

Auditor liability rules under imperfect information and costly litigation: the welfare-increasing effect of liability insurance

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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.

1. INTRODUCTION

During the last few years, remarkable modifications of auditor liability have been enacted in several countries. For example, the Private Securities Litigation Reform Act of 1995 in the US 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, nowhere was the principle of negligence 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

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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 might be seen in the existence of multiple tortfeasors, since the probability of a false 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. For the problem tackled here it is therefore not important whether the manager plays an active role or not. Since we are not especially interested in determining the behaviour of the manager, we take it as exogenously given for simplicity.

In this paper, we focus on a second fact that might be seen as an important 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 analyse 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 premiums depending on the auditor's effort, or substantial deductibles, are rather infrequent. In our setting with unobservable but verifiable effort and risk-averse auditors, we demonstrate that strict liability with obligations defined by insurance companies outperform negligence-based liability rules.

One might wonder why we are considering insurance contracts only under strict liability but not under negligence-based liability rules. Under negligence rules liability insurance contracts are only meaningful if either the standard is imprecisely defined as to factor uncertainty into the model, or if the obligation standard of the insurer is lower than the standard set by courts. The first possibility is excluded in our model, since we are considering only precise but not vague negligence standards.⁶ The second possibility is identical to strict liability with insurance coverage, since an insured auditor will never surpass

the insurer's obligation standard and will thus always be liable. It follows that we do not have to consider the case of negligence with insurance contracts additionally.

The recent analytical auditing literature has also dealt with problems of auditor liability under several different aspects. Melumad and Thoman (1990) study a hidden information setting where an entrepreneur may signal the quality of the future cash flows of his project by voluntarily choosing an audited disclosure policy. In this model, auditor liability is the main incentive device for the auditor to deliver auditing effort and to truthfully report the findings. While the analysis of Melumad and Thoman (1990) basically concentrates on voluntary disclosure and auditing, the main part of the literature is directed to mandatory auditing. The papers of Dye (1993, 1995) consider the role of restricted auditor wealth on the consequences of auditor liability regarding the auditor's incentive to exert auditing effort and the structure of the audit market. Other papers study specific problems of designing certain liability systems. Narayanan (1994) and Chan and Pae (1998) analyse the role of damage apportionment rules with respect to auditors' incentives under strict liability and under a negligence system, both emphasizing the strategic interdependency between the auditor's effort strategy and investors' suing policy.⁷ The problem of damage apportionment rules and strategic interdependencies is also the main focus of Hillegeist (1999), but his analysis concentrates on the interdependency between management's disclosure policy, the auditor's effort strategy and the firm's market price. Boritz and Zhang (1998) examine the role of different rules for the allocation of litigation costs within different liability systems. The papers by Willekens *et al.* (1996) and Ewert (1999) compare precise and vague standards within a negligence system using different approaches (e.g., Willekens *et al.* (1996) do not consider the role of strategic interdependencies, while this is the main driving force for the results in Ewert (1999)⁸). Schwartz (1997) deals with the problem of damage measurement in systems of vague negligence and strict liability by investigating the combined impact of damage measurement and liability system on the firm's investment policy.

However, none of these papers incorporates the role of liability insurance for the effects of a liability system. To our knowledge, conceptual problems of liability insurance within an auditing context are explicitly tackled in just two analytical papers. The first one is by Moore and Scott (1989), but insurance aspects are only briefly mentioned in a very restricted setting by assuming a risk-neutral auditor. The authors show that such an auditor will not even want to buy fair liability insurance due to the adverse effect this may have on the probability of having to pay damages at all, which is in turn anticipated by the insurance company. The second paper is by Balachandran and Nagarajan (1987). They analyse the reporting incentives of a risk-averse auditor under either strict liability or negligence (with a precise negligence standard). In their analysis, insurance aspects are incorporated by explicitly

considering a so-called ‘co-insurance rate’, denoting that portion of the total damage that has to be paid by the auditor. The authors show that under negligence there exists a minimum value m that the co-insurance rate must not fall short of in order to achieve the socially desired reporting strategy. For each value within the closed interval $[m, 1]$ the negligence system with supplementary liability insurance (i.e., a co-insurance rate less than 1) guarantees the social optimum. Furthermore, it is shown that strict liability requires more information in order to achieve the same result, such that negligence with supplementary liability insurance is recommended by the authors.

