

# Internal Control vs External Manipulation: A Model of Corporate Income Tax Evasion\*

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## Abstract

*The purpose of this paper is to offer a formal model of corporate income tax evasion. While individual tax evasion is essentially a portfolio selection problem, corporate income tax evasion is much more complicated. When the owner of a firm decides to evade taxes, not only does it risk being detected by the tax authorities but, more importantly, the optimal compensation scheme offered to the employees will be altered. Specifically, due to the illegal nature of tax evasion, the contract offered to the manager is necessarily incomplete. This creates a distortion in the manager's effort, and reduces the efficiency of the contract. Tax evasion thus increases the profit retained by the firm not only at the expense of the risk of being detected, but also in the efficiency loss of internal control.*

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# 1. Introduction

The classic paper of Allingham and Sandmo (1972) has resulted in much theoretical and empirical analysis on why and to what extent an *individual* would evade taxes.<sup>1</sup> However, *corporate* income tax evasion has to date attracted relatively scant theoretical investigation.<sup>2</sup> One reason for such an unbalanced development in the research of tax evasion is that essentially no corporate income compliance micro data has been previously available to researchers. Another and perhaps more important reason is that the conceptual difference in the evasion decision between an *individual* and a *corporation* is hard to capture analytically. The standard analytical framework of individual tax evasion essentially treats the decision as a portfolio selection problem. The amount of tax evaded is the risky asset which yields a higher payoff if evasion is not detected by the tax authority, but a lower payoff if it is. The individual selects the optimal amount of the risky asset, given the probability of being detected and the penalty imposed by the tax authority.<sup>3</sup> A natural question to ask is: Can the evasion behavior of corporate managers be satisfactorily explained by the traditional tax evasion model for individuals? Our answer to this question is “no”. Tax evasion by a corporation is much more complicated because it involves the strategic behavior of more than one person, thereby changing the relation between the firm and its manager, and in the process distorting the incentives of the latter.

Our argument is based on a critical insight: A contract that is based on illegal actions will not be honored by the court, and is thus not enforceable. More specifically, suppose a principal hires an agent to engage in an illegal activity. Depending on the effort level of the agent’s illegal action, there are several possible outcomes. This means that in order to induce effort, the payoff of the agent must be contingent on outcomes. Since the agent participates

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<sup>1</sup>See, for instance, Cowell (1990) and Andreoni, Erard, and Feinstein (1998) and the references therein.

<sup>2</sup>Kreutzer and Lee (1986), Wang and Conant (1988) and Chu (1990) are part of the scant literature on corporate income tax evasion.

<sup>3</sup>Later works have also incorporated labor supply decision into the model. In that case an individual’s decision to evade taxes is more than just a portfolio selection problem. See, for example, Cowell (1981), Sandmo (1981), and Andreoni, Erard, and Feinstein (1998).

in an illegal activity, he bears the risk of being detected and penalized. In order to induce him to participate, the contract needs to compensate him for this risk, in addition to for effort. Efficient contracting calls for the principal to share the risk with the agent, by paying the agent a higher wage when the illegal act is detected (and the agent punished). That is, the agent's pay needs to be contingent on whether or not the illegal action is detected. However, this is practically impossible. The principal can always renege on the contract by refusing to pay the agent a higher wage when the illegal action is detected. The court will not honor the terms of contract even if the agent files law suit, because it is based on illegal activity. Knowing this, the agent will insist that this risk be compensated *ex ante* through the labor contract. But if this is so, the contract will be incomplete in the sense that agent's pay will be the same regardless of whether the illegal action is detected or not. The contract thus plays the double role of rewarding the agent for his effort and for his bearing the risk of tax evasion. Consequently, there is distortion in the agent's incentives in effort.

In the context of tax evasion, suppose a firm consists of a risk-neutral principal and a risk-averse agent. The latter, being an agent of the former, is responsible for the operation of the firm, including filing tax returns. As such, tax evasion requires the cooperation of the manager. By the same argument, the labor contract offered to the agent will fail to have the principal and agent share evasion risk efficiently, essentially because compensation to the latter cannot be contingent upon whether evasion is detected or not. This incompleteness in contract will thus distort the effort of the agent.

The argument above implies that the firm which intends to evade taxes has to balance the trade-off between two considerations. On the one hand, tax evasion can increase its expected after-tax income. On the other hand, besides the risk of being detected considered in the traditional individual tax evasion literature, the firm also needs to bears the cost of efficiency loss in internal control. In a word, besides the traditional income vs. risk trade-off, there is an additional trade-off between internal control and expected gain in evasion. The latter aspect of evasion cost is one that is not and cannot be formulated in the standard individual tax evasion model. We need to emphasize that the distortion of effort does not

come from the risk of being detected by the tax authority *per se*, but from the fact that the structure of the compensation scheme for the manager has to be changed if the principal decides to evade taxes. In essence, this is because that individual income tax evasion is a single-person decision problem, and corporate income tax evasion inevitably involves the interaction of many persons. It is in this sense that corporate income tax evasion is much more complicated than individual income tax evasion.

Our model implies that, although a risk-neutral individual will evade taxes if and only if the expected profit from evasion is greater than that from reporting honestly, a risk-neutral owner of a firm will evade tax only when the expected profit from evasion is greater than that from reporting honestly by a substantial margin. Even if the expected tax savings from evasion is positive and the principal is risk neutral, she will not necessarily choose to evade taxes, i.e., the condition for profitable tax evasion is more stringent for firms than for individuals, because the internal efficiency loss may outweigh the expected gain from evasion.

