

## **Liability Insurance as Protection Against Legal Error**

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### **ABSTRACT**

If the legal system operates perfectly in applying the negligence rule, potential injurers always meet the standard of care and are never liable. But substantial evidence suggests that courts make mistakes in applying the negligence rule. We analyze the behavior of the potential injurer, the potential victim and the insurer in the presence of legal errors. We show that, as intuition suggests, the risk of legal errors is sufficient to create a demand for liability insurance. In equilibrium, potential victims sue with positive probability and potential injurers buy insurance, but purchase less than full coverage.

## Liability Insurance as Protection Against Legal Error

### 1. Introduction

If the legal system operates perfectly, so that there is no uncertainty in the definition or application of the negligence rule, potential injurers always meet the standard of care and are never liable (Brown, 1973, Shavell, 1982). When potential injurers bear no risk, they have no demand for liability insurance. But in the U.S., over \$100 billion a year is spent on insurance, such as medical and professional liability insurance, providing protection against liability arising from negligence.<sup>1</sup> For the types of liability risks insured by these policies, potential injurers could avoid liability by simply meeting the standard of care.

Although not offered as the sole explanation for the existence of a market for liability insurance, it is widely believed that protection against the possibility of legal errors by the courts is an important reason for the purchase of liability insurance. For example, Shavell (2004, p. 265) writes “Thus risk-averse injurers will decide to purchase liability insurance, and the type of insurance that risk-averse injurers will purchase will protect them primarily against being found negligent through some sort of lapse or error.” Posner (2007, p. 200), discussing negligence, states “Theoretically, there is a cheaper way to avoid the risk of being held liable for an automobile accident: don’t be negligent ... . But because courts make mistakes ... there is always some risk to a driver of being adjudged negligent and hence a demand for liability insurance.”

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<sup>1</sup> This figure includes premiums for medical malpractice, the liability portion of commercial multiple peril, commercial auto liability, and the “other liability” portion of commercial general liability insurance. “Other liability” includes coverage for liability resulting from negligence, carelessness, or failure to act. This category includes, among others, professional liability (e.g., accountants, lawyers), directors and officers, errors and omissions and employment practices liability. The premium data are for 2005 and 2006 and are from the Insurance Information Institute.

There is a large body of research in law and economics examining the extent and implications of legal errors. There is significant disagreement in the literature on the issue of punitive damages. . Eisenberg, et. al. (1997) and Eaton (2007) present empirical results that they interpret as implying that punitive damages are awarded rationally. However, Polinski (1997) argues that their results are consistent with punitive damages being awarded randomly. Helland and Taborrock (2000) show that differences in the types of cases tried account for most of the differences between damages awarded by judges and juries. Hersch and Viscusi (2004) report that, after controlling for the type of case,, juries are more likely to make punitive damage awards and juries make larger compensatory and punitive damage awards than judges. Viscusi (1999, 2001) provides evidence that, due to cognitive biases, judges and prospective jurors may misapply the negligence rule and find against non-negligent defendants, especially if damages are large. They also conclude that jurors are prone to punish firms for carrying out risk analyses.

Craswell and Calfee (1986) and Shavell (1987) show that uncertainty in negligence standards leads potential injurers to increase the level of care beyond the socially optimal level. Png (1986) shows that legal errors, either in favor of the plaintiff or in favor of the defendant, increase the sanctions required to achieve socially optimal care. Polinski and Shavell (1989) also argue that legal errors reduce deterrence and may increase or decrease plaintiffs incentives to sue. Hylton (1990, p. 434) finds that suits are brought even against non-negligent plaintiffs "... in the expectation that damages will be awarded in error". Kaplow and Shavell (1994, 1996) examine the effects of legal errors in determining liability and assessing damages. Farmer and Pecorino (2000) argue the quality of cases that go to trial can be reduced by jury biases. Landeo, Nikitin and Baker (2006) find that the possibility of legal errors increases the number of suits, decreases the number of trials and decreases the deterrence effect of punitive damages. While

the literature on the effects of legal errors is substantial, these studies assume that liability insurance is not available.