It is, however, questionable whether the results mentioned above really support a certain degree of liability insurance for auditors. The results of Balachandran and Nagarajan (1987) especially imply that a pure negligence system with a co-insurance rate of 1 (i.e. without any liability insurance) is completely sufficient to achieve the socially desired outcome, and it should be obvious that this solution does not require any context-specific information at all and is thus easily implementable.

Our results differ from these implications in that we are able to show welfare-increasing effects that can really be attributed to liability insurance. In doing this, our model builds on strategic interdependencies which are so prevalent and important in the recent analytical auditing literature described above. Regarding these modelling techniques, our paper is most closely related to the modelling approaches in Narayanan (1994), Chan and Pae (1998) and Ewert (1999), where the strategic interdependency between the auditor’s effort and the investors’ incentive to sue plays a dominant role. The remainder of the paper is organized as follows: Section 2 presents the model. In Section 3 we assume that the auditing effort can be verified without costs. Section 4 introduces verification costs, and Section 5 concludes the paper with a short summary and some directions for future research.

2. THE MODEL

We consider a risk-averse auditor who accepts the order to audit the financial statement in exchange for a flat fee. By a flat fee we mean that the auditor’s payment is completely independent of the result of the audit, and hence creates no incentives. This assumption mirrors – as far as we know – the fee arrangements in auditing in most European countries and the United States. This does not imply that the fee cannot reflect the auditor’s risk. On the contrary we would expect that, *ceteris paribus*, auditing fees are higher under strict liability than under negligence, because of the auditor’s higher risk of being held liable.

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 .⁹ As usual, we assume that the following properties about the function $e(p)$ hold:¹⁰

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

If 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.¹¹ Effort e is unobservable, but verifiable.

Now we look at the court's decision about the standard of due care. The usual assumption in the economic analysis of law is that courts set the socially optimal standard whenever this is possible. The first-best optimal standard (FBO) minimizes the sum of the cost of care and damage, because investors are assumed to be risk neutral. Thus, the FBO is given by

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

However, the FBO cannot be applied since the effort is unobservable and litigation costs are positive. If courts set the FBO, 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 the FBO in Equation (2) is not meaningful in our setting. But defining a second-best standard (SBO) 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.¹² Moreover, litigation costs may be reduced through settlements, and the probability of settlements depends on the liability rule. Owing to these difficulties and the objective of our paper, we refrain from determining an SBO standard. Instead, we assume that courts establish a *relevant* standard of due care. By a relevant standard we mean that the standard is set low enough to guarantee that it would always be met if the auditor's effort was observable.¹³ The renunciation of determining an SBO can be done 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 negligence. Second, the risk allocation will be optimal under strict liability but not under negligence.

Furthermore, we assume that liability payments are restricted to total damages. There are at least two reasons justifying our assumption. First, most countries regularly restrict liability payments to the amount of damages and limit punitive damages to extreme cases of gross negligence. Second, and more importantly, punitive damages do not solve the problem at hand since under negligence only equilibria in mixed strategies exist even if punitive damages are applied. Therefore, the auditor violates any level of due care with positive probability.

3. COSTLESSLY VERIFIABLE EFFORT

3.1. Negligence

In this section, we assume that effort e is *ex-post* verifiable without costs. We look first at the decision problem of the auditor and the investor. Afterwards we determine the equilibrium of the game.

3.1.1. The auditor's effort decision

The preferences of the auditor are represented by utility function $U(\cdot)$ with constant absolute risk aversion (CARA utility functions).¹⁴ She owns 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} ,¹⁵ her expected utility is $U(W - e(\bar{p}))$. If she does not 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 of the following maximization problem:

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

with the FOC

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

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

3.1.2. 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 did not meet the standard \bar{p} if damage D occurred. Of course,

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

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

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

$$qD \geq (1 - q)T \tag{7}$$

or

$$q \geq \frac{T}{D + T} \tag{8}$$

3.1.3. 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 $1 - \theta$ and chooses p^* with θ .*

Proof. See the 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. The reason for this result is the strategic interdependence between the decisions of the auditor and the investor: if the auditor always meets the standard, the best answer of the investor is not to sue at all. But if the investor never sues, the best answer of the auditor is not to choose the standard of due care, hence violating the assumption that never taking legal action is optimal. Notice that the shortcomings of the negligence rule even hold if punitive damages are factored into the analysis.

Proposition 1 stands in sharp contrast to a related proposition in Willekens

et al. (1996: 256). The authors claim, that – given a certain negligence standard – the auditor exerts this due care standard with certainty. The reasons for this difference are due to the fact that Willekens *et al.* do not explicitly consider strategic interdependencies. This can, however, only be justified by implicitly assuming that either suing the auditor never involves any costs for investors, i.e. initiating a trial is a costless action or investors can observe the auditor's effort and therefore know exactly *ex ante* whether they will win a lawsuit. If litigation is costless, investors are essentially indifferent between suing and not suing if they know that the auditor has delivered the required effort. Although investors can be certain in this case that each trial will be lost, one can assume without any problems that the auditor will nevertheless be sued. If investors can observe the auditor's effort they will always sue if the auditor does not meet the standard and therefore the auditor will always choose the standard of due care. However, both assumptions seem to bear little resemblance to reality.

3.2. Strict liability with liability insurance

Next we analyse strict liability. The advantage of strict liability is that the strategic interdependence between auditor and investor disappears because it is always profitable for the investor to sue in case of damage regardless of the auditor's effort. But without liability insurance, the risk allocation under strict liability is obviously suboptimal, because the risk-averse auditor has to bear the whole risk. However, 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 that under negligence. Second, optimal risk allocation is achieved. We restrict our attention to insurance contracts that consist of a flat premium P , indemnity payments I and obligations \tilde{p} required to receive the indemnity payments.

The idea is that if the auditor's effort is *ex-ante* unobservable but *ex-post* verifiable, an insurer cannot calculate the premium on information about the auditor's effort, but she can base her indemnity on the *ex-post* verified effort. This can be done by stipulating obligations for the auditor, which, if not met, result in an exclusion of indemnity payments. Obligations can be interpreted as standards set by the insurer. Our approach fits with empirical observations: in reality, liability insurance contracts often stipulate obligations,¹⁶ but seldom entail premiums which depend directly on the auditor's effort.

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 exists guaranteeing that the auditor chooses the obligation \tilde{p} with certainty and therefore does not bear any risk;*

• \tilde{p} is weakly superior to \bar{p} , i.e.

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

Proof. See the Appendix.

The intuition behind the solution is straightforward. First, total risk is privately internalized. Second, the auditor has to bear the agency costs fully, since insurance markets are competitive. Thus, the auditor chooses the insurance contract with obligations \tilde{p} that minimize 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 verification 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. Thus 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 mirrors the due care level, i.e. $\tilde{p} = \bar{p}$. Note that this assumption is in favour of 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 expected effort level) of the auditor defined as

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

under strict liability with insurance and

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

with negligence. $\tilde{\theta}$ is the probability that the obligation is violated, and \tilde{p}^* is the detection probability chosen in this case. 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 $\tilde{p}^* = p^*$

$$3 \tilde{q} < q, \tilde{\theta} < \theta, \tilde{E}(p) > \bar{E}(p) \text{ if } m^2 < T(T+D)$$

$$4 \tilde{q} \geq q, \tilde{\theta} \geq \theta, \tilde{E}(p) \leq \bar{E}(p) \text{ if } m^2 \geq T(T+D)$$

Proof. See the 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 investors than for insurers, 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 of the auditor violating the standard must be smaller. If verification costs are large, the second effect will be stronger than 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 including 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 analysed 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 and insurance coverage 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 scrutinized is always relevant if the effort of the injurer is unobservable, and if litigation is costly.

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

APPENDIX

Proof of Proposition 1. We proceed in three steps.

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 $\pi = 0$, we have $\pi = 1$, but for $\pi = 1$, the auditor's best response is $p = \bar{p}$.

Existence of an equilibrium in mixed strategies. All assumptions required to guarantee the existence of an equilibrium are fulfilled (see i.e. Dasgupta and Maskin, 1986).

