



The Level of Litigation: Private Versus Social Optimality of Suit and of Settlement

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I. Introduction

The legal system is a very expensive social institution. Increasingly we read about the volume and the high costs of suit, and we observe the use of various measures to reduce litigation activity, for example, requirements that losing plaintiffs bear defendants' legal fees, ceilings on damage awards, and judicial fostering of settlement. At the same time, we occasionally encounter the view that suit might need to be encouraged to overcome the private costs of litigation, and we notice some employment of policies promoting litigation, such as legal aid programs and requirements that losing defendants bear plaintiffs' legal fees.

Against this background, I ask the basic question: What is the socially optimal level of litigation given its expense, and how does it compare to the privately determined level of litigation? As will be explained, the former and the latter levels of legal activity generally differ, and the reasons involve two fundamental types of externality. The first is a negative externality: When a party spends on litigation, he does not take into account the litigation costs that he induces others to incur. The second is a positive externality: When a party engages in litigation, he does not take into account the effect that this has on incentives to reduce harm. In consequence, the privately determined level of litigation can depart from the socially optimal level—in either direction—and corrective social policy may help to remedy the divergence.

To develop these points, I investigate the standard model of potentially harmful behavior and the liability system,¹ but I allow for the costliness of litigation. Let me now summarize the analysis that follows.²

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¹See originally Brown (1973), and see Landes and Posner (1987) and Shavell (1987) for general treatments of liability and accidents.

²The contribution of this article to prior literature is twofold. First, the article examines the private versus the social optimality of litigation in a more general setting than has previously been done: Not only victims' incentives to sue, but also injurers' level of care, and the settlement rate are investigated, and policy instruments (fees and subsidies)

Basic Model. I begin by considering a model in which, if a victim of harm brings suit, there will definitely be a trial; that is, I abstract until later from the possibility of settlement before trial. I first characterize the socially optimal volume of suit and then contrast it to the level of suit that parties actually bring, which as just stated may be either socially excessive or socially insufficient. To amplify, the private cost of a suit is less than the social cost of a suit, for that includes the injurer's costs as well as the public costs (those costs associated with operation of the judicial system). This difference suggests that the private incentive to bring suit may be excessive. However, the private benefit of suit is the court award of damages to the victim, equal to the harm he has suffered, whereas the social benefit of suit resides in its deterrent effect, its influence on the degree of care that injurers exercise to lower the risk of harm. This deterrent effect could exceed the private benefit, counteracting the tendency toward excessive numbers of suits due to the difference between private and social costs, and possibly could result in too few suits.³ The deterrent effect could also fall short of the private benefit, exacerbating the cost-divergence-associated tendency toward excessive numbers of suits.⁴ A problem of excessive suit can be corrected in principle by an appropriately chosen fee for bringing suit; and a problem of too few suits can be remedied by use of a proper subsidy.

I also observe that the level of care exercised by injurers should reflect the fact that if they cause harm and are sued, the social costs engendered by harm equal the harm *plus* the sum of litigation costs. But because injurers who are sued bear the victim's harm plus only their own litigation costs, they will exercise too little care. A way to correct this problem is to supplement the usual court award that injurers pay with a tax on injurers equal to the victim's litigation cost plus the public's litigation cost.

Model Allowing for Settlement. The foregoing results are modified to a degree when the basic model is extended to allow for parties to settle rather than to go to trial. Although settlement is assumed to involve positive costs (settlement generally takes time to achieve and involves the use of lawyers), it enables the parties to avoid trial costs. The possibility of settlement thus implies that a suit becomes, in effect, socially cheaper and, consequently, that the socially optimal level of suit rises. This alters the optimal levels of

influencing suit are considered together with policy instruments (fines and the level of damages) separately affecting incentives to take care and to settle.

Second, the article introduces the issue of the private versus the social incentive to settle in a setting with asymmetric information.

The prior literature on the social versus the social optimality of bringing suit begins with my article, Shavell (1982), which is extended in Kaplow (1986), Menell (1983), and Rose-Ackerman and Geistfeld (1987); see also related work in Hylton (1990), Polinsky and Che (1991), and Polinsky and Rubinfeld (1988a,b). An earlier version of the present article is Shavell (1996), and an informal and more general treatment of the subject of the present article is contained in Shavell (1997). For discussion of prior literature, refer to note 6, to the text and notes after Proposition 3, and to note 31.

³Suppose, for instance, the following: The cost of suit for a victim would be \$125 and the cost for an injurer would be the same; the injurer can prevent a certain harm of \$100 by spending \$1. Here, there is insufficient private incentive to bring suit: Victims will not bