The Manager and the Auditor in a Double Moral Hazard Setting: Efficiency through Contingent Feess and Insurance Contracts

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Abstract

Our article integrates the manager's care in the literature on auditor's liability. With unobservable efforts, we face a double moral hazard setting. It is well-known that efficient liability rules without punitive damages do not exist under these circumstances. However, we show that the problem can be solved through strict liability, contingent auditing fees, and fair insurance contracts. Neither punitive damages nor deductibles above the damages are required.

Keywords: auditor liability, duble moral hazard, team production problem, partnerships, insurance.

JEL classification:

1 Introduction

Recently, many papers analyzing the effects of different liability rules on the quality of audits have been published. Besides others, Dye (1993), Narayanan (1994), Chan and Pae (1996), and Boritz and Zhang (1997) compare strict liability to negligence, and joint and several liability to proportionate liability under the reasonable assumption that the auditor's effort is not (perfectly) observable. Melumad and Thoman (1990) focus on hidden information, Schwartz (1994) introduces the concept of vague negligence rules, Ewert (1998) compares vague negligence to perfect negligence, and Ewert, Feess and Nell (1998) discuss the significance of insurance contracts.

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Though illuminating, the papers do not compare the equilibria efforts under different liability rules to the first best level. Moreover, the manager's behavior is taken as exogenously given when the auditor's behavior is been considered. Though this seems to be justified since the auditor checks a given statement, it ignores the fact that a liability rule affects not only the auditor's effort, but also the manager's care. Taking this into account, the problem turns out to be double moral hazard problem (Holmström 1982): wrong investment decisions can only be made if the manager makes a false statement *and* the auditor does not detect the mistake.

This article contributes to the literature on auditor's liability by incorporating the manager's behavior. Following Narayanan (1994) and others, we focus on the moral hazard problem (hidden action), while we assume that the auditing technology is public information (i.e. we leave the hidden information-case to further research). It is well-known from the literature that efficient liability rules without punitive damages do not exist for multi-party accidents with moral hazard (Shavell 1987):[1] Negligence based rules are not available since the efforts are unobservable, and an efficient strict liability rule requires that each party bears the total loss (Finsinger and Pauly 1990).[2] However, there are two main differences between the problem at hand and the common problem of multi-party accidents: first, there is a close relationship between the manager and the auditor, so that it is appropriate to assume that the agents can agree upon private contracts as a remedy to the partnership problem.[3] Second, the manager and the auditor act sequentially. This is important despite the assumption that the efforts are unobservable, because the manager and the auditor can agree upon a contract that specifies payments contingent on whether the auditor detects a false statement or not. Hence, conversely to the negative result about multiparty accidents, we show that the problem can be solved by a simple strict liability rule without punitive damages if contingent auditing fees are allowed.

The idea is actually straightforward: Within a system of strict liability, each proportionate rule leads to inefficiently low efforts because each party takes only part of the loss into consideration (this is exactly the team production problem). Now assume that the auditor and the manager sign a contract that consists of two parts: a flat fee that is payed in advance, and a variable auditing fee that is only payable if the auditor finds a mistake. We

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[1]We use the terms "double moral hazard problem, team production problem" and "multiparty accidents" synonymously.

[2]In Law & Economics, the team production problem is analyzed with respect to multiple tortfeasors or multi-party accidents (see especially Kornhauser and Revesz 1989), and extended to settlements and the problem of insolvency (Kornhauser and Revesz 1994).

[3]The same assumption would be odd for mass collisions on highways, for instance.

show that the variable fee can be specified as to guarantee efficient incentives for both the manager and the auditor if and only if the manager's liability share equals the auditor's *optimal* probability of detecting a false statement. To the best of our knowledge, our paper is the first one designing a liability rule setting efficient incentives for *both*, the manager and the auditor.

