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Imperfect Information and Costly Litigation -
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Effect of Liability Insurance**

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Auditor Liability Rules under Imperfect Information and Costly Litigation - The Welfare Increasing Effect of Liability Insurance

Abstract

This paper examines auditor liability rules under imperfect information, costly litigation and risk averse auditors. A negligence rule fails in such a setting, because in equilibrium auditors will deviate with positive probability from any given standard. It is shown that strict liability outperforms negligence with respect to risk allocation, and the probability that a desired level of care is met by the auditor if competitive liability insurance markets exist. Furthermore, our model explains the existence of insurance contracts containing obligations - a type of contract often observed in liability insurance markets.

Keywords: auditor liability, risk allocation, liability insurance

1 Introduction

During the last years, remarkable modifications of auditor liability were enacted in several countries. For example, the Private Securities Litigation Reform Act of 1995 in the U.S. replaced joint and several liability by proportionate liability.¹ In Germany, the "Gesetz zur Kontrolle und Transparenz im Unternehmensbereich (KonTraG)"² has increased maximum liability payments for each false statement from 0,5 to 8 million DM. Though the changes are important, the principle of negligence was nowhere substituted by strict liability.

Theoretically, it is somewhat surprising that auditor's liability is negligence based, because it is well known that strict liability is superior if problems of asymmetric information are taken into account. We consider a setting where the auditor's effort is unobservable but verifiable, and where litigation is costly. With these reasonable assumptions, a negligence rule is inefficient even if the court perfectly adjusts the due care standard. The reason is that an equilibrium in pure strategies does not exist: plaintiffs have no incentive to sue if the auditor certainly takes due care, but the auditor has no incentive to meet the due care level if plaintiffs never sue. Thus, only equilibria in mixed strategies do exist, implying that any due care level is violated with positive probability.³ Since the first best is attainable through a simple strict liability rule, one might wonder why strict liability is of no practical importance.

A first reason could be seen in the existence of multiple participants, since the probability of a false and undetected statement depends on the care levels of the manager *and* the auditor. It has been proven that, for multi-party liability problems, no efficient strict liability without comparative or contributory negligence exists if punitive damages are excluded.⁴ However, the argument is of limited value in the special case of auditor liability, because the manager and the auditor can agree upon payments contingent on whether the auditor detects a false statement or not. In a companion paper (Feess and Nell 1998) it is shown that proportionate liability leads to efficient incentives if contingent fees are allowed.

In this paper, we focus on a second fact that might be seen as an impor-

¹See King and Schwartz (1996) for a discussion of this Act.

²The KonTraG was finally approved on 1998-03-27.

³This follows directly from Simon (1981).

⁴See Finsinger and Pauly (1990). This follows immediately from Holmström's (1982) analysis of the so called team production problem.

tant drawback of strict auditor liability, namely risk averse auditors. With risk averse auditors, strict liability leads to suboptimal risk allocation, and induces suboptimal levels of care.⁵ We analyze the welfare effects of liability insurance under the assumption that the insurer faces the same informational problems as the court. Since the auditor's effort is unobservable, the insurance premium cannot be made contingent on the auditor's effort. However, because the effort is verifiable ex post (i.e. if the auditor is sued), the insurer and the auditor can ex ante agree upon a contract that excludes indemnity payments if the auditor violates the obligations specified in the contract. Obligations can be interpreted as standards set by the insurer. In fact, we often observe liability insurance contracts with obligations, whereas premia depending on the auditor's effort, or substantial deductibles, are rather seldom. In our setting with unobservable but verifiable effort, and risk-averse auditors, we demonstrate that strict liability with obligations defined by insurance companies outperforms negligence based liability rules.

There are many papers analyzing different aspects of auditor liability. Besides others, Dye (1993), Dye (1995), 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, and Schwartz (1994) introduces the concept of vague negligence rules. Our paper is most closely related to Narayanan (1994) and Ewert (1998). Both papers analyze the strategic interdependency between the auditor's effort and the investor's incentive to sue. Narayanan compares the joint and several rule to the proportionate rule under different settings, while Ewert compares precise negligence standards with vague negligence. With unobservable but verifiable effort and positive litigation costs, each precise negligence standard can be outperformed by a vague standard. However, none of these papers deals with insurance markets. Section 2 presents the model. In section 3 we assume that the effort can be verified without costs. Section 4 introduces verification costs. Section 5 concludes.

