment of tax schedule design, readers are referred to Chander-Wilde (1998).

has no further knowledge about w other than the fact that it is bounded between 0 and α. Therefore, its belief about w can be represented by a uniform distribution function

$$h(w) \;=\; \frac{1}{\alpha}$$

on the support $[0, \alpha]$. For concreteness, α can be interpreted as an index of the firm's operation scale, and the exogenously fixed w can be taken as the firm's predetermined emission level.

In the pollution enforcement model of Harford (1987), he shows that a firm's pollution level is independent of its reporting decision when pollution fine is linear. The firm will simply choose an emission level that equates its marginal abatement cost and the constant fine rate. Therefore, our analysis of firms' reporting choice assuming exogenous w is quite legitimate. Another context that our model fits perfectly is income tax reporting. When a tax payer determines how much income to declare to the tax authority, the decision is made given actual income.

The decision facing a firm in our model is then *how much emission to confess to the EPA and hence to be fined for.* Let the amount reported by a firm be denoted by x. Since no rational firm would exaggerate its pollution violation, the following must be true:

$$0 \;\leq\; x \;\leq\; w \;\leq\; \alpha$$

Further, let the constant pollution tax rate be t. The firm's total payment due for the reported pollution is then tx.

Lacking monitoring action by the EPA, firms will not have any incentive to admit pollution wrong-doings. Consequently, the EPA has to expend enforcement efforts and impose additional penalties to discourage false reporting. In prevailing practical situations, it is often stipulated in environmental statutes that a penalty multiplier ($\delta > 0$) be applicable. That is, an additional fine of $\delta t[w - x]$ will be levied on firms inspected and caught under-stating their real emission by $[w-x]$ (> 0).[5] Thus a firm's final tax liability will depend on whether it is eventually inspected:

$$C(x \,|\, w, d) \;=\; \begin{cases} tx, & \text{if } d = 0 \\ tw + \delta t[w - x] = t[1+\delta]w - \delta tx, & \text{if } d = 1 \end{cases} \tag{1}$$

[5]For instance, the US civil penalties on tax evaders are applied at a rate of 20% of the portion of the tax underpayment. In cases of serious intentional fraud, however, it is as high as 75% (See Andreoni et al. (1998), page 820). That is, δ is 0.2 and 0.75 respectively for these cases.

where d is a binary dummy indicating whether an inspection occurs ($d = 1$) or not ($d = 0$).[6] Note that truth-telling firms will not care about what the EPA does:

$$C(w \,|\, w, d = 0) \;=\; C(w \,|\, w, d = 1) \;=\; tw$$

In our model, a risk-neutral firm tries to minimize total expected fines by choosing x optimally. That is, *how much emission to report to the EPA given its real pollution w?*

We now turn to the EPA's decision problem: *whether and how to inspect a firm upon receiving a reported level x.* Obviously the problem would not exist if monitoring activities incur no cost to the EPA. Hence we assume that a cost of c per audit has to be borne by the regulatory authority.

2.1. The Revenue-Seeking EPA

In this section, we first analyze the case in which the cost-conscious EPA aims at maximizing its expected fine revenues. Given a firm's reported emission x, EPA's tax revenue, contingent on its inspection decision, would be:

$$R(d \,|\, x) = \begin{cases} tx, & \text{if } d = 0 \\ t[1+\delta]w - \delta tx - c, & \text{if } d = 1 \end{cases} \tag{2}$$

Hence no inspection will be conducted by the EPA if its expected net gains from doing so is negative:

$$E[R(d = 1 \,|\, x)] \;\leq\; E[R(d = 0 \,|\, x)] \tag{3}$$

Given its prior belief of a uniformly distributed w and the understanding that w must be no less than x, the EPA's revised belief is that the firm's true w is equally likely to be any value in the interval $[x, \alpha]$. This leads to the *ex post* distribution density:

$$\bar{h}(w) \;=\; \frac{1}{\alpha - x}, \;\; \forall\, w \in [x, \alpha] \tag{4}$$

It will be shown later that this updated belief is consistent with equilibrium strategies of the regulated firms.