The objective of this paper is to determine whether the risk of legal errors is sufficient to create a market for liability insurance. In order to understand the incentives that lead to a market for insurance when the courts can make mistakes, we analyze the behavior of three decision makers – potential injurers, potential victims and insurers. The potential injurer purchases an insurance policy that indemnifies her if she loses a lawsuit. Given the insurance policy, the potential injurer then chooses the level of care which determines the probability of an accident. The potential victim then decides whether or not to sue; a lawsuit may occur whether or not there is an accident. If a lawsuit is filed, the courts then determine whether the potential injurer is liable for damages. The outcome of lawsuits is random, depending probabilistically on whether there is an accident and on the potential injurer's level of care.

The papers most closely related to ours are Sarath (1991) and Fagart and Fluet (2007). Sarath (1991) incorporates both legal errors and insurance, but he is primarily concerned with incentives for litigation. Our main focus is on the demand for insurance. Sarath analyzes a principal-agent game between the potential injurer and the potential victim; the insurer is not an active player in the game. Sarath takes the existence and design of the insurance policy as an exogenous constraint on the principal-agent relationship.<sup>2</sup> In our analysis, the insurance policy is endogenous and the insurer is an active strategic player in the principal-agent game. Sarath assumes insurance is actuarially fairly priced, which leads the potential injurer to fully insure. In

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<sup>2</sup> Sarath assumes that the insurance premium is perfectly retroactively rated. This type of insurance policy is not common.

our analysis, the insurance policy is not fairly priced and, unless the equilibrium is at zero effort by the potential injurer, the potential injurer chooses less than full insurance.

Fagart and Fluet (2007) are concerned with the efficiency of the strict liability and negligence rules when the courts make errors in determining liability. They assume that potential injurers insure against liability and potential victims insure against uncompensated losses. Both types of insurance are assumed to be actuarially fairly priced. They find that the efficiency of the negligence rule depends critically on the informativeness of evidence, on evidentiary standards and on the information that can be included in insurance policies. We assume that potential victims are risk neutral and do not insure. We do not assume insurers earn zero expected profit. More importantly, we are concerned with the equilibrium in the market for liability insurance rather than its efficiency.

The model that we develop in Section 2 is an extension of the standard economic model of accidents, with the addition of legal errors. In Section 3 we show that legal errors are sufficient to lead to the creation of a market for liability insurance. Brief concluding remarks are offered in Section 4.

## 2. The model

The potential injurer is assumed to be risk averse and have initial wealth  $w$ .<sup>3</sup> The potential injurer's utility depends on net income,  $y$ , after payment of the insurance premium to the insurer, payment of any damage awards, receipt of any insurance indemnity, and the cost of effort  $e$ . If the potential injurer chooses effort level  $e$  and receives net income  $y$ , the potential injurer's

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<sup>3</sup> We assume throughout that the potential injurer's initial wealth is sufficient to pay any damages awarded by the court, in order to abstract from the problem of "judgment-proof" defendants (Shavell, 1986).

utility is  $u(y) - e$ , where  $u' > 0$  and  $u'' < 0$ . The reservation utility level,  $\underline{U}_I$ , the expected utility obtained by an uninsured potential injurer.

The potential victim's wealth is  $x_2$  if there is no accident and  $x_1$  if there is an accident, so  $h = x_2 - x_1$  is the harm suffered by the victim in the event of an accident. The probability of an accident is  $p(e)$ . The amount of effort that the potential injurer can exert to reduce the probability of an accident is  $e \in [e_L, e_H]$  where  $0 \leq e_L < e_H$ . We assume  $p'(e) < 0$ ,  $p''(e) > 0$  so that greater effort by the potential injurer decreases the likelihood of an accident. We assume that accidents are neither entirely certain nor entirely preventable, that is,  $0 < p(e_H) < p(e_L) < 1$ . The potential victim is assumed to be risk neutral and to have reservation utility level  $\underline{U}_V = 0$ .