Although the source of inefficiency we discuss above is based on the idea that illegal action results in incompleteness of contract and thus loss of efficiency in internal control, there are potentially other reasons that can also incur internal control inefficiency when the firm evades tax. We shall explore two of them later in the paper, somewhat informally, which we believe are equally important.

The remainder of the paper is organized as follows. Section 2 sets up the formal model and identifies the source of inefficiency in internal control. Section 3 discusses some extensions of the basic model, and makes qualifications for our results against these extensions. In particular, it discusses the cases when the manager can extort payment from the owner, and when they have repeated interaction. It also explores other possible sources of inefficiency as the firm evades tax. Section 4 concludes.

## 2. The Model

Consider a standard principal-agent model in which a risk-neutral principal (owner) of a firm hires a risk-averse agent (manager) to produce an output  $y$ .<sup>4</sup> For simplicity we assume  $y$  to be the profit (gross of wage cost) of the firm. The realization of  $y$  is stochastic, and depends on the effort level of the manager, denoted  $e$ . The value of profit, however, is verifiable and observable to both principal and agent. Let  $f(y|e)$  be the density function of the realization of  $y$  when the effort level of the manager is  $e$ , with support on  $\Re^+$ . We make the following assumption:

**A1.**  $f(y|e)$  first-order stochastically dominates  $f(y|e')$  if  $e > e'$ .

This assumption is standard in the literature of principal-agent analysis (see, e.g., Hölmström (1979)). It implies that when the manager exerts more effort, the expected profit of the firm will be higher.

The net profit of the principal is  $y - w$ , where  $w$  is the compensation for the manager. There is also a profit tax (with rate  $t$ ) that the principal has to pay, so her after-tax profit (utility) is  $(1 - t)(y - w)$ . The utility of the manager is assumed to be  $u(w, e) = u(w) - v(e)$ , where  $u(\cdot)$  is the agent's utility in income, and  $v(\cdot)$  the disutility of effort. Assume that  $u' > 0, u'' < 0, v' \geq 0, v'' > 0$ , and  $v'(0) = 0$ . The last assumption essentially guarantees an interior solution for the agent's effort. This facilitates our presentation, but is not important for the main argument.

### 2.1 The Honest Principal

If the owner does not evade tax, her optimization problem is

#### Problem H

$$\begin{aligned} & \max_{w(y), e} (1 - t)E[y - w(y)] \\ & \text{s.t. } e \in \arg \max_{e'} E[u(w(y)) - v(e')]; \end{aligned}$$

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<sup>4</sup>From now on we will use agent and manager interchangeably. So do we for owner and principal. We also refer to the principal as “she” and the agent as “he”.

$$E[u(w(y)) - v(e)] \geq \underline{U};$$

where  $\underline{U}$  is the reservation utility of the manager. The first constraint above is the incentive compatibility (IC) constraint, and the second is the individually rational (IR) constraint.

Assuming that the first-order condition approach is valid, problem **H** becomes

$$\begin{aligned} & \max_{w(y), e} (1-t) \int (y - w(y)) f(y|e) dy \\ \text{s.t.} & \int u(w(y)) f_e(y|e) dy - v'(e) = 0; \\ & \int u(w(y)) f(y|e) dy - v(e) \geq \underline{U}. \end{aligned}$$

The first-order conditions are for problem **H** thus

$$\begin{aligned} \frac{1-t}{u'(w(y))} &= \lambda + \mu \frac{f_e(y|e)}{f(y|e)} \quad \forall y; \\ (1-t) \int (y - w(y)) f_e(y|e) dy + \mu \left[ \int u(w(y)) f_{ee}(y|e) dy - v''(e) \right] &= 0; \end{aligned}$$

where  $\mu > 0$  is multiplier for the IC, and  $\lambda > 0$  for the IR, constraint. Further assume that **A2**.  $f(y|e)$  satisfies the monotone likelihood condition:  $f_e/f$  is increasing in  $y$ .

The solution to problem **H** is the second-best outcome for internal control, and we denote the optimal compensation of Problem **H** by  $w^1(y)$ . By **A2** we know that  $w^1(y)$  is an increasing function of  $y$ . Moreover, since  $v'(0) = 0$  we also know that the optimal effort level  $e^* > 0$ .

## 2.2 The Evading Principal

If the principal intends to evade tax, then after the value of  $y$  is realized, she decides the value of  $y$  to be declared to the tax authority. Let  $r$  to be the value of  $y$  declared. Assume that  $p$  is the probability that the firm is audited by tax authority,<sup>5</sup> and that once the firm is audited, evasion will be detected for sure. Let  $q(y-r)$  and  $x(y-r)$  be the penalties to the owner and manager, respectively, for the amount of income evaded,  $y-r$ . Assume that

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<sup>5</sup>In this paper we have focused on the evading behavior of the taxpayers, but do not go into the government's or the tax authority's policy response against evasion. The auditing probability is thus independent of firm characteristics. For discussion on this aspect, see, for example, Cremer and Gahvari (1996), Dubin, Graetz and Wilde (1992), and Mookherjee and Png (1992).

**A3.**  $q(0) = 0, q'(z) > 0, q''(z) > 0$ , and  $\lim_{z \rightarrow \infty} q'(z) = \infty$  for all  $z \geq 0$ .<sup>6</sup> Similarly for  $x(z)$ .