The no-inspection condition (3) can be re-written, using (2) and (4), as:

$$\int_x^{\alpha} (t[1+\delta]w - \delta tx - c)\bar{h}(w)dw \;\;\leq\;\; tx$$

[6] It is worth noting that our setting is in line with Yitzhaki (1974), who assumes that the fine is imposed on evaded tax $t[w - x]$, as opposed to Allingham-Sandmo (1972), in which the fine is imposed on undeclared income $[w - x]$. Other authors have also adopted similar penalty scheme; for example, Reinganum-Wilde (1986)

After integration and algebraic manipulation of terms, this condition becomes:

$$\left(x - \frac{\alpha t\delta + \alpha t - c}{t[1+\delta]}\right)^2 \;\leq\; \left(\frac{c}{t[1+\delta]}\right)^2$$

or simply:

$$\alpha - \frac{2c}{t[1+\delta]} \;\leq\; x \;\leq\; \alpha$$

As such, the EPA will find monitoring action not cost-effective if the reported x falls in the range $[x^*, \alpha]$ where

$$x^* \;\equiv\; \alpha - \frac{2c}{t[1+\delta]} \tag{5}$$

Consequently, no inspection will occur as long as x is sufficiently high (no less than x^*), inasmuch as the updated belief (4) can be justified.

Realizing this, firms with actual emission w greater than x^* see no reason to report an x higher than x^*, and will all choose $x \leq x^*$ to reduce their pollution fines. These firms can hence safely lie and escape inspections.

However, to deter these high-pollution firms from further concealing their true emissions, the EPA would have to conduct inspections against firms reporting a value below x^*. Apparently there is no need for sure inspections to achieve reporting compliance. The EPA needs only a minimal inspection probability π^* to ensure that the following holds for all x in $[0, x^*]$:

$$C^*(x \,|\, w) \;\equiv\; \pi^* \cdot C(x \,|\, w, d=1) + [1-\pi^*] \cdot C(x \,|\, w, d=0) \;\geq\; tw, \;\; \forall\, w \tag{6}$$

Since firms' conditional cost $C(x \,|\, w, d)$ is linear in x, this condition will be automatically satisfied for each x if it holds for any x in $[0, x^*]$. Take $x = 0$ and (6) as an equation, we then obtain:

$$\pi^* \;=\; \frac{1}{1+\delta} \tag{7}$$

In summary, the complete EPA monitoring scheme can be characterized by an inspection schedule as follows:

$$\pi(x) \;=\; \begin{cases} 0, & \text{if } \; x \geq x^* \\ \pi^* = \frac{1}{1+\delta}, & \text{if } \; x < x^* \end{cases} \tag{8}$$

EPA actions are hence triggered by reported emissions that are lower than x^*. This threshold policy is similar in nature to the "cut-off rule" obtained by some authors in the tax evasion literature.[7]

In response to the EPA monitoring plan (8), the firms can do no better than adopting the following reporting strategy:

$$x(w) = \begin{cases} x^*, & \text{if } w \geq x^* \\ w, & \text{if } w < x^* \end{cases} \tag{9}$$

The interaction between firms with $w \geq x^*$ and the EPA is illustrated in Figure 1, which shows the firm's expected fine payment as a function of its reported x. If a firm reports an x greater than x^*, then the relevant cost function is $C(x \,|\, w, d = 0)$. If instead it chooses some $x \in [0, x^*)$, its expected cost would be $C^*(x \,|\, w)$. The thick line segments in the figure represent firm costs under the EPA enforcement scheme (8):

$$C(x) = \begin{cases} C(x \,|\, w, d = 0) = tx, & \text{if } x \geq x^* \\ C^*(x \,|\, w) = tw, & \text{if } x < x^* \end{cases}$$

It is apparent that such high-emission firms will under-report and choose $x = x^*$ to save on fine payments.

On the other hand, the less polluting firms (those with $w < x^*$) are always concerned with $C^*(x \,|\, w)$. The best strategy for them is hence to honestly disclose their infraction: $x = w$. This situation is shown in Figure 2.

It can now be seen that, given prior belief $h(w)$ of x's distribution and upon observing $x = x^*$, the EPA indeed correctly infers that the firm's real emission w follows distribution $\bar{h}(w)$. This is true because all (and only) firms with $x \geq x^*$ will report $x = x^*$. Therefore, EPA's revised belief $\bar{h}(w)$ is indeed consistent with firm behaviors.