The potential victim may decide to file suit against the potential injurer. A suit may be filed whether or not an accident actually occurs. We assume that the potential victim cannot precommit to a decision not to sue. The probability that the potential injurer will be found guilty depends on the outcome and on the potential injurer's action. Any damages awarded to the potential victim by the court are binding, and are transferred by the court from the potential injurer to the potential victim. Direct side payments between the potential victim and the potential injurer are not possible.<sup>4</sup>

The potential injurer may obtain liability insurance against the risk of losing a lawsuit and being ordered to pay damages. The insurance contract is  $\mathbf{c} = (c_0, c_1, c_2)$ , where  $c_0$  is the premium, which is paid in all states of the world, and  $c_i$  is the gross indemnity paid to the potential injurer if the outcome is  $x_i$  and the potential injurer loses the suit. The insurer is risk

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<sup>4</sup> These assumptions rule out the possibility of out of court settlements, and therefore rule out the possibility that suits will be initiated to obtain out of court settlements. Liability insurance policies cover amounts paid to settle cases as well as judgments. The distinction between settlements and judgments is not central to our purposes in this paper.

neutral, and has reservation expected profit level  $\underline{\Pi} = 0$ , that is, the insurer must earn non-negative expected profit.

The timing of decisions and events in the model is as follows. First, the insurer and potential injurer agree to the insurance policy  $c$  and the potential injurer pays the premium  $c_0$ . The operation of the legal system is assumed to be common knowledge. Given the insurance policy, the potential injurer chooses effort  $e$ . The state of nature is realized and the potential victim receives wealth  $x_1$  or  $x_2$ . The potential victim then decides whether to sue the potential injurer based on the expected value of the suit. If a suit is filed, the potential victim pays litigation cost  $L > 0$ .<sup>5</sup> The court then decides whether the potential injurer is negligent based on the outcome  $x_i$  and the potential injurer's action  $e$ . If the potential injurer is found to be negligent, then the court transfers damages  $d_i$  from the potential injurer to the potential victim, and the insurer pays the indemnity  $c_i$  to the potential injurer.

*2.1. Legal errors.* Given the outcome  $x_i$  and effort  $e$ , the court determines whether or not the potential injurer is negligent. The probability that the potential injurer loses the suit is  $g_i(e)$ . Under a strict liability rule,  $g_i(e)$  is independent of  $e$ , and, if there are no legal errors, then  $g_1 = 1$  and  $g_2 = 0$ . Under a negligence rule, the potential injurer is negligent if they breach their duty of care to the potential victim and, as a result, the potential victim suffers damages. If the standard of due care is  $\bar{e}$  and there are no legal errors, then  $g_2(e) = 0$  for all  $e$  and  $g_1(e) = 1$  if  $e < \bar{e}$  and  $g_1(e) = 0$  if  $e \geq \bar{e}$ .

Legal errors may arise from imperfect observability of the potential injurer's action or from variation in how the due care standard is applied from case to case. In general,  $g_i(e)$  will

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<sup>5</sup> An alternative, and perhaps more realistic, assumption is that litigation costs are proportional to damages,  $L_i = \alpha d_i$ . This does not change any of the results in the paper.

depend on both the potential victim's outcome and the potential injurer's effort. We assume that  $g_1(e) > g_2(e)$ , that  $g_i'(e) < 0$ ,  $g_i''(e) > 0$ , and that the  $g_i$  are bounded away from both one and zero. For a given level of effort by the potential injurer, the probability of being found negligent is higher when an accident actually occurs. Given the outcome  $x_i$ , increasing effort decreases the likelihood of being found negligent. If the potential injurer loses the suit, the court awards damages of  $d_i$ , which is transferred to the potential victim. We assume  $d_1 \geq d_2 > L > 0$ .

The potential victim decides whether to file suit based on the expected value of litigation. If the potential victim observes  $e_i$ , then the potential victim will sue if  $g_i(e)d_i > L$ .<sup>6</sup> Since the  $g_i(e)$  are decreasing in  $e$ , the potential injurer can choose a sufficiently high effort level so that the potential victim will not sue. Define  $\hat{e}_i$  by  $g_i(\hat{e}_i)d_i = L$ , and observe that since  $d_1 \geq d_2$  and  $g_1(e) > g_2(e)$ , we have  $\hat{e}_1 > \hat{e}_2$ . Then, if  $e < \hat{e}_2$ , the potential victim will always file suit, if  $\hat{e}_2 \leq e < \hat{e}_1$ , the potential victim will file suit only when the outcome is  $x_1$ . If  $e \geq \hat{e}_1$ , the potential victim will never file suit; in the presence of legal errors,  $\hat{e}_1$  becomes the de facto liability standard.<sup>7</sup> We let  $s_i(e)$  denote whether a suit is filed, that is  $s_i(e) = 1$  if  $x_i$  is observed and  $g_i(e)d_i > L$ , and  $s_i(e) = 0$  otherwise; we let  $s = (s_1, s_2)$ . Since the potential victim makes a discrete decision to file suit or not, expected payoffs may be discontinuous at  $\hat{e}_2$  and  $\hat{e}_1$ . This in turn implies that the incentive scheme offered to the potential injurer may be discontinuous.