The key observation applied to the paper is that a contract is meaningful only if it is legally enforceable. The wage contract  $w^1(y)$  discussed in Section 2.1 is enforceable because in case the owner refuses to pay the amount  $w^1(y)$  to the manager after  $y$  is realized, the latter can take the contract to the court and demand payment. Since  $y$  is verifiable, the court will honor and enforce the contract. In contrast to the honest principal case, in the case of tax evasion, even if the true value of profit  $y$  is verifiable to all, the wage has to be a function of reported profit,  $r$ , rather than the real profit  $y$ . That is because if  $r$  is the official profit declared to the tax authority, then a wage that is contingent on  $y$  will have to be implicit, and thus has no legal power. This implicit contract will then be renegeed on by the principal: Since  $w^1(y)$  increases in  $y$ , and since the reported profit  $r$  will always be smaller than real profit  $y$  if evasion is to be profitable at all, the firm is always better to pay the manager  $w^1(r)$  than  $w^1(y)$ . But given that the implicit contract is not enforceable, the owner always has incentive to renege on the contract after  $r$  is reported, and pay according to  $r$ , rather than  $y$ . This implies that wage contract has to be contingent on  $r$ , rather than  $y$ .

The firm's optimization problem, if it intends to evade tax, consists of two stages. In the first stage it offers a contract to the manager. In the second stage, after  $y$  is realized, it decides how much tax to declare. We will solve the problem by backward induction and thus discuss the second stage tax-reporting problem first. It turns out that our result critically depends on whether the manager is liable for tax evasion if it is detected. We will thus discuss the two cases separately.

### *2.2.1 The Manager Is Not Liable for Evasion*

In this subsection we discuss the case when the manager is not legally liable for evasion. It, however, can be argued that since the manager is by definition the agent of the firm who runs the business on behalf of the owner, he cannot distance himself from evasion. Thus

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<sup>6</sup>If  $q(\cdot)$  is not assumed to be an increasing function, then the detection probability  $p$  has to be a function of  $r - y$  in order to avoid a corner solution (i.e., for the second-order condition of (1), which is to be derived shortly, to hold which involves more tedious algebra but offers the same insight.

the non-liable case discussed here is more for the purpose of providing a benchmark (and a framework) in facilitating later comparison than for the purpose of its result.

In the case when the manager is not liable for tax evasion,  $x(y - r) = 0$  for all  $r$  and  $y$ . The manager thus suffers no loss of utility when evasion is detected. Consequently, the owner does not have to compensate him for any risk involved in evasion, and only needs to provide him with enough incentive to declare the amount of income that maximizes expected after-tax profit. First we discuss the second stage problem.

### Second Stage:

Suppose  $w(r)$  is the wage function offered to the manager in the first stage. Since  $y > r$  if evasion is to be profitable, by **A2** we know that  $w(y) > w(r)$ . That means even if the manager is not liable for evasion, he has to be provided with incentive to under-report profit, because he is paid less under the reported income  $r$  than under real income  $y$ . Since the loss of the manager for reporting  $r$  (instead of real profit  $y$ ) is  $w(y) - w(r)$ , the owner needs to compensate the manager by this amount in order to induce him to under-report.<sup>7</sup> The owner and manager will thus need a new contract to transfer this payment. They can sign a “service” contract asking the manager to report  $r$ , and in return for this service the owner will pay him an amount  $w(y) - w(r)$ . For example, let  $s = w(y) - w(r)$ . Then the terms of the contract can be as follows: “Hereby the owner of the firm asks the manager to prepare the tax return on behalf of the firm. The latter acknowledges that the profit for the firm is  $r$ . In return for this service the firm agrees to compensate him by an amount  $s$ .” This is an enforceable contract because if the firm fails to carry out the terms of the contract after  $r$  is reported, the manager can take it to the court, shows the reported profit  $r$  on the tax returns, and demands payment.

It should be emphasized that in general the court will not delve into the issue of whether  $r$  is the true profit when asked to enforce this service contract. As such, tax evasion will not

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<sup>7</sup>In fact in order to induce the agent to report  $r$  as profit, it might not be enough only to pay him  $w(y) - w(r)$ . He might ask for more than that amount for participating in collusion. That is, he might extort more payment than  $w(y) - w(r)$  from the principal. This case is discussed in Section 3.1 on agent’s extortion.



be exposed. The owner, however, might threaten that if the agent goes to the court, he will expose the evasion so as to invalidate the contract. This threat is not credible since in that case the owner will also be penalized, and the amount of penalty is more than the amount he owes the manager,  $w(y) - w(r)$ . On the other hand, if the manager fails to report  $r$  as profit, the firm is under no obligation to pay for it.<sup>8</sup> Given the service contract, the manager is fully compensated for the loss of wage income  $w(y) - w(r)$ , and is thus willing to under-report profit. Denote this scenario by the contract  $\{w(r); w(y) - w(r)\}$ ; where  $w(r)$  is the wage contract in the first stage, and  $w(y) - w(r)$  the service contract in the second. Note that under the extended contract, the wage of the agent is  $w(r) + (w(y) - w(r)) = w(y)$ , which is exactly the same as when the agent is paid according to the real profit  $y$ . That is, under  $\{w(r); w(y) - w(r)\}$ , the agent is actually paid according to real profit  $y$  although it is  $r$  that is declared.

It is important to emphasize that the service contract discussed above is needed only if the wage of the manager must depend on report profit  $r$ , rather than real profit  $y$  (as is claimed in Section 2.2). If, on the other hand, the principal can manage to pay the agent according  $y$  directly, then there is no need for the service contract because, as can be seen from the argument, the function of the service contract is exactly to make sure that the agent is paid according to real profit  $y$ , even when he reports  $r$ . Put differently, it is actually not important for our argument whether the agent's wage contract depends on  $r$  or  $y$ . They both lead to the same maximization problem of the principal that we will discuss in the next paragraph. This fact also implies that the efficiency loss in control we claim does not come from the fact that the wage contract needs to depend on reported profit.