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 $q = D/(D+ T)$. 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

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

If π is unique, p^* is also unique. Hence, Equation (6), together with $q = D/(D+ T)$, implies that the equilibrium is unique, because $dq/d\theta > 0$, and Equation (6) must be fulfilled. \square

Proof of Proposition 2. Let $I = (D+ T)$ if $p \geq \bar{p}$. Assume for the moment that $\bar{p} = \bar{p}$. Then the auditor chooses \bar{p} with certainty: $p > \bar{p}$ is excluded because \bar{p} is sufficient as to guarantee that the insurer pays. But $p < \bar{p}$ can be excluded by the assumption that the standard is relevant and by the fact that the auditor is always liable under strict liability. Since insurance markets are competitive, we have to search for the obligation \bar{p} that maximizes the auditor's expected utility under all contracts which break even. The 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 this is not the case, then obligations \tilde{p} differ from the negligence standard \bar{p} , which strengthens the efficiency gain of strict liability with insurance compared to negligence. \square

Proof of Proposition 3. First note that under strict liability with liability insurance and verification costs a unique equilibrium in mixed strategies exists. (The proof is identical to the proof of Proposition 1.)

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

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

holds. Analogously, for strict liability

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

must hold. For CARA utility functions (15) is equivalent to

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

Comparing Equations (14) and (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 of Equation (16) is strictly higher than in Equation (14) ($m > 0$) if $\pi = \gamma$, it follows $\gamma > \pi$.¹⁷ This proves part (1) of Proposition 3.

Now we are able to determine the optimal detection probability below the standard for both cases. p^* and \tilde{p}^* must both meet the first-order condition and must result in the same expected utilities for the auditor. It is easy to show that both requirements are fulfilled for $\tilde{p}^* = p^*$ since from the first-order conditions we obtain

$$\frac{\gamma}{\pi} = \frac{(\partial U / \partial e)(W - e(p^*) - D - T - m) - (\partial U / \partial e)(W - e(p^*))}{(\partial U / \partial e)(W - e(\tilde{p}^*) - D - T) - (\partial U / \partial e)(W - e(\tilde{p}^*))} \tag{17}$$

and from (14) and (16)

$$\frac{\gamma}{\pi} = \frac{U(W - e(p^*)) - U(W - e(p^*) - D - T - m)}{U(W - e(\tilde{p}^*)) - U(W - e(\tilde{p}^*) - D - T)} \tag{18}$$

follow. Substituting (17) into (18) results in:

$$\frac{U(W - e(p^*)) - U(W - e(p^*) - D - T - m)}{U(W - e(\tilde{p}^*)) - U(W - e(\tilde{p}^*) - D - T)} = \frac{(\partial U / \partial e)(W - e(p^*) - D - T - m) - (\partial U / \partial e)(W - e(p^*))}{(\partial U / \partial e)(W - e(\tilde{p}^*) - D - T) - (\partial U / \partial e)(W - e(\tilde{p}^*))} \quad (19)$$

For CARA utility functions (19) clearly holds. Since the equilibrium is unique, $\tilde{p}^* = p^*$ follows, which proves (2).

In an equilibrium under negligence, the investor is indifferent between taking and not taking legal action:

$$q = \frac{T + m}{D + T + m} \quad (20)$$

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

$$\tilde{q} = \frac{m}{D + T} \quad (21)$$

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 $\tilde{E}(p) > \tilde{E}(p)$, follows immediately from $d\theta/dq > 0$. □

ACKNOWLEDGEMENTS

The authors would like to thank the participants of the 25th Seminar of the European Group of Risk and Insurance Economists and the 8th Joint Conference between the European Association of Law and Economics and the Geneva Association as well as two anonymous referees for valuable comments. The usual disclaimer applies.

NOTES

- 1 See King and Schwartz (1996) for a discussion of this Act.
- 2 The KonTraG was finally approved on 27 March 1998.
- 3 This follows directly from Simon (1981).
- 4 See Finsinger and Pauly (1990). This follows immediately from Holmström's (1982) analysis of the so-called team production problem.
- 5 The 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).
- 6 For applications of the concept of vague negligence on auditor's liability see Schwartz (1997) and Ewert (1999).
- 7 These interdependencies are also important in Melumad and Thoman (1990).
- 8 We will return to this point in the discussion of Proposition 1 in subsection 3.1.3.
- 9 We are using the standard assumption that the auditor's effort can reduce the