We assume damages are not random, however, we do not assume that the damages awarded by the courts are necessarily equal to the harm suffered by the potential victim. We do not rule out the possibility of punitive damages, that is, we allow  $d_1, d_2 \geq x_2 - x_1$ . If the potential

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<sup>6</sup> We implicitly assume the potential victim has rational expectations regarding the probable success of litigation.

<sup>7</sup> However, if  $d_1$  is large enough, then  $\hat{e}_1 > e_H$  and the potential injurer can never choose a high enough effort level to prevent being sued. We assume that this is not the case, formally,  $g_1^{-1}(L/d_1) < e_H$ .

victim receives  $x_2$ , there is no economic damage. Nonetheless, we allow “frivolous” lawsuits, that is, we allow the potential victim to sue even when no accident has occurred and no harm has been suffered.

*2.2. Payoffs to the participants and expected utility.* Table 1 summarizes the payoffs to the participants in the model. Suppose first that the outcome is  $x_1$ . If the potential victim sues and wins (with probability  $\phi_1 = pg_1$ ), the potential victim’s payoff is  $x_1 - L + d_1$ , the insurer’s payoff is  $c_0 - c_1$ , and the potential injurer’s payoff is  $y_1 = w - c_0 - d_1 + c_1$ . Now suppose that the outcome is  $x_2$ . If the potential victim sues and wins (with probability  $\phi_2 = (1 - p)g_2$ ), the potential victim’s payoff is  $x_2 - L + d_2$ , the insurer’s payoff is  $c_0 - c_2$ , and the potential injurer’s payoff is  $y_2 = w - c_0 - d_2 + c_2$ .

Now suppose the outcome is  $x_1$ , and either no suit is filed or a suit is filed and the potential victim loses; this occurs with probability  $\phi_3 = p(1 - g_1)$ . In either case, the insurer’s payoff is  $c_0$ , and the potential injurer’s payoff is  $y_3 = w - c_0$ . The potential victim’s payoff is  $x_1 - s_1L$ , that is,  $x_1 - L$  if the suit is lost and  $x_1$  if there is no suit. If the outcome is  $x_2$  and the potential victim sues and loses or does not sue (with probability  $\phi_4 = (1 - p)(1 - g_2)$ ), the insurer’s payoff is  $c_0$ , and the potential injurer’s payoff is  $y_4 = w - c_0$ . The potential victim’s payoff is  $x_2 - s_2L$ .

**Table 1: Payoff Relevant States for Insurer, Potential Victim and Potential Injurer**

Payoff State	Probability	Insurer's Income	Potential victim's Income	Potential injurer's Income
1	$\varphi_1 = pg_1$	$c_0 - c_1$	$x_1 - L + d_1$	$w_1 - c_0 - d_1 + c_1$
2	$\varphi_2 = (1 - p)g_2$	$c_0 - c_2$	$x_2 - L + d_2$	$w - c_0 - d_2 + c_2$
3	$\varphi_3 = p(1 - g_1)$	$c_0$	$x_1 - s_1 L$	$w - c_0$
4	$\varphi_4 = (1 - p)(1 - g_2)$	$c_0$	$x_2 - s_2 L$	$w - c_0$

The payoffs to the insurer and to the potential injurer are the same in states 3 and 4. We distinguish between these two states since the payoff to the potential victim is different.