⁵The problem is aggravated by the fact that auditors carry out many audits, from which - even positively correlated - liability claims can result, see Nell and Richter (1996).

2 The model

We consider a risk averse auditor who accepts the order to audit the financial statement in exchange for a flat fee. The financial statement contains a mistake with probability z , which causes damage D for a risk neutral investor. The probability p to detect the mistake depends on the auditor's cost of effort e . As usual, we assume that the following properties about the function $e(p)$ hold:⁶

$$e(0) = 0, e(1) = \infty, \frac{\partial e}{\partial p} > 0, \frac{\partial e}{\partial p} \Big|_{\lim p \rightarrow 1} = \infty, \frac{\partial^2 e}{\partial p^2} > 0 \quad (1)$$

If a damage occurs, the auditor is sued by the investor with probability π , where litigation costs are $T < D$. T is allocated according to the English rule.⁷ Effort e is unobservable, but verifiable. In the following section, we assume that effort e is ex post verifiable without costs.

3 No Verification costs

3.1 Negligence

3.1.1 The court's decision on the standard of due care

A standard assumption in the economic analysis of law is that courts set the socially optimal standard whenever this is possible. The first best standard (FBS) minimizes the sum of the cost of care and damage, because investors are assumed to be risk neutral. Thus, the FBS is given by

$$\min_e C = e(p) + z(1 - p)D \quad (2)$$

However, the FBS cannot be applied since the effort is unobservable and litigation costs are positive. If the court sets the FBS, the auditor will violate this standard with positive probability, so that litigation costs have to be taken into account when thinking about an optimal standard. It follows that

⁶Of course, we could use the inverse function $p(e)$ instead.

⁷The results would not change substantially if we applied the american rule instead. See Chan and Pae (1996) for the comparison of the english and the american rule.

the FBS in Eqn. 2 is not meaningful in our setting. But defining a second best standard (SBS) turns out to be extremely difficult, because it must be expressed with respect to the liability rule whenever liability rules lead to different litigation costs.⁸ Moreover, litigation costs may be reduced through settlements, and the probability of settlements depends on the liability rule. Due to these difficulties and the objective of our paper, we refrain from determining a SBS. Instead, we assume that courts establish a standard of due care that would always be chosen by the auditor if her effort was observable. This assumption can be introduced without loss of generality, since we demonstrate that for *each* standard, there exists a combination of strict liability and insurance that is superior in two respects: First, a level of due care will be met with certainty under strict liability but not under a negligence. Second, the risk allocation will be optimal under strict liability but not under a negligence. Hence, our argument that strict liability outperforms negligence can be established without defining a SBS.

3.1.2 The auditor's effort decision

The auditor is risk averse with a twice differentiable utility function $U(\cdot)$. She has initial wealth W (including the auditing fees) and maximizes the expected utility of her wealth with respect to the detection probability p . If she meets the standard \bar{p} ,⁹ her expected utility is $U(W - e(p))$. If she doesn't meet the standard and chooses $p < \bar{p}$, she will be held liable whenever the investor sues. Whether the privately optimal level of care is lower than the standard thus depends on the suing probability: With $\pi = 0$, the optimal level of care would be zero. With $\pi = 1$, the optimal level of care is \bar{p} , because

$$U(W - e(\bar{p})) > (1 - z(1 - p))U(W - e(p)) + z(1 - p)U(W - e(p) - D - T) \quad \forall p < \bar{p} \quad (3)$$

by the assumption on \bar{p} . If an optimal level of care $p^* < \bar{p}$ exists, it is the solution to the following maximization problem:

⁸One might expect that litigation costs are lower under strict liability, since it is not necessary to prove that the auditor was negligent.

⁹Of course, the court's standard is expressed through obligations (i.e. through e) instead of probabilities, but this is of no importance.

$$\begin{aligned} \max_{p < \bar{p}} E[U(w)] &= (1 - z\pi(1 - p))U(W - e(p)) \\ &\quad + z\pi(1 - p)U(W - e(p) - D - T) \end{aligned} \quad (4)$$

with the FOC

$$\begin{aligned} \frac{dE[U(w)]}{dp} &= 0 = z\pi \left[U(W - e(p)) - U(W - e(p) - D - T) \right] \\ &\quad - \frac{\partial e}{\partial p} \left[(1 - z\pi(1 - p)) \frac{\partial U}{\partial p} U(W - e(p)) \right. \\ &\quad \left. + z\pi(1 - p) \frac{\partial U}{\partial p} (W - e(p) - D - T) \right] \end{aligned} \quad (5)$$

Though it can easily be shown that the second order condition can generally be violated, it is demonstrated later on that it does hold in equilibrium.