Note further the following comparative statics, derived from (5), regarding x^*:

$$\frac{dx^*}{dc} < 0, \; \frac{dx^*}{dt} > 0, \; \frac{dx^*}{d\delta} > 0$$

Therefore, with α fixed, the no-inspection range $[x^*, \alpha]$ expands as inspection cost rises. In contrast, this interval shrinks if EPA's inspection rewards become greater (due to an increase in the pollution fine rate t or the under-reporting penalty multiplier δ). Furthermore, we notice that the threshold value x^* moves parallel with α

$$\frac{dx^*}{d\alpha} = 1,$$

[7] As Andreoni et al. (1998, page 827) point out, the strategy that maximizes audit revenues typically involves a cut-off rule if the authority can commit itself to a pre-announced audit strategy. In particular, Reinganum-Wilde (1985) shows that audit cutoff rules weakly dominate random audit rules. For special cases of lump-sum fines, cutoff rules are actually the least-cost policies for inducing truthful reporting.

while the size of the no-inspection interval remains constant:

$$\frac{d[\alpha - x^*]}{d\alpha} \;=\; 0 \tag{10}$$

In the aggregate sense, $h(w)$ can be interpreted as the distribution of emissions by all regulated firms. Then (10) says that, as firms' possible emission range becomes larger, a smaller fraction of them will be exempted from inspections. In the corner cases, absolutely no monitoring is worthwhile if $x^* < 0$, or stated more succinctly:

$$c \;>\; \bar{c} \;\equiv\; \frac{t\alpha[1+\delta]}{2}$$

So, what is the total tax revenues of the EPA in equilibrium? With $h(w)$ representing the distribution of firms' true emissions, EPA's net revenues, exclusive of its inspection costs, are:

$$R^* \;=\; \int_0^{x^*}[tw - \pi^* c]h(w)dw + \int_{x^*}^{\alpha}[tx^*]h(w)dw \;=\; \frac{t\alpha}{2} - \frac{c}{1+\delta} \tag{11}$$

The first integral term in (11) is the net tax revenues from the honest low-emission firms; and the second integral term represents the total tax payment of the high-emission firms which all report $x = x^*$. When $c > \bar{c}$, the EPA will not bother to inspect, and will simply allow the firms to lie and report zero emission. As this occurs, the EPA receives no revenues at all.

2.2. Comparison with the First-Best Case

We may contrast the scenario above with a perfect-information setting, the benchmark case in which the EPA knows the firm's actual emission w and hence requires no auditing. Total EPA revenues in this first-best case would be:

$$\bar{R} \;=\; \int_0^{\alpha}[twh(w)]\,dw \;=\; \frac{t\alpha}{2} \tag{12}$$

Expected loss in EPA revenues due to information asymmetry is thus:

$$L^* \;=\; \bar{R} - R^* = \frac{c}{1+\delta} \tag{13}$$

This loss L^* goes up with inspection cost c, and declines with the severity of cheating penalty δ. It is, however, independent of distribution parameter α and tax rate t.

2.3. The Compliance-Maximizing EPA

Next we consider alternatively a regulatory agency whose goal is to obtain maximal reporting compliance. Due to linearity of the fine structure, the EPA can actually secure full compliance ($x = w$) from all firms by choosing an inspection probability equal to π^* of (7). The expected fine revenues, net of inspection expenses, now will be:

$$\hat{R} \; = \; \int_0^\alpha [tw - \pi^* c] h(w) dw \; = \; \frac{t\alpha}{2} - \frac{c}{1+\delta} \tag{14}$$

Curiously, the expected net revenue level of a compliance-maximizing EPA is identical to that of a revenue-pursuing one. (Though the gross revenues in the two cases are different.) The expected loss in EPA revenues now, due to information asymmetry, is hence also the same:

$$\hat{L} \; = \; L^* \; = \; \frac{c}{1+\delta} \tag{15}$$

which is just equal to the total inspection costs of the compliance-maximizing EPA:

$$\int_0^\alpha [\pi^* c] h(w) dw \; = \; \int_0^\alpha \frac{c}{\alpha[1+\delta]} dw$$

3. Policy Implications

Though the EPA revenues are the same under both policy objectives, the regulated firms are affected differently. If the EPA is revenue-oriented, total tax payment of all firms is:

$$C^* \; = \; \int_0^{x^*} [tw] h(w) dw + \int_{x^*}^\alpha [tx^*] h(w) dw$$

whereas that in the compliance-pursuing EPA case is:

$$\hat{C} \; = \; \int_0^\alpha [tw] h(w) dw$$

Therefore, less money is paid out by the regulated firms in the former case. The difference in tax liabilities is equal to:

$$\Delta \; = \; \hat{C} - C^* \; = \; \int_{x^*}^\alpha t[w - x^*] h(w) dw \; = \; \frac{t[\alpha - x^*]^2}{2\alpha} \; > \; 0$$

Since fine payments by firms to the EPA may be considered as pure transfers within the economy, no efficiency concern is involved in this aspect.

There is, however, a real loss of resources in the process that has to be borne by the society: the EPA's inspection costs. When the EPA maximizes tax revenues, a fraction of the firms (those with $w > x^*$) are exempted from inspection. In contrast, a compliance-maximizing EPA will randomly inspect all firms, regardless of their reported values. The social cost saved in the former case is:

$$S = \int_{x^*}^{\alpha} [\pi^* c] h(w) dw = \frac{c[\alpha - x^*]}{\alpha[1+\delta]}$$

In summary, the equilibrium outcome under a compliance-maximizing EPA can be compared with that under a revenue-seeking EPA:

- The firms are worse off with a higher tax payment in the former case.
- The EPA expected revenues are the same.
- Higher reporting compliance (more honesty) is obtained in the former case.
- More enforcement efforts are invested in the former case.

Therefore, a compliance-oriented EPA utilizes more social resources to achieved its goal than a revenue-oriented one. This may be worthwhile if the society values reporting compliance for its own sake.

In terms of social costs, however, it may more desirable to have the EPA pursue fine revenues, rather than higher compliance. That is, a Niskanen-type EPA that focuses on self-interest is, ironically, preferred to one that adheres strictly to its duty.

4. Conclusions

In this short essay, we raise questions about regulatory goals of government agencies, and explore welfare implications in a simplified framework. It is found surprisingly that a more bureaucratic EPA may be preferred to one that sticks strictly to its official duties in terms of social costs saved. The purpose of this paper is not to rebuke current enforcement literature, but to complement it and offer another perspective on EPA policy effects. As such, our analysis is intended to be an exemplary argument rather than a general theory.

Our model may also be framed in other contexts and admit of many interpretations, and our conclusions are readily applicable. Take the tax evasion issue as an example. By re-interpreting w as a taxpayer's real income level instead, our analysis will go through without any modification.