The second-stage optimization problem of the principal is thus, given the value of  $y$  and the fact that the agent is *de facto* paid according to  $w(y)$ , to maximize expected after-tax profit:

$$\max_r (1 - p)[y - w(y) - t(r - w(y))] + p[(1 - t)(y - w(y)) - q(y - r)].$$

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<sup>8</sup>In fact there is no incentive for the agent to renege since he is fully compensated on the one hand, and is paid *after*  $r$  is reported on the other.

The first-order condition is

$$q'(y - r) = \frac{(1 - p)t}{p}. \quad (1)$$

One can easily verify that the second-order condition holds. From (1) we have  $y = r + q'^{-1}(\frac{1-p}{p}t)$ . That is, the firm will not evade tax if the realized gross profit is lower than  $q'^{-1}(\frac{1-p}{p}t)$ ; and will evade an amount  $q'^{-1}(\frac{1-p}{p}t)$  if otherwise. The optimal reported profit is thus a function of real profit:

$$r(y) = \begin{cases} y - q'^{-1}(\frac{1-p}{p}t), & \text{if } y > q'^{-1}(\frac{1-p}{p}t); \\ 0, & \text{if } y \leq q'^{-1}(\frac{1-p}{p}t). \end{cases} \quad (2)$$

By **A3** we know that  $y > r$ . It can be easily seen from (1) that  $\partial r / \partial y = 1$ ; that is, the amount evaded is independent of the realization of  $y$ . We note that the second-stage problem for the principal is exactly the individual income tax evasion problem with a risk-neutral tax payer, as considered in, for example, Srinivasan (1973).

#### First Stage:

Given the second stage outcome, the principal designs a contract to maximize her after-tax income.

Under the contract  $\{w(r); w(y) - w(r)\}$ , the manager's utility is  $E[w(r) + (w(y) - w(r))] - v(e) = E[w(y)] - v(e)$ , which is exactly the same as that in Problem **H**. Similarly, the expected profit of the owner is the gross profit subtracted by the two payments to the manager, which is

$$\begin{aligned} & (1 - p) \int [y - w(r) + (w(y) - w(r)) - t(r - w(y))] f(y|e) dy \\ & + p \int [y - w(r) + (w(y) - w(r)) - t(y - w(y)) - q(y - r)] f(y|e) dy \\ = & (1 - t) \int (y - w(y)) f(y|e) dy \\ & + (1 - p)t \int (y - r) f(y|e) dy - p \int q(y - r) f(y|e) dy. \end{aligned} \quad (3)$$

Although (3) is somewhat different from the principal's expected profit in Problem **H**, their corresponding solutions are obviously the same.<sup>9</sup> This means that the optimal wage contract for the evasion problem satisfies  $w(r) = w(r(y)) = w^1(y)$ . Consequently, the second-best effort from the manager will be induced. This is essentially because the second stage tax-reporting problem can be made independent of the first-stage traditional principal-agent problem. That is, they are actually two independent decision-making problems. The owner can thus choose the optimal level of  $r$  in the second stage without affecting the optimal solution for the labor contract in the first stage. We therefore have

*Proposition 1* If the manager is not liable for tax evasion, then there will be no efficiency loss in internal control for evading tax. The principal offers the contract  $\{w(r); w(y) - w(r)\}$  to the agent, and the amount of income evaded is  $q'^{-1}\left(\frac{1-p}{p}t\right)$  if  $y \geq q'^{-1}\left(\frac{1-p}{p}t\right)$ ; and is 0 otherwise.

The scenario we discuss corresponds closely to the so-called “two-accounting-book” practice in reality, which is very commonly used by tax-evading firms, especially in less-developed economies. By this practice, the firm keeps two sets of accounting books, one that records all the real values of revenue and cost that are used for internal control; and the other book that has the false accounting information which is used for tax purpose. Interpreted in terms of our model, the owner uses the book that contains true accounting information to control the manager by offering him contract  $w^1(y)$ , and uses the book that contains false information ( $r$ ) and the payment  $w(y) - w(r)$  for the agent to evade tax. By doing so the firm essentially separates tax evasion and internal control as two independent decision-making problems. Consequently, there will be no efficiency loss in internal control. As is proved in Proposition 1, this is indeed the case when the agent is not liable for evasion. However, when the agent is liable for evasion, we will show in the following that there will be efficiency loss in internal control.

### *2.2.2 The Manager Is Liable for Evasion*

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<sup>9</sup>This is because the optimal amount evaded,  $y - r$ , is a constant by (2), and the second and third integration in (3) are both constants.

Although tax evasion will not incur efficiency loss when the manager is not liable, in general the manager, being the one who prepares the tax return,<sup>10</sup> can hardly distance himself once it is detected. In that case the owner needs to compensate him for the risk involved in order to induce him to participate in evasion.

Since the manager is risk-averse and the owner risk-neutral, the efficient allocation of risks calls for the latter to bear all the risks for the manager. If this can be achieved, then the manager will act as if he is not liable, and the result in Proposition 1 is attained. At the first blush, it might seem that this is indeed possible. For example, the owner can offer the manager a contract that is contingent on whether evasion is detected. That is, the manager is still paid according to  $\{w(r); w(y) - w(r)\}$  if evasion is not detected. If, however, evasion is detected, then the manager is paid according to  $\{w(r); w(y) - w(r) + x(y - r)\}$ . Since the manager is compensated by exactly the amount of penalty when evasion is detected, he is fully insured against the risks from evasion, and will thus act as if he is not liable for evasion.<sup>11</sup> The objective function and constraint of the manager are thus exactly the same as in Problem **H**, and the objective function of the owner differs to (3) only by a term  $p \int x(y - r)f(y)dy$  (the expected value of the penalty for the agent that she needs to pay), which has no consequence on the solution for optimal wage  $w(y)$ . In other words,  $w^1(y)$  is still the contract that induces the second-best effort in the first stage, and there should be no efficiency loss in internal control. This argument, however, is not correct.