Though we focus on hidden action, one may nevertheless wonder if a proportionate rule that divides damages according to the *optimal* probability of detecting a mistake is realistic (recall that the *real* probability is unobservable). This might lead to high transaction costs and serious problems of justice and equity if the optimal probabilities differ between different auditors. Moreover, due to the close relationship between the auditor and the firm, it might be the case that only the court faces a problem of hidden information. Thus, a less sophisticated liability rule is clearly preferable. We show that *each* proportionate rule (for instance a liability rule where the auditor pays total damages and the manager pays nothing) solves the problem if contingent fees are allowed, and if the liable parties have access to liability insurance. Suppose the auditor is strictly liable for total losses if she does not detect a false statement. Though this sets efficient incentives for the auditor, the manager has no incentive when preparing a statement. Following our basic idea, the contingent fee can be specified as to guarantee efficient incentives for the manager. Given strict liability for the auditor and a variable fee that she gets whenever she reveals the mistake, her effort will be excessively high. But this problem can be solved through the auditor's liability insurance - the manager's variable payment increases the auditor's effort, and this is balanced by the opposite effect created by insurance. We demonstrate that the efficient contracts are chosen in the unique Perfect Bayesian Equilibrium if the insurance contract is observable or verifiable in court.

Our proposal differs from the actual legal situation at least in two respects: first, in reality, auditor's liability is based on negligence, not on strict liability. Second, contingent fees are excluded by the codes of professional ethics. However, our idea might be justified for the following reasons: first, it is easy to demonstrate that the current legal situation is inefficient. Second, substituting negligence by strict liability is always interesting if the effort is not perfectly observable. Third, contingent auditing fees do not seem to be eccentric. Fourth, assuming that insurance contracts are observable does not seem to be restrictive. Finally, the liability rule and the efficient contracts are quite simple: they consist only of strict liability, flat fees, a payment contingent on the detection of a mistake, and a deductible strictly below the auditor's liability share.[4]

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[4]Feess and Hege (1998) demonstrate that the common team production problem can

Section 2 presents the model. Section 3 derives the efficient proportionate liability rule without insurance. Section 4 explains the structure of the efficient contracts for a simple liability rule. Section 5 concludes.

2   The model

For simplicity, we directly assume that a group of investors suffer damages $D = 1$ whenever the firm's type is falsely reported as "good". The probability that the manager wrongly reports "good" is $\pi(m)$, and the probability that the auditor does not detect the mistake is $p(a)$. $\pi(m)$ and $p(a)$ are common knowledge, but a and m are unobservable. For notational convenience, m and a denote both the players' efforts and their costs.[5] The following properties hold:

$$\pi(m) > 0 \forall m, \frac{\partial \pi}{\partial m} < 0, \frac{\partial^2 \pi}{\partial m^2} > 0, \ p(a) > 0 \forall a, \frac{\partial p}{\partial a} < 0, \frac{\partial^2 p}{\partial a^2} > 0 \qquad (1)$$

All players are risk-neutral. Social costs are defined as

$$C = \pi(m)p(a) + m + a \qquad (2)$$

leading to the FOC's

$$\frac{\partial \pi}{\partial m} p(a^f) = -1 \qquad (3)$$

$$\frac{\partial p}{\partial a} \pi(m^f) = -1 \qquad (4)$$

From the literature on multi-party accidents as discussed in the introduction, it is well-known that efficient liability rules without punitive damages do not exist if private contracts between the manager and the auditor are excluded.

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also be solved trough proportionate liability and insurance contracts.

[5]Usually it is assumed that (1) there are two states of the nature, a good state with probability β, and a bad state with probability $1 - \beta$, (2) that the investment's expected net present value is positive, (3) that audits are socially valuable and (4) that the auditing technology has one-sided errors, i.e. that an auditor never errs if the state is good. Our reduced form, however, leads to the same results and simplifies the model.

3   The efficient proportionate rule

First we consider the case where the court divides the damages as a function of the efficient detection probability $p(a^f)$. Define α as the manager's share and $1-\alpha$ as the auditor's share. The manager and the auditor agree upon an amount γ that is payable if the auditor detects a false statement. Without loss of generality, we assume that the audit market is competitive. The auditor's reservation level of utility is normalized to zero. We consider the following game:

1. The liability rule specifying α is proposed.

2. The manager suggests a take-it-or-leave-it contract consisting of a flat payment c and a contingent payment γ.

3. The auditor accepts or not.

4. The manager chooses her unobservable effort m.

5. The auditor chooses her unobservable effort a.

6. A false statement is detected or not, and loss $D = 1$ occurs if a false statement is not detected

7. Payments are made according to the liability rule and the private contract.

Proposition 1: Efficiency requires that $\alpha = \gamma = p(a^f)$.