- likelihood but not the extent of damages. However, our results still hold if the auditor is also able to reduce the extent of damages.
- 10 Of course, we could use the inverse function $p(e)$ instead.
 - 11 The results would not change substantially if we applied the American rule instead. See Chan and Pae (1996) for the comparison of the English and American rules.
 - 12 One might expect that litigation costs are lower under strict liability, since it is not necessary to prove that the auditor was negligent.
 - 13 If this condition is not fulfilled, the auditor will never meet the standard and therefore the standard is not relevant and we obtain *de facto* strict liability.
 - 14 This assumption seems reasonable, since we want to ignore potential wealth effects of different liability rules on the risk aversion of the auditor, because it seems likely that the auditor calculates liability costs into her audit fees. However, for most of the analysis CARA utility functions are not necessary. The assumption is required only in Section 4.
 - 15 Of course, the court's standard is expressed through obligations (i.e. through e) instead of probabilities, but this is of no importance.
 - 16 Theoretically, one could also imagine that the auditor pays an additional fine if she violates the obligation standard. However, those fines are forbidden in most countries, and would – analogously to punitive damages – not alter our results substantially.
 - 17 Recall that $dE[U(W)]/d\pi < 0$ and $dE[U(W)]/d\gamma < 0$.

REFERENCES

- Balachandran, B. V. and Nagarajan, N. J. (1987) 'Imperfect information, insurance, and auditors' legal liability', *Contemporary Accounting Research*, 3: 281–301.
- Boritz, J. E. and Zhang, P. (1998) 'The implications of alternative litigation cost allocation systems for the value of audits', Working Paper, University of Waterloo, Ontario.
- Chan, D. K. and Pae, S. (1996) 'The economic consequences of alternative auditor liability and legal cost allocation rules: an equilibrium analysis', Working Paper, Hong Kong.
- Chan, D. K. and Pae, S. (1998) 'An analysis of the economic consequences of the proportionate liability rule', *Contemporary Accounting Research*, 15: 457–80.
- Dasgupta, P. and Maskin, E. (1986) 'The existence of equilibrium in discontinuous economic games, I and II', *Review of Economic Studies*, 53: 1–41.
- Dye, R. (1993) 'Auditor standards, legal liability, and auditor wealth', *Journal of Political Economy*, 101: 887–914.
- Dye, R. (1995) 'Incorporation and the audit market', *Journal of Accounting and Economics*, 19: 75–114.
- Ewert R. (1999) 'Auditor liability and the precision of auditing standards', *Journal of Institutional and Theoretical Economics*, 155: 181–206.
- Feess, E. and Nell, M. (1998) 'The manager and the auditor in a double moral hazard setting: efficiency through contingent fees and insurance contracts', Working Paper, University of Frankfurt am Main.
- Finsinger, J. and Pauly, M. (1990) 'The double liability rule', *Geneva Papers on Risk and Insurance*, 15: 159–74.
- Hillegeist, S. A. (1999) 'Financial reporting and auditing under alternative damage apportionment rules', *Accounting Review*, 74: 347–69.
- Holmström, B. (1982) 'Moral hazard in teams', *Bell Journal of Economics*, 13: 324–40.
- King, R. R. and Schwartz, R. (1996) 'Commentary on the Private Security Litigation

- Reform Act of 1995: a discussion of three provisions', *Accounting Horizons*, 11: 92–106.
- Melumad, N. D. and Thoman, A. L. (1990) 'On auditors and the courts in an adverse selection setting', *Journal of Accounting Research*, 28: 77–120.
- Moore, G. and Scott, W. (1989) 'Auditors' legal liability, collusion with management, and investors' loss', *Contemporary Accounting Research*, 5: 754–74.
- Narayanan, V. G. (1994) 'An analysis of auditor liability rules', *Journal of Accounting Research*, 32: 39–59.
- Nell, M. and Richter, A. (1996) 'Optimal liability: the effects of risk aversion, loaded insurance premiums, and the number of victims', *Geneva Papers on Risk and Insurance*, 21: 240–57.
- Schwartz, R. (1997) 'Legal regimes, audit quality and investment', *Accounting Review*, 72: 385–406.
- Simon, M. J. (1981) 'Imperfect information, costly litigation and product quality', *Bell Journal of Economics*, 12: 171–84.
- Willekens, M., Steele, A. and Miltz, D. (1996) 'Audit standards and auditor liability: a theoretical model', *Accounting and Business Research*, 26: S.249–S.264.