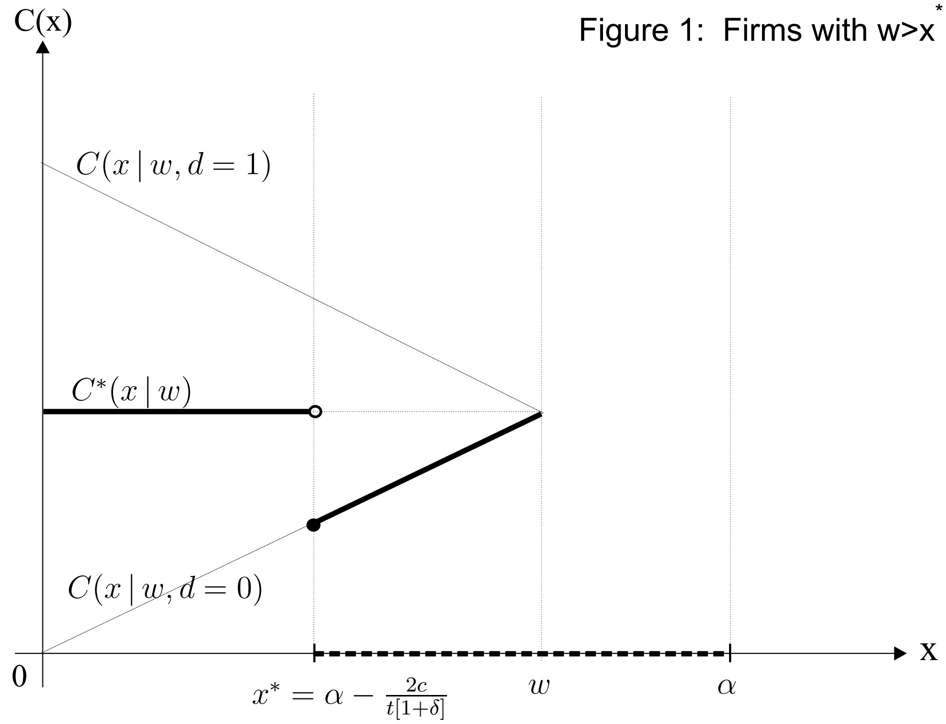

Figure 1: Firms with w>x*

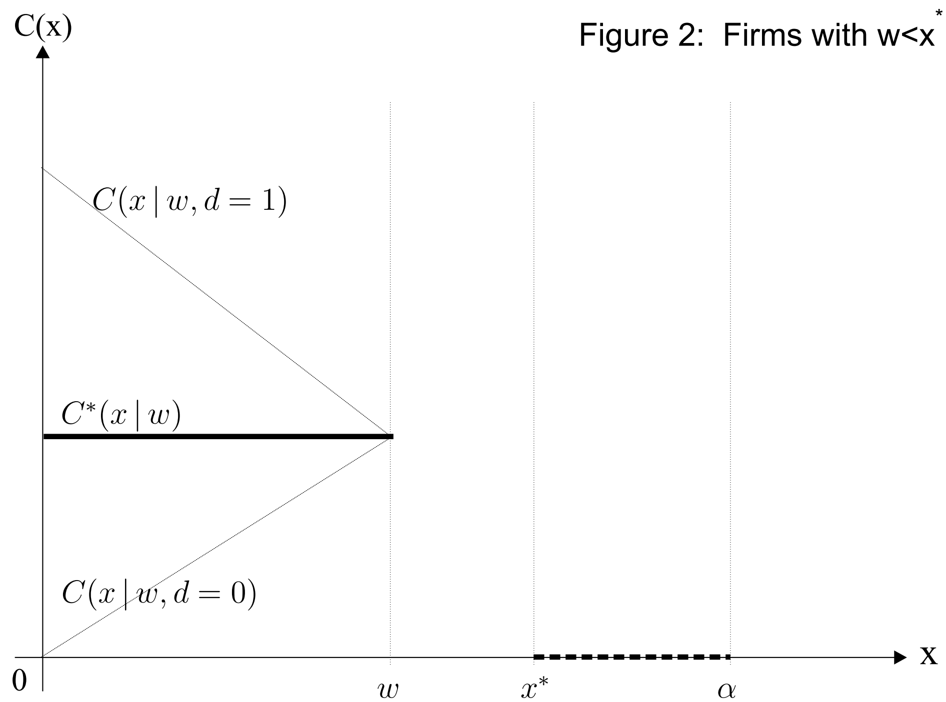

Figure 2: Firms with w<x*

References

1. Allingham, M.G. and A. Sandmo (1972) "Income Tax Evasion: A Theoretical Analysis," *Journal of Public Economics*, 1, 323-38.

2. Andreoni, J., B. Erard, and J. Feinstein (1998) "Tax Compliance," *Journal of Economic Literature*, 36, 818–860.

3. Chander, P. and L.L. Wilde (1998) "A General Characterization of Optimal Income Tax Enforcement," *Review of Economic Studies*, 65, 165-183.

4. Harford, J.D. (1987) "Self-Reporting of Pollution and the Firm's Behavior Under Imperfectly Enforceable Regulations," *Journal of Environmental Economics and Management*, 14, 293–303.

5. Innes, R. (1999) "Remediation and Self-reporting in Optimal Law Enforcement," *Journal of Public Economics*, 72:379–93.

6. Jones, C.A. and S. Scotchmer (1990) "The Social Cost of Uniform Regulatory Standards in a Hierarchical Government," *Journal of Environmental Economics and Management*, 19, 61–72.

7. Kaplow, L. and S. Shavell (1994) "Optimal Law Enforcement with Self-Reporting of Behavior," *Journal of Political Economy*, 102(3), 583–606.

8. Malik, A.S. (1993) "Self-reporting and the Design of Policies for Regulating Stochastic Pollution," *Journal of Environmental Economics and Management*, 24, 241–257.

9. Niskanen, W.A., Jr. (1971) *Bureaucracy and Representative Government*, Aldine.

10. Pestieau, P., U.M. Possen, and S.M. Slutsky (1998) "The Value of Explicit Randomization in the Tax Code," *Journal of Public Economics*, 67, 87–103.

11. Reinganum, J.F. and L.L. Wilde (1985) "Income Tax Compliance in a Principal-Agent Framework," *Journal Of Public Economics*, 26, 1–18.

12. — and — (1986) "Equilibrium Verification and Reporting Policies in a Model of Tax Evasion," *International Economic Review*, 27(3), 739–60.

13. — and — (1988) “A Note on Enforcement Uncertainty and Taxpayer Compliance,” *Quarterly Journal of Economics*, 103(4), 793–98.

14. Swierzbinski, J.E. (1994) “Guilty until Proven Innocent: Regulation with Costly and Limited Enforcement,” *Journal of Environmental Economics and Management*, 27, 127–146.

15. Yitzhaki, S. (1974) “A Note on Income Tax Evasion: A Theoretical Analysis,” *Journal of Public Economics*, 3(2), 201-2.