Proof: With shares α and $1-\alpha$, and γ and c, the players' cost functions are

$$M = \alpha\pi(m)p(a) + m + \gamma\pi(m)\left[1 - p(a)\right] + c$$

$$A = (1-\alpha)\pi(m)p(a) + a - \gamma\pi(m)\left[1 - p(a)\right] - c$$

Now suppose $\alpha = \gamma = p(a^f)$. The cost functions are then

$$\begin{aligned} M & = p(a^f)\pi(m)p(a) + m + p(a^f)\pi(m)\left[1 - p(a)\right] + c \\ & = p(a^f)\pi(m) + m + \widetilde{c} \end{aligned}$$

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$$A = \left[1 - p(a^f)\right] \pi(m)p(a) + a - p(a^f)\pi(m)\left[1 - p(a)\right] - c$$
$$= \pi(m)p(a) - p(a^f)\pi(m) + a - c$$

Since the manager's optimal behavior is independently of the auditor's effort given by the FOC $\frac{\partial \pi}{\partial m}p(a^f) = -1$, she clearly acts efficiently. This is the case whenever the private contract copycats the liability rule, i.e. if $\gamma = \alpha$. Given the manager's efficient effort choice (which is anticipated by the auditor by the definition of an equilibrium), the auditor's FOC turns out to be $\frac{\partial p}{\partial a}\pi(m^f) = -1$. Thus, both players act efficiently if the court announces the liability rule α, and if the manager suggests a contract $(\gamma = \alpha, c)$ accepted by the auditor.

The auditor accepts if she gets at least her reservation level of utility, so that c is given by

$$c = \pi(m^f)p(a^f) - p(a^f)\pi(m^f) + a^f = a^f$$

Given that the manager pays only the auditor's cost of effort, her cost function turns out to be identical to the social cost function, so that she prefers to suggest the efficient contract. □

The intuition for the suggested combination of a proportionate rule and a private contract is straightforward: first, each proportionate rule leads to efficient incentives for the auditor if the manager's liability payment equals the contingent fee (the contingent fee serves as a substitute for the part not borne by the auditor). Second, there is only one proportionate rule that leads simultaneously to efficient incentives for the manager: she must pay $p(a^f)$, because the probability that the auditor detects a false statement $(1-p(a^f))$, weighed with the payment $(p(a^f))$ must be balanced to the part that is not borne by the manager $(1-p(a^f))$, weighed with the probability that the fault remains undetected $(p(a^f))$.

4 Strict liability and insurance

4.1 Strict liability for the auditor

Next we consider the case where the court does not want (or is not able to) make the proportionate rule dependent on the optimal detection probability. First, we suggest strict liability for the auditor and no liability for the manager. Though each proportionate rule leads to the efficient care levels if

insurance coverage is available, strict liability for the auditor has some nice properties compared to other rules (see section 3.2).

Additionally to section 2, we assume that insurance companies are operating on a perfectly competitive insurance market, and that insurance contracts are observable. We consider the following game:

1. The liability rule is proposed.

2. The manager suggests a contract z to the auditor consisting of a flat fee c, a variable fee k that has to be paid if the auditor detects a false statement, and an insurance contract *for the auditor*.[6] An insurance contract y consists of a fixed premium x paid by the auditor and a deductible d. Given the auditor's liability payments α, the insurance company pays $\alpha - d$ if the investment fails. Thus, $y = [x, d,]$, and $z = [c, k, x, d]$.