3.1.3 The investor's decision to sue

The risk neutral investor sues whenever her expected profit is not negative. The expected profit depends on damages D , litigation costs T and the probability q that the auditor didn't meet the standard \bar{p} if damage D occurred. Clearly, q must be calculated by Bayes' Rule. Let θ be the probability that the auditor chooses p^* and is thus held liable if the investor sues. Then q can be calculated as

$$q = \frac{\theta(1 - p^*)}{\theta(1 - p^*) + (1 - \theta)(1 - \bar{p})} \quad (6)$$

The investor sues if her expected gain is non-negative, i.e. if

$$qD \geq (1 - q)T \quad (7)$$

or

$$q \geq \frac{T}{D + T} \quad (8)$$

3.1.4 Determination of the Equilibrium

Proposition 1 states the main drawback of negligence if effort is ex ante unobservable and litigation costs are positive.

Proposition 1. There is a unique equilibrium in mixed strategies where the investor takes legal action with probability $0 < \pi < 1$. The auditor meets \bar{p} with probability θ and chooses p^* with $1 - \theta$.

Proof: see appendix.

The equilibrium can be characterized as follows:

- The investor's probability to sue is such that the auditor is indifferent between \bar{p} and p^* .
- The probability that the auditor does not meet the standard of due care is such that the investor is indifferent between taking legal action or not.
- The investor forms her beliefs to win a lawsuit via Bayes' Rule.

We thus obtain the unsatisfactory result that the auditor violates each standard with positive probability. Moreover, the risk allocation is suboptimal, since in equilibrium the risk averse auditor has to bear some risk. We are convinced that ex ante unobservable effort and positive litigation costs are realistic assumptions, so that the negligence rule causes serious inefficiencies.

3.2 Strict liability with liability insurance

Next we analyze strict liability. Without liability insurance, the risk allocation under strict liability is obviously suboptimal, because the risk averse auditor has to bear the whole risk. We demonstrate that strict liability is superior to negligence if competitive liability insurance markets exist and insurers have the same information as the courts: first, the auditor exercises a care level with certainty that is at least as good as under negligence. Second, optimal risk allocation is achieved. We restrict our attention to insurance contracts consisting of a flat premium P , indemnity payments I , and obligations \tilde{p} required to receive the indemnity payments.

The result is summarized in Proposition 2.

Proposition 2. Suppose the auditor is strictly liable and liability insurance markets are competitive. Then an insurance contract guaranteeing that the

auditor chooses the obligation \tilde{p} with certainty is signed. The auditor bears no risk, and \tilde{p} is weakly superior to \bar{p} , i.e.

$$e(\tilde{p}) + z(1 - \tilde{p})(D + T) \leq e(\bar{p}) + z(1 - \bar{p})(D + T) \quad (9)$$

Proof: see appendix.

The intuition behind the solution is straightforward: First, total risk is privately internalized. Second, the auditor has to fully bear the agency costs, since insurance markets are competitive. Thus, the auditor chooses the insurance contract with obligations \tilde{p} that minimizes total costs.

To summarize, there are three advantages of strict liability with insurance:

- the auditor chooses the standard with certainty
- this implies that risk allocation is optimal
- and the standard itself might be superior.

4 Verification costs

So far we have assumed that the auditor's effort is ex post perfectly verifiable without costs. Now we introduce verifications costs (m) which are assumed to be identical for courts and insurance companies. Without verification costs, the analysis was straightforward, since strict liability results in a pure strategy equilibrium. But if the insurer has to bear costs for evaluating the effort of the auditor, a pure strategy equilibrium cannot exist. Hence we have to compare two equilibria in mixed strategies. Let \bar{p} again be the due care level defined by the court. To simplify the analysis, we assume that the insurance contract copycats the due care level, i.e. $\tilde{p} = \bar{p}$. Note that this assumption is in favor for the negligence rule, since it can again be demonstrated that \tilde{p} can never be worse than \bar{p} . As a criterion to compare two mixed strategy equilibria, we use the expected detection probability (the auditor's expected effort level) of the auditor defined as

$$\tilde{E}(p) = \tilde{\theta}\tilde{p} + (1 - \tilde{\theta})\tilde{p}^* \quad (10)$$

under strict liability with insurance and

$$\bar{E}(p) = \theta\bar{p} + (1 - \theta)p^* \quad (11)$$

with negligence. $\tilde{\theta}$ is the probability that the obligation is violated, and \tilde{p}^* is the detection probability chosen in this case. A second simplification is to ignore potential wealth effects of the insurance premium on the risk aversion of the auditor. This assumption can be alternatively justified as follows:

1. The auditor calculates the insurance premium into her audit fees. Her wealth will therefore not be affected by the payment of the insurance premium.
2. The auditor's preferences are given by a CARA utility function.

The following proposition shows that strict liability with competitive insurance contracts remains superior if verification costs do not exceed a certain limit.

Proposition 3. Comparison of the equilibria under negligence and under strict liability leads to the following relations:

1. $\pi < \gamma$, where γ is the insurer's inspection probability
2. $\tilde{p}^* = p^*$
3. $\tilde{q} < q$, $\tilde{\theta} < \theta$, $\tilde{E}(p) > \bar{E}(p)$ if $m^2 < T(T + D)$
4. $\tilde{q} \geq q$, $\tilde{\theta} \geq \theta$, $\tilde{E}(p) \leq \bar{E}(p)$ if $m^2 \geq T(T + D)$

Proof: see appendix

Proposition 3 means that strict liability with insurance results in a higher expected level of care ($\tilde{E}(p) > \bar{E}(p)$) and leads to an improved risk allocation if the verification costs do not pass some critical level. We can easily interpret this result. There are two opposite effects: On the one hand, checking the level of care is more costly for the investor than for the insurer, because they have to bear litigation costs T if \bar{p} was met. On the other hand, insurers always have to pay verification costs, while investors pay only if the auditor is not held liable. If verification costs are not too high compared to litigation costs and damages, the first effect will be stronger than the second. Thus, verification is more attractive for the insurer than for the investor - it follows

that the probability that the auditor violates must be smaller. If verification costs are large, the second effect outweighs the first. Thus, verification of the auditor's level of care is less costly for the investor, and the level of care is met with higher probability under negligence. However, it seems likely that in most cases verification costs are below the critical level. Moreover, the second effect vanishes if we allow insurance contracts that include payments from the auditor to the insurer if the obligation is violated. In this case, strict liability with insurance is always superior.

5 Conclusion

We analyzed auditor liability rules with risk averse auditors, ex ante unobservable but verifiable effort, and litigation costs. We demonstrated that strict liability is superior to negligence if fair insurance is available. While there is always a positive probability that the auditor violates the standard under negligence, the obligation defined by the insurance company is always met if the ex post verification of care is possible without costs. If verification costs are positive, the auditor will fail to meet the standard with a positive probability under strict liability as well as under negligence. However, for realistic levels of verification costs, the deviation from the obligation standard occurs with a smaller probability than under the negligence rule.

Our model helps to explain the design of insurance contracts often observed in reality. Obligations are a prominent feature of these contracts, while insurance premiums depending on effort are rare. These facts strengthen our conjecture that an insurer can hardly observe the auditor's effort ex ante, but that she is able to check whether standards or obligations were met ex post.

Our analysis aimed specifically at the problem of auditor liability. Nevertheless, we are convinced that our results are also important for other areas of liability, since the problem we scrutinised is always relevant if the effort of the injurer is unobservable, and if litigation is costly.

We left out some important aspects. First, we didn't explicitly model the manager's action in deriving the financial statement. Instead, we assumed an exogenous probability of some mistake. Second, we didn't tackle limited liability problems, which strengthen the necessity to include insurance contracts in the analysis. Third, and perhaps most interesting, we didn't consider the case where courts and insurers can only imperfectly verify auditor's effort.