The insurance company's expected profit is

$$\Pi(\mathbf{c}, e) = c_0 - \varphi_1 c_1 - \varphi_2 c_2. \quad (1)$$

The potential injurer's expected utility is

$$U_I(\mathbf{y}, e) = \varphi_1 u(w - c_0 - d_1 + c_1) + \varphi_2 u(w - c_0 - d_2 + c_2) + (\varphi_3 + \varphi_4) u(w - c_0) - e, \quad (2)$$

where  $\mathbf{y} = (y_1, y_2, y_3, y_4)$  is the potential injurers net income. The potential injurer's participation constraint is

$$U_I(\mathbf{y}, e) \geq \underline{U}_I. \quad (3)$$

The incentive compatibility constraint is

$$e \in \operatorname{argmax} U_I(\mathbf{y}, e). \quad (4)$$

The potential victim's expected utility is

$$U_V(\mathbf{s}, e) = \varphi_1 [x_1 - L + d_1] + \varphi_2 [x_2 - L + d_2] + \varphi_3 [x_1 - s_1 L] + \varphi_4 [x_2 - s_2 L]. \quad (5)$$

The potential victim's expected utility shifts upward by  $\varphi_3 L$  at  $\hat{e}_1$  and by  $\varphi_4 L$  at  $\hat{e}_2$ . The potential victim's incentive compatibility constraint is

$$\mathbf{s} \in \operatorname{argmax} U_V(\mathbf{s}, e). \quad (6)$$

The insurance company's problem is to maximize expected profit subject to the potential injurer's and potential victim's incentive compatibility and participation constraints. We assume that the monotone likelihood ratio property and the convexity of distribution function condition hold.<sup>8</sup> These assumptions together imply that the first-order approach is valid (Grossman and Hart, 1983, Rogerson, 1985) and that the cost-minimizing incentive scheme is monotonic, i.e.,  $y_1 \leq y_2 \leq y_3 = y_4$  (Grossman and Hart, 1983).

### 3. The demand for liability insurance

In this section, we prove the main result of the paper, that the possibility of legal errors is sufficient to create a demand for liability insurance.

Monotonicity of the incentives provided to the potential injurer implies that  $c_1 \leq d_1$  and  $c_2 \leq d_2$ , that is, the potential injurer will not purchase more than full insurance. To show that there will be a demand for insurance, we need to show that either  $c_1 > 0$  or  $c_2 > 0$  in equilibrium. Let  $\mathbf{c}^* = (c_0^*, c_1^*, c_2^*)$  be the insurance policy and  $e^*$  the effort level that maximized the insurer's expected profit.

**Proposition 1:** If the insurance policy  $\mathbf{c}^*$  and effort level  $e^*$  maximize the insurer's expected profit, then there is a demand for liability insurance ( $c_1^*$  or  $c_2^* > 0$ ) and the insurance company earns positive expected profit.

*Proof:* To begin, suppose that  $e^* > e_L$ . An actuarially fair policy offering the same indemnity as  $\mathbf{c}^*$  is  $\bar{\mathbf{c}} = (\bar{c}, c_1^*, c_2^*)$  where  $\bar{c} = \varphi_1 c_1^* + \varphi_2 c_2^*$ . Then the insurance policy  $\mathbf{c}^*$  can be rewritten as

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<sup>8</sup> The monotone likelihood ratio condition is  $\varphi_1(e'')/\varphi_1(e') \leq \varphi_2(e'')/\varphi_2(e') \leq (\varphi_3(e'')+\varphi_4(e''))/(\varphi_3(e')+ \varphi_4(e'))$  for  $e'' > e'$ . The first inequality holds if  $g_1(e'')/g_1(e') \leq g_2(e'')/g_2(e')$ , but the second inequality does not yield any simple or