3. The manager chooses her unobservable effort m.

4. The auditor chooses her unobservable effort a.

5. Payments are made according to the liability rule and the private contract.

Proposition 2: Suppose the auditor is strictly liable for the entire damage $(1 - \alpha = 1)$. Then, in the unique Perfect Bayesian Equilibrium

1. The manager suggests the contract

$$\widetilde{z} = \left[\widetilde{c}, \widetilde{k}, \widetilde{x}, \widetilde{d}\right] = \left[a^f, \frac{p(a^f)}{1 - p(a^f)}, \frac{p(a^f)}{1 - p(a^f)}\pi(m^f)p(a^f), 1 - \frac{p(a^f)}{1 - p(a^f)}\right] \tag{5}$$

2. The auditor accepts.

3. The manager chooses m^f, and the auditor chooses a^f. Social costs are minimized and identical to the manager's costs

$$M = \pi(m^f)p(a^f) + m^f + a^f \tag{6}$$

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[6]Alternatively, we could assume that the auditor seeks for insurance coverage, and that the manager signs the contract with the auditor only if the insurance contract guarantees efficiency. However, it is often the case that firms directly sign insurance contracts for their subcontractors.

4. The profits of the insurance company and the auditor are zero.

Proof: see Appendix.

The basic logic behind the private contracts has already been explained in the introduction. The manager's payment $\widetilde{k} = \frac{p(a^f)}{1-p(a^f)}$ occurs if the auditor detects a false statement. The expected payment is thus $E(\widetilde{k}) = \frac{p(a^f)}{1-p(a^f)}\pi(m)(1-p(a))$, which is simply $p(a^f)\pi(m)$ if the auditor chooses a^f (thus guaranteeing m^f). The fixed auditing fee $c = a^f$ follows from the auditor's participation constraint. Given $\widetilde{k} > 0$, the auditor would choose $a > a^f$ without insurance, because she is strictly liable (this would lead to a^f) *and* gets $\widetilde{k}$ if she finds a mistake. The deductible $1 - \frac{p(a^f)}{1-p(a^f)}$ is specified as to guarantee that the effect of $\widetilde{k}$ is balanced by $d < 1$.

4.2 Other proportionate rules

In this subsection, we show that strict auditor liability for total damages ($\alpha = 0$) is the only "proportionate" rule guaranteeing that a standard insurance contract leads to the pareto-efficient care levels. By a standard insurance contract we mean that the deductible is positive, but smaller than total damages ($0 < d < 1$). Suppose first $\alpha = 1$. Hence, the manager must insure herself, since the auditor has no liability risk. It follows immediately that efficiency for the auditor requires $k = 1$. Following the logic in subsection 3.1, it can easily be shown that (given $k = 1$) the manager acts efficiently if and only if the deductible is

$$d = \frac{2p(a^f) - 1}{p(a^f)}$$

This implies $d < 0$ if $1 - p(a^f) > 0,5$, i.e. the deductible has to be negative (the insurer pays more than total damages) if the auditor's optimal detection probability is sufficiently high: With $1 - p(a^f) > 0,5$, the manager has too high an incentive to avoid false statements, because her expected payments to the auditor are higher than the expected harm. This effect must be balanced by a negative deductible. Thus, a standard insurance contract cannot always restore efficiency if $\alpha = 1$.

For the general case ($0 < \alpha < 1$), we restrict our attention to insurance coverage for the manager.[7] It is then easy to prove that the efficient contract

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[7]With $0 < \alpha < 1$, we could also consider insurance coverage for the auditor or both, the manager and the auditor. Since this does not lead to fundamentally new insights, we do not want to strain the reader's patience.

is

$$\widetilde{z} = \left[\widetilde{c}, \widetilde{k}, \widetilde{x}, \widetilde{d}\right] = \left[a^f + \pi(m^f)\left(p(a^f) - \alpha\right), \alpha, \left(\alpha - p(a^f)\right)\pi(m^f), 1 + \frac{p(a^f) - \alpha}{\alpha \cdot p(a^f)}\right]$$
(7)

The required deductible $1 + \dfrac{p(a^f) - \alpha}{\alpha \cdot p(a^f)}$ is above one if $p(a^f) - \alpha$, i.e. if the auditor's optimal probability of detection is higher than the manager's share. On the other hand, the deductible must be neagtive if α is considerably higher than $p(a^f)$ (if $\dfrac{p(a^f)}{1 - p(a^f)} < \alpha$), so that standard insurance contracts are not always sufficient. Hence, one might opt for $\alpha = 0$.

5 Discussion

We demonstrated that the team production problem between the manager and the auditor can be solved through a simple strict liability rule if contingent auditing fees are permitted. If the proportionate rule can be based on the auditor's *efficient* probability of detecting a false statement, then no other instrument is required. If this is not the case, we suggest strict liability for the auditor combined with insurance that is voluntarily chosen (thus mandatory insurance is not necessary). The suggested contracts are quite simple: they consist only of a contingent payment, flat fees and a deductible strictly below the auditor's damages. Though straightforward, we are of the opinion that our proposal might be of some importance, since it is the first one that leads to efficient incentives for both, the manager *and* the auditor. Moreover, it demonstrates that strict liability without contributory negligence can efficiently be adopted for multi-party accidents if the setting fits to our model. We are optimistic that the model is not restricted to the problem of auditing, but might also be of relevance for all situations where one agent supervises the result of an other agent's activity (including i.e. the careless construction of an aircraft that is checked by the authority). However, we have not analyzed the case with hidden action *and* hidden information yet.

6 Appendix

Proof of Proposition 2

Step 1: To prove qua backwards induction, we first show that it is privately optimal to choose m^f and a^f if the contract $\widetilde{z}$ is signed. Given $\widetilde{z}$, the manager's and the auditor's costs M and A are

$$M(\widetilde{z}) = \pi(m)\left(1 - p(a)\right)\frac{p(a^f)}{1 - p(a^f)} + m + a^f \tag{8}$$

and

$$\begin{aligned}
A(\widetilde{z}) &= \left(1 - \frac{p(a^f)}{1 - p(a^f)}\right)\pi(m)p(a) - \pi(m)\left(1 - p(a)\right)\frac{p(a^f)}{1 - p(a^f)} \tag{9}\\
&\quad + a - a^f + \frac{p(a^f)}{1 - p(a^f)}\pi(m^f)p(a^f)
\end{aligned}$$

Let m^* and a^* be the care levels in the Nash equilibrium, given $\widetilde{z}$. Due to the assumptions on $\pi(m)$ and $p(a)$, m^* is decreasing in a, and a^* is decreasing in m. Thus, the equilibrium is unique. Now suppose that $a^* = a^f$. The manager's objective function is then

$$\begin{aligned}
M(\widetilde{z}, a^f) &= \pi(m)\left(1 - p(a^f)\right)\frac{p(a^f)}{1 - p(a^f)} + m + a^f \tag{10}\\
&= \pi(m)p(a^f) + m + a^f
\end{aligned}$$

which is clearly minimized by m^f. Given m^f, the auditor's objective function turns out to be

$$\begin{aligned}
A(\widetilde{z}, m^f) &= \pi(m^f)p(a) + a - \pi(m^f)\frac{p(a^f)}{1 - p(a^f)} \tag{11}\\
&\quad - a^f + \frac{p(a^f)}{1 - p(a^f)}\pi(m^f)p(a^f)
\end{aligned}$$

Since $-\pi(m^f)\frac{p(a^f)}{1-p(a^f)} - a^f + \frac{p(a^f)}{1-p(a^f)}\pi(m^f)p(a^f)$ is independent of the auditor's behavior, $A(\widetilde{z}, m^f)$ is minimized by a^f. It follows that $\left(m^f, a^f\right)$ is a unique Nash equilibrium if $\widetilde{z}$ is signed.

Step 2: Next we show that the manager suggests $\widetilde{z}$. Given $\widetilde{z}$, the manager knows (see step 1) that m^f, a^f is the Nash equilibrium if the auditor accepts. The auditor's utility is then

$$A(\widetilde{z}, m^f) \;\; = \;\; \pi(m^f)p(a^f) + a^f - \pi(m^f)\frac{p(a^f)}{1 - p(a^f)} \tag{12}$$

$$-a^f + \frac{p(a^f)}{1 - p(a^f)}\pi(m^f)p(a^f) = 0$$

so that the auditor's participation constraint is fulfilled.
The manager's costs

$$M(\widetilde{z}, a^f, m^f) = \pi(m^f)p(a^f) + m^f + a^f \tag{13}$$

are identical to the minimum social costs. Since the profits of the auditor and the insurance company are zero,[8] and since the total loss is privately internalized through strict liability, the manager's costs are identical to the social costs. It follows that there is no other contract leading to lower costs. □

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