Appendix

Proof of Proposition 1: We proceed in three steps:

1. *Non-existence of an equilibrium in pure strategies:* suppose the auditor chooses \bar{p} with certainty. The investor's best response is to never sue ($\pi = 0$). But for $\pi = 0$, the auditor's best response is $p = 0$. On the other hand, for $p = 0$, we have $\pi = 1$, but for $\pi = 1$, the auditor's best response is $p = \bar{p}$.
2. *Existence of an equilibrium in mixed strategies:* All assumptions required as to guarantee the existence of an equilibrium are fulfilled (see i.e. Dasgupta and Maskin (1986)).
3. *Uniqueness:* It remains to show that the equilibrium in mixed strategies is unique. An equilibrium requires that the investor is indifferent between suing or not, thus $q = \frac{D}{D+T}$. The auditor randomizes if

$$U(W - e(\bar{p})) = (1 - z\pi(1 - p^*))U(W - e(p^*)) + z\pi(1 - p^*)U(W - e(p^*) - D - T) \quad (12)$$

π is unique if the auditor's expected utility when choosing p^* is strictly decreasing in π , which is fulfilled because

$$\frac{dE[U(w)]}{d\pi} = z(1 - p^*) \left[U(W - e(p^*) - D - T) - U(W - e(p^*)) \right] < 0 \quad (13)$$

If π is unique, p^* is also unique. Hence, Eqn. 6, together with $q = \frac{D}{D+T}$, implies that the equilibrium is unique, because $\frac{dq}{d\theta} > 0$, and Eqn. 6 must be fulfilled. ■

Proof of Proposition 2: Let $I = (D + T)$ if $p \geq \tilde{p}$. Assume for the moment that $\tilde{p} = \bar{p}$. Then the auditor chooses \tilde{p} with certainty: $p > \tilde{p}$ is excluded because \tilde{p} is sufficient as to guarantee that the insurer pays. But $p < \tilde{p}$ can be excluded by the fact that the auditor is always liable under

strict liability. Since insurance markets are competitive, we have to search for the obligation \tilde{p} that maximizes the auditor's expected utility under all contracts which break even. Auditor's total costs are $e + z(1 - \tilde{p})(D + T)$. If $e + z(1 - \tilde{p})(D + T)$ is minimized by \bar{p} , then $\tilde{p} = \bar{p}$. If not, then obligations \tilde{p} differ from the negligence standard \bar{p} , which strengthens the efficiency gain of strict liability with insurance compared to negligence. ■

Proof of Proposition 3:

Under negligence, the auditor is indifferent between p^* and \bar{p} if

$$U(W - e(\bar{p})) = (1 - z\pi(1 - p^*))U(W - e(p^*)) + z\pi(1 - p^*)U(W - e(p^*) - D - T - m) \quad (14)$$

holds. Analogically, for strict liability

$$U(W - P - e(\bar{p})) = (1 - z\gamma(1 - \tilde{p}^*))U(W - P - e(\tilde{p}^*)) + z\gamma(1 - \tilde{p}^*)U(W - P - e(\tilde{p}^*) - D - T) \quad (15)$$

must hold. Since we neglect effects of the insurance premium P on the auditor's risk aversion, Eqn. 15 is equivalent to

$$U(W - e(\bar{p})) = (1 - z\gamma(1 - \tilde{p}^*))U(W - e(\tilde{p}^*)) + z\gamma(1 - \tilde{p}^*)U(W - e(\tilde{p}^*) - D - T) \quad (16)$$

Comparing Eqn. 14 and Eqn. 16 yields that the auditor's expected utility is independent of the liability rules if she exercises \bar{p} . Hence, the expected utilities with p^* and \tilde{p}^* are identical, too. Since the expected utility of the right hand side in Eqn. 16 is strictly higher than in Eqn. 14 ($m > 0$) if $\pi = \gamma$, it follows $\gamma > \pi$.¹⁰ This proves part (1) of Proposition 3. Moreover, π and γ must be chosen as to guarantee that $\tilde{p}^* = p^*$, which proves part (2). In an equilibrium under negligence, the investor is indifferent between taking and not taking legal action:

¹⁰Recall that $\frac{dE[U(W)]}{d\pi} < 0$ and $\frac{dE[U(W)]}{d\gamma} < 0$.

$$q = \frac{T + m}{D + T + m}$$

Under strict liability, the insurance company is indifferent between checking or not the auditor's effort level:

$$\tilde{q} = \frac{m}{D + T}$$

Comparing q and \tilde{q} yields $q > \tilde{q}$ if and only if $m^2 < T(D + T)$. The complementary of $\tilde{q} < q$, $\tilde{\theta} < \theta$, and $\tilde{E}(p) > \bar{E}(p)$, follows immediately from $\frac{d\theta}{dq} > 0$.
■

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