$(\bar{c} - \Delta c, c_1^*, c_2^*)$ , where  $\Delta c = c_0^* - \bar{c}$ . Since  $\bar{c}$  has zero expected profit, the expected profits are increased if  $\Delta c > 0$ . Suppose, by way of contradiction, that  $\Delta c = 0$ , so that the potential injurer gets  $\bar{c}$ . Since the potential injurer is risk averse, the introduction of the actuarially fair insurance policy  $\bar{c}$  gives the potential injurer a strictly positive surplus. But, if  $c^*$  maximizes expected profit, the potential injurer's expected utility is equal to the reservation utility level, and the potential injurer receives zero surplus. Therefore,  $\bar{c}$  does not maximize expected profit. Since the potential injurer's expected utility is decreasing in  $\Delta c$ , we must have  $\Delta c > 0$  and  $c^*$  has positive expected profit. Now if both  $c_1^* = 0$  and  $c_2^* = 0$ , then  $c^*$  becomes the policy  $(\Delta c, 0, 0)$ . Paying an insurance premium and receiving no indemnity is clearly worse than being uninsured, so  $(\Delta c, 0, 0)$  violates the participation constraint. Therefore, at least one of the inequalities  $c_1^* > 0$  or  $c_2^* > 0$  must hold.

Now assume the effort level is at the minimum effort,  $e_L$ . Then the incentive scheme is flat ( $y_1 = y_2 = y_3 = y_4$ ), which implies  $c_1^* = d_1 > 0$  and  $c_2^* = d_2 > 0$ . Then the premium is  $c_0^* = w - u^{-1}(\underline{U}_I) > 0$  which again is greater than the actuarially fair premium. ||

This result is different from Shavell (1982), where there are no legal errors. Under a perfectly enforced negligence rule, the potential injurer always meets the due care standard, is never liable, and therefore has no demand for liability insurance. Proposition 1 shows that, as intuition suggests, the possibility of legal errors is a source of risk that leads to a demand for liability insurance. We show that insurance is less than fairly priced and the insurer earns a positive expected profit. Since the insurer earns a positive expected profit, the insurer's

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readily interpretable restrictions on  $p$  or the  $g_i$ . The assumptions on the first and second derivatives of  $p$  and the  $g_i$

participation constraint is satisfied, and there will a supply of insurance as well as a demand for insurance.

If the potential injurer chooses a high enough effort level, then the potential victim never files suit. We show that this does not occur in equilibrium.

Proposition 2: In equilibrium, lawsuits occur with positive probability.

*Proof*: If  $e^* \geq \hat{e}_1$ , then the potential victim never files suit, so we need to show  $e^* < \hat{e}_1$ .

Suppose, by way of contradiction, that  $e^* \geq \hat{e}_1$ . Since the potential victim never sues, the potential injurer has no demand for liability insurance and the insurer earns zero expected profit.

But we know from Proposition 1 that the insurer can induce effort levels that lead to strictly positive profit in equilibrium. Therefore,  $e^* \geq \hat{e}_1$  cannot be an equilibrium outcome. ||

Since  $\hat{e}_2 < \hat{e}_1$ , Proposition 2 implies that, in equilibrium, the potential victim always sues in the event of an accident. This further implies that, since the probability of an accident is decreasing in effort, the probability of litigation is at least  $p(\hat{e}_1)$ . This is a consequence of the fact that it is in the insurance company's interest that at least some litigation take place, since otherwise there is no need for liability insurance.

We now turn to the characterization of the insurance policy. First, suppose that  $\hat{e}_2 \leq e^* < \hat{e}_1$ . If the potential victim receives  $x_1$ , the payoff to the potential injurer is either  $y_1 = w - c_0 - d_1 + c_1$  or  $y_3 = w - c_0$ , depending on whether or not the potential victim wins the suit. If the potential victim receives  $x_2$ , there is no suit, so  $y_2$  is not relevant, and the potential injurers payoff

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are sufficient for the convexity of distribution function condition.

is  $y_4 = w - c_0$ . Observe that the potential injurer's payoff is the same whether or not a suit is filed, so long as the potential victim does not win, i.e.,  $y_3 = y_4$ . Then the potential injurer's expected utility is

$$U_I(\mathbf{y}, e) = \varphi_1 u(y_1) + (1 - \varphi_1)u(y_3) - e. \quad (7)$$

Then the potential injurer chooses effort so that

$$u(y_1) - u(y_3) = 1/\varphi_1'(e). \quad (8)$$

This implies that  $y_1 < y_3$ , or  $c_1^* < d_1$ , so that the potential injurer buys less than full coverage against damages.