The reason for this is as follows. A contract which is contingent on illegal activity will not be honored by the court. As such, a term of contract that asks the principal to pay a certain amount (in our case  $x(y - r)$ ) to the manager after the illegal action of tax evasion is detected will not be honored. Therefore, if evasion were to be detected, the principal would certainly have incentive to renege on the contract. Knowing this, the manager will insist that the compensation for risk of evasion be impounded into either the wage contract or the

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<sup>10</sup>For example, in the U.S. the corporate income tax return (Form 1120) requires the signature of the officer.

<sup>11</sup>Like the case when the agent is non-labile, the agent can also extort more payment from the principal. For this please see Section 3.1.

service contract *ex ante*. Consequently, the pay for the manager cannot be contingent on whether evasion is detected or not. This creates an incompleteness in the contract. We will show that this incompleteness prevents efficient sharing of risks, and results in distortion of the manager's effort.<sup>12</sup> The argument above can actually be put into a more general context. A contract, if to be enforceable, cannot partition the states of nature according to different outcomes caused by an illegal action. This restriction on an "illegal contract" will create an incompleteness in the sense that the different states of nature that result from the illegal action can only be treated identically by a contract. In a word, a contract must be incomplete regarding different states that are caused by an illegal action. The argument here is a simple application of this principle when the illegal action is tax evasion.<sup>13</sup>

Define  $\pi(y)$  to be such that  $pu(w(y) + \pi(y) - x(y - r)) + (1 - p)u(w(y) + \pi(y)) = u(w(y))$ . That is,  $\pi(y)$  is the risk premium necessary for the manager to be indifferent between receiving  $w(y)$  for sure and participating in evasion, which is actually a lottery that pays out  $w(y) + \pi(y)$  with probability  $1 - p$  and  $w(y) + \pi(y) - x(y - r)$  with probability  $p$ . Since by (2) the amount evaded,  $y - r$ , is fixed regardless of realization  $y$ , the penalty function  $x(y - r)$  is a constant. The risk premium  $\pi(y)$  thus depends only on the degree of risk aversion of the manager, but not directly on  $y$ . The more risk-averse the manager, the greater is the value of  $\pi(y)$  needed in order to induce him taking the risk.

Since the risk of evasion can only be compensated *ex ante*, there are two ways the principal can compensate the manager for this risk. The first is through the original wage contract  $w(r)$ . In this case, the reward for bearing the risk of evasion is impounded into the original wage contract so that the manager is fully compensated for the risk involved. The contract offered to the agent is thus  $\{w(r) + \pi(y); w(y) - w(r)\}$ . That is, the agent is paid a wage  $w(r) + \pi(y)$  if the realization of profit is  $y$ . The other is through the service contract, so that the contract offered is  $\{w(r); w(y) - w(r) + \pi(y)\}$ . That is, the agent is paid  $w(y) - w(r) + \pi(y)$

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<sup>12</sup>We are grateful to a referee for suggesting this approach to us.

<sup>13</sup>It can be argued that one of the main reasons why violence is so prevalent in organized crimes is that since "contracts" regarding illegal actions cannot be honored by court, in order to enforce an agreement private enforcement in the form of violence must be used.

for his service for reporting  $r$  as profit. Again, the first scheme cannot work because once  $\pi(y)$  is paid up-front through the wage contract, then in the second stage there is no more incentive for the manager to be willing to report  $r$ , instead of the true profit  $y$ . Thus, all the reward for the manager's participating in evasion will be paid through the second scheme; i.e., through the service contract. In this case, the expected utility of the manager when he evades tax is

$$\begin{aligned} & \int pu(w(y) + \pi(y) - x(y - r))f(y|e)dy + \int (1 - p)u(w(y) + \pi(y))f(y|e)dy - v(e) \\ &= \int u(w(y))f(y|e)dy - v(e); \end{aligned}$$

where the equality follows from the definition of  $\pi(y)$ . The expected profit of the owner is

$$\begin{aligned} & p \int [(1 - t)(y - w(y) - \pi(y)) - q(y - r)]f(y|e)dy \\ & + (1 - p) \int [y - w(y) - t(r - w(y) - \pi(y))]f(y|e)dy \\ &= (1 - t) \int (y - w(y) - \pi(y))f(y|e)dy \\ & + t(1 - p) \int (y - r)f(y|e)dy - p \int q(y - r)f(y|e)dy. \end{aligned}$$

The maximization problem of the firm is thus

**Problem E**

$$\begin{aligned} & \max_{w(y), e} (1 - t) \int [y - w(y) - \pi(y)]f(y|e)dy \\ & + t(1 - p) \int (y - r)f(y|e)dy - p \int q(y - r)f(y|e)dy \\ & \text{s.t. } e \in \arg \max_{e'} \int u(w(y))f(y|e')dy - v(e'); \\ & \int u(w(y))f(y|e)dy - v(e) \geq \underline{U}. \end{aligned} \tag{4}$$

The first-order condition corresponding to the IC constraint (4) is

$$\frac{1-t}{u'(w(y))} \left(1 + \frac{\partial \pi(y)}{\partial w(y)}\right) = \lambda + \mu \frac{f_e}{f}. \quad (5)$$

Denote the solution to problem **E** by  $w^E(y)$ . It can be seen clearly that  $w^E(y) = w^1(y)$  if and only if  $\partial \pi(y)/\partial w(y) = 0$ ; i.e., only when the need to compensate the risk of evasion for the manager in the second stage does not interfere with the wage policy in the first. In other words, tax evasion will not incur efficiency loss in internal control only if the tax evasion decision in the second stage is independent of the provision of effort (through the incentive contract) in the first stage. In general, however,  $\partial \pi(y)/\partial w(y)$  is not zero. For example, if the manager exhibits increasing risk aversion,<sup>14</sup> then he needs to be compensated by more for the risk of evasion when he has more income (i.e., when  $w(y)$  is larger). As a result,  $\pi(y)$  increases in  $w(y)$  and  $\partial \pi(y)/\partial w(y) > 0$ . In this case, by (5) we know that  $w^E(y)$  is less than  $w^1(y)$ . That is, he is paid less under  $w^E(y)$  than under the second-best contract. Consequently, there is under-provision of effort on the part of the manager. The intuition is clear: If the agent's aversion to risk increases with income, then since the principal needs to compensate him more for risk of evasion at higher realization of  $y$ , she is less willing to encourage higher output than under the second-best contract. As a result, the agent is under-motivated. Similarly, if the manager exhibits decreasing risk-aversion (i.e.  $\sigma'(y) < 0$ ), then the manager is over-compensated in  $w^E(y)$  relative to the second-best contract. Finally, if the manager has constant degree of risk aversion, then  $\pi(y)$  is fixed and  $\partial \pi(y)/\partial w(y) = 0$ . There is thus no loss of efficiency in contract. We thus have the following proposition:

*Proposition 2* If the manager is liable for tax evasion, then unless he exhibits constant risk-aversion, the firm will incur loss of efficiency in internal control. Moreover, the manager is over (under)-compensated, relative to the second-best, when he exhibits decreasing (increasing) risk-aversion.

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<sup>14</sup>That is, the degree of risk aversion of the manager,  $\sigma(y) \equiv -u''(y)/u'(y)$ , is increasing in  $y$ .

We have thus shown that there is a trade-off between the gain from evasion and the loss of internal control efficiency incurred by evasion. It is important to note that the efficiency loss in question is *not* the amount that the principal has to compensate the manager for the risk of evasion involved. It is the loss of efficiency in controlling him *in addition to* that amount of compensation. Unlike the case of single individual, a risk neutral owner does not necessarily evade tax when the tax evasion “lottery” yields positive expected profit, as she needs to bear the additional cost of efficiency loss in control. This, of course, does not mean that the two-accounting-book scheme mentioned above is impossible. In fact, companies in many developing countries have been successful in using this scheme in evading tax. It only means that if the manager is liable, then the firm can scarcely make use of the two-accounting-book scheme without incurring loss of efficiency in internal control. And whether a firm will evade tax depends on the relative size of the expected profits under the optimal solutions for problems **H** and **E**.

A comparison of results in Section 2.2.1 and Section 2.2.2 suggests that whether tax evasion involves efficiency loss in control solely depends on whether the decision of evasion can be separated from that of control of agent. If yes, then they are essentially two decision problems that can be optimized independently, and there is no loss of control as the firm evades tax. On the other hand, if they cannot be separated, then optimal reporting strategy will interfere with the solution of the principal-agent problem, and the agent’s incentives will be distorted thereby.

Our model predicts the common sense result that if the cost of evasion is smaller – for example, the audit probability  $p$  or the penalties of evasion,  $q(\cdot)$  and  $x(\cdot)$ , are smaller – then it is more likely that the firm will evade tax. More interesting is the case concerning internal control. It implies that mutual trust between the principal and agent might be an important factor in determining internal control efficiency as the firm evades tax. For example, if the manager can trust that the principal will (against her short-run interest) compensate him for the amount of penalty  $x(y - r)$  when evasion is detected, then he is fully compensated for evasion risk. In that case, there is efficient sharing of risk, and the second-best effort



can be induced. This will in turn predict that tax evasion is more prevalent in smaller firms or family firms, in which mutual interaction is closer and mutual trust tighter. Since less developed economies tend to have more of smaller and family firms, our model also predicts that, other thing being equal, tax evasion is more common in less developed economies.

Finally, one might wonder although there is efficiency loss in control, if this loss is significant enough to deserve attention at all. According to Jensen and Murphy (1990), each \$1,000 change in shareholder wealth corresponds to an annual increase of the CEO's salary by only 2 cents. This implies that the potential loss to the firm can be substantial even if the manager's compensation deviates from the second-best level by only a small amount.

### 3. Discussion

In this section we consider several issues that are not discussed in the main model, together with the influences of these additional considerations on the main result of the paper, and the qualifications that need to be made for our results to hold against these considerations.

#### 3.1 *Agent's Extortion*

In Section 2, we have implicitly assumed that as long as the agent is fully compensated for its risk, he is willing to cooperate with the principal in evasion. This might not be true in reality. The agent can take advantage of his role in it, and demand a portion of the gain from evasion. In a word, he can extort the owner during evasion. This case is more difficult to analyze because currently there still lacks a standard theory of extortion, and it is thus difficult to model how extortion payment is determined. Examples for extortion, however, abound. For instance, generally whistle blowers are treated leniently in the legal process. As such, it gives the manager the power to blackmail the principal. To prevent the manager from carrying out the threat of informing the tax authority, the principal has to reward him with a compensation higher than  $w^E(y) + \pi(y)$ ; i.e., the wage contract offered to the

manager has to satisfy the “no-whistle-blow” constraint.<sup>15</sup> Given the lack of a standard model of extortion, we will abstract from the discussion of how extortion payment is determined, and simply assume that  $z(y)$  is the amount of payment, in addition to total wage  $w(y)$  and compensation of risk of evasion  $\pi(y)$ , that is received by the agent. In this case the first-order condition corresponding to (5) is

$$\frac{1-t}{u'(w(y))} \left[ 1 + \frac{\partial(\pi(y) + z(y))}{\partial w(y)} \right] = \lambda + \mu \frac{f_e}{f}. \quad (6)$$

It can be easily seen that as long as extortion payment is independent of wage policy in the first stage (so that  $\frac{\partial z(y)}{\partial w(y)} = 0$ ), then there will not be an additional efficiency concern that enters into our model. In other words, as long as  $\partial z(y)/\partial w(y) = 0$ , then the distortion mentioned in Section 2 is the only efficiency loss incurred. Generally, this might not be the case. For example, we can imagine that when the profit of the firm is high (so that  $w(y)$  is high as well), the manager might believe that the firm can afford to be extorted by greater amount. In that case  $z(y)$  is higher as well. Consequently,  $\partial z(y)/\partial w(y) > 0$ , and extortion creates another source of distortion. However, it must be emphasized that extortion itself does not necessarily worsen the distortion of the incentive contract. From (6) we can see that as long as  $\pi(y)$  and  $z(y)$  have opposite relations with respect to changes in  $w(y)$  (i.e.,  $\partial \pi(y)/\partial w(y)$  and  $\partial z(y)/\partial w(y)$  have different signs), then extortion actually ameliorates the extent of the contract’s distortion. Put differently, although the principal’s expected gain of evasion is necessarily reduced with extortion, the efficiency of the incentive contract might actually improve. The reason for this is quite intuitive. For example, if the agent exhibits increasing risk aversion, then our previous reasoning shows that he is under-motivated relative to the second-best result. However, if the agent is able to extort more for higher realization of  $y$  (i.e., if  $z(y)$  increases with wage), then there is an additional motivation for the agent to provide effort, because it corresponds to higher output, and thus higher extortion rent. The problem of under-provision of effort is thus assuaged in the presence of extortion. Naturally, if  $\pi(y)$  and  $z(y)$  have opposite relations with respect to

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<sup>15</sup>We thank Jennifer Reinganum for suggesting this to us.

changes in  $w(y)$ , then the ability of the agent to extort can only exacerbate the problem of effort distortion.

### *3.2 Repeated Interaction*

It might be argued that since a firm is a long-lived entity, the principal and agent should have a long-term relationship. If this is so, then a contract (or collusion) that is not legally enforceable can still be enforced as an implicit contract by way of reputation. This is actually an application of the folk theorem in repeated games.<sup>16</sup> By this argument one party who has been cheated can retaliate by refusing to cooperate with the deviant in the future. If the loss caused by retaliation is large enough, and if the parties do not discount the future heavily, then the threat of retaliation can deter them from deviation against implicitly-agreed actions.

In our context, this implicit contract might work as follows. The principal pays the agent according to  $w^1(y)$ , and the agent declares  $r$  as profit. In the case when evasion is detected, the principal promises to compensate the agent the full amount of penalty,  $x(y - r)$ . The manager, if betrayed, can refuse to collude with the principal in the future. If the owner does not discount future incomes by much, then lower non-cooperative income in the future is enough to deter the principal from cheating. This argument has some merit, and perhaps works in some environments, but the folk theorem actually holds only under very stringent assumptions. Above all, it requires that the principal and agent are bound to interact indefinitely, otherwise the end-period argument will unravel to destroy all possibility of successful collusion. In our context, once tax evasion is detected and both are penalized, it is very likely that the relation between the manager and the principal will be severed;<sup>17</sup> i.e., they will not have a long-term relation (as is required by the assumption of the folk theorem) after evasion is detected. Consequently, the ability of the manager to “retaliate” against the principal when the latter reneges is in doubt.

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<sup>16</sup>See, for example, Fudenberg and Maskin (1986).

<sup>17</sup>For example, the manager may be forced to resign.

### *3.3 Other Sources of Inefficiency*

In our model, the source of inefficiency in tax evasion comes from the fact that the contract is deemed incomplete due to its illegal nature, and thus is difficult to enforce. This incompleteness in turn induces distortion on the agent's effort. There are, however, potentially many other reasons why corporate income tax evasion can create inefficiency in internal control. Here we discuss two of the reasons which we believe to be of the greatest interest.

#### *3.3.1 Informational value of signals and detection probability*

The basic tenet of contract theory is that in order to make the contract between the owner and manager operational and enforceable, the signals on which the wage contract is based must be verifiable (see Hart, 1995). According to Hölmström (1982), the more firm-related variables that are of informational value regarding the effort level of the agent are written into the contract, the better the principal can control the agent, and therefore the more efficient is the contract. But by doing so, more verifiable information regarding internal governance of the firm will be made public, making it easier for the tax authority to detect tax evasion. If the probability of being detected increases significantly when the contract is more detailed and open to the public, then the principal will be unwilling to incorporate as much information as the optimum would require when she evades tax.<sup>18</sup> We can thus have a model in which the degree of completeness of contract is a choice variable of the principal. A more complete contract enhances efficiency in internal control, but it also increases the probability that tax evasion will be detected. In order to evade tax, the owner chooses the optimal degree of completeness in contract to balance the trade-off between the two considerations.

More specifically, suppose  $y_1, \dots, y_n$  are  $n$  profit-related (verifiable) signals that are of informational value in inferring the effort level of the agent. If the firm does not evade tax, then by Hölmström (1982) the wage contract should be a function of all the  $y_i$ 's. If it evades tax, then it must manipulate the values of (at least a subset of) the  $y_i$ 's that are reported to

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<sup>18</sup>For example, knowing that the hiring and paying of black market labor cannot be based on written contracts make one more cautious in hiring black market labor than what the optimum would otherwise call for.

tax authority. However, this will increase the probability that evasion is detected if these  $y_i$ 's are also included in the labor contract. Suppose the expected gain of evasion in manipulating the value of  $y_i$  is  $X_i$ , and the probability of being detected when  $y_i$  is (resp. is not) used in the wage contract as a determinant of wage is  $p_i + \Delta p_i$  (resp.  $p_i$ ). The efficiency loss (in monetary term) when  $y_i$  is not incorporated in the wage contract is assumed to be  $c_i$ . The expected gain of evasion by manipulating the value of  $y_i$  is thus  $M_i \equiv X_i - p_i q - c_i$  if  $y_i$  is not written into the contract, and is  $N_i \equiv X_i - (p_i + \Delta p_i)q$  if it is. Then if  $\max\{M_i, N_i\} \leq 0$ , the firm will not use  $y_i$  as an instrument to evade. If  $\max\{M_i, N_i\} > 0$  and  $M_i > N_i$ , then  $y_i$  will be used as an instrument to evade and it is not written into the contract. If  $\max\{M_i, N_i\} > 0$  and  $M_i < N_i$ , then  $y_i$  is sufficiently important for internal control despite that it increases detection probability when it is written into contract. Consequently,  $y_i$  will be used as an instrument to evade and it is also written into the contract. The firm then does the same exercise for all the  $y_i$ 's, and decides whether to evade tax, and if so which subset of  $\{y_i\}_{i=1}^n$  to be used as instruments to evade. Finally, it can also decide whether those  $y_i$ 's which are used to evade tax should be written into contract. We thus not only have a model in which the firm can choose which signal(s) to use as instrument(s) to evade, but also that the completeness of contract is endogenously chosen to balance the trade-off between detection probability and internal control.

### *3.3.2 Double use of control instruments*

Another possible loss of efficiency, when the firm evades tax, is that the same instrument that is used to control the manager is also used as an instrument to evade tax. Let us consider the following example which reflects the real situation in many countries. Suppose there is a restaurant, the profit of which is sales revenue minus wage and the cost of inputs. The wage of the restaurant's manager is based on revenues and costs, which are imperfect signals for his effort level. In order to evade taxes, the owner of the restaurant can either ask the manager not to issue receipts to customers (especially cash-transaction customers) so that the sales record can be suppressed, or ask the manager to exaggerate the amount of inputs so that costs can be overstated. Suppose that the manager is asked to evade taxes by

suppressing sales records. In that case he might be tempted to treat his friends or family in the restaurant without paying for it; or he might simply put part of the revenue (for which he did not issue receipts) into his own pocket. As a result, it will be hard for the owner to evaluate the performance of the manager via the information revealed by revenue. In other words, there is an efficiency loss of internal control for the restaurant. The case is the same for over-reporting costs. If the manager is asked to over-report costs in order to evade taxes, then the manager will be prone to waste and increases the costs of the firm (perhaps for his own perquisites), and the information value of costs as an instrument to control the manager is partly lost.<sup>19</sup>

More specifically, suppose that in order to evade tax, the manager is asked to report lower value of output  $y$ . Given this discretion, he might be able to divert some output for his own use and claim lower output. The information value of output as a signal of effort level will therefore be reduced. That is, the information on the manager's effort level provided through the function  $f(y|e)$  will then be noisier when the manager is asked to help evade tax by manipulating the value of  $y$ . There can be many ways to model this. For example, the conditional density function of output can be assumed to be a mean-preserving spread of the original density function  $f(y|e)$  when the firm evades tax. Since there is information loss in the signal, the efficiency of the optimal contract will be reduced.

## 4. Conclusions

This paper proposes what we believe to be the first theoretical model of corporate income tax evasion. We explore the link between internal control and the external evasion decisions of businesses. Since the attempt of the owner to evade tax requires the collusion of the manager, it brings additional risk to the manager if he is liable for evasion. The fact that tax evasion is illegal prevents the possibility of compensating for this risk ex post, meaning that the manager must be compensated through the wage contract ex ante. This not only

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<sup>19</sup>Note that this does not necessarily mean that the manager colludes with the owner to evade taxes. He might not be in charge of tax matters, and is only asked not to issue receipts for some consumers.

creates an incompleteness in contract, but also forces the labor contract to play the double role of rewarding the agent's effort and compensating for the risk of evasion. Consequently, it incurs efficiency loss in controlling the manager's effort.

We also explore other possible sources of inefficiency in tax evasion. The first is that in order to cheat on tax, the business owner needs to create vague information to mislead the tax authority. As long as this information is also needed for internal control, such vagueness will reduce the informational value of the contract in controlling the manager. The second possible source of efficiency loss is that in order to evade tax, the firm needs to either over-report cost or under-report revenue. But once it delegates the power of manipulating the value of cost or revenue to the manager, the latter can abuse this power for his own benefit. Consequently, the informational value of cost or revenue as an instrument of control is reduced. Although we have not modelled the two resources of inefficiency formally, the intuition is clear.

The idea that if a contract involves actions that are illegal, then it is deemed to be incomplete, which in turn incurs efficiency loss, appears to us much more general than in the context of tax evasion. In particular, this might help to explain why violence is prevalent in organized crime, as it uses violence as a way to enforce clauses that are otherwise not honored by the courts.

Finally, since corporate income tax evasion involves cooperation of members in a hierarchy, we have reason to believe that a deeper understanding of the recent development in the theory of collusion in hierarchies can greatly enrich the study of corporate income tax evasion.<sup>20</sup>

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<sup>20</sup>The investigation of collusion in hierarchies is still in its preliminary stage. See Tirole (1986) for a seminal study, Tirole (1992) for survey, and Kofman and Lawarree (1993) and Felli and Villas-Boas (2000) for recent theoretical results.

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