Now suppose that  $e^* < \hat{e}_2$ , so that the potential victim always sues. If the potential victim is harmed and receives  $x_1$ , the payoff to the potential injurer is again either  $y_1 = w - c_0 - d_1 + c_1$  or  $y_3 = w - c_0$ . If the potential victim is not harmed and receives  $x_2$ , the payoff to the potential injurer is either  $y_2 = w - c_0 - d_2 + c_2$  or  $y_4 = w - c_0$  depending on whether or not the potential victim wins the suit or not. Then the potential injurer's expected utility is

$$U_I(\mathbf{y}, e) = \varphi_1 u(w - c_0 - d_1 + c_1) + \varphi_2 u(w - c_0 - d_2 + c_2) + (\varphi_3 + \varphi_4) u(w - c_0) - e. \quad (2)$$

This does not impose much structure on the insurance policy. From Proposition 1, we know that either  $c_1$  or  $c_2$  or both are positive. Monotonicity implies that  $c_1 \leq d_1$ ,  $c_2 \leq d_2$  and  $c_2 - d_2 \geq c_1 - d_1$ . The last inequality implies that if  $c_1 > d_1 - d_2$ , then  $c_2 > 0$ . In the special case where damages are equal, the potential injurer's expected utility is

$$U_I(\mathbf{y}, e) = (\varphi_1 + \varphi_2)u(y_1) + (1 - \varphi_1 - \varphi_2)u(y_3) - e. \quad (9)$$

Then the incentive compatibility constraint implies that  $c_1^* = c_2^* < d$ . Finally, suppose that  $e^* = e_L$ . Then, as shown in the proof of Proposition 1, the potential injurer buys full coverage  $c_1^* = d_1$  and  $c_2^* = d_2$ .

Two of the sources of uncertainty in the legal system are the unpredictability of verdicts and the level of court awarded damages. Increases in damages do not change the aggregate cost minimizing payoffs for a given level of effort,  $\partial y_1/\partial d_i = 0$  and  $\partial y_2/\partial d_i = 0$ ,  $i = 1, 2$ . For example, if  $e_L \leq e^* < \hat{e}_2$ , then an increase in  $d_1$  and/or  $d_2$  is exactly offset by increased coverage, and the increase in coverage is offset by a higher insurance premium. An increase in damages increases the absolute amounts transferred among the participants, but leaves the potential injurer's incentives unchanged. Increases in  $d_2$  and  $d_1$  also have the effect of increasing  $\hat{e}_2$  and  $\hat{e}_1$ . Unless the increase in damages changes the relationship between  $e^*$  and one of the  $\hat{e}_i$ , increasing damages does not change the equilibrium effort level. Similarly, increases in  $g_2$  and  $g_1$  increase  $\hat{e}_2$  and  $\hat{e}_1$ . Increases in  $\hat{e}_2$  and  $\hat{e}_1$  expand the set of equilibria in which the potential victim is induced to sue the potential injurer and also expands the set of equilibria in which the potential injurer buys insurance. Thus, increases in the potential victim's probability of success or in damages lead to increased litigation, and increase the demand for liability insurance.

## 5. Conclusions

In this paper we analyze whether the possibility of legal errors is sufficient to lead to the development of a market for liability insurance. Shavell (1982) shows that if there are no legal errors and the negligence rule is perfectly enforced, then a risk averse potential injurer will exercise sufficient care to avoid liability and will have no demand for insurance. But the courts do make mistakes and the negligence rule is not perfectly enforced. Legal errors may be due to case-by-case variation in the negligence standard or to imperfect observability of the potential

injurer's level of care. The possibility of legal errors implies that the outcome of lawsuits depends on the occurrence of an accident and on the potential injurer's care stochastically rather than deterministically.

In our model, the insurance policy between the insurer and the potential injurer is determined endogenously. The potential victim's decision whether or not to sue is also endogenous and we allow for both legitimate and frivolous lawsuits. We show that the potential victim sues the potential injurer with positive probability. We show that the risk of legal errors can lead to the development of a market for liability insurance. The insurance company earns a strictly positive expected profit and risk averse potential injurers purchase less than full coverage against liability losses. Increases in the probability of successful litigation and in court awarded damages lead to increases in litigation and to increases in the demand for liability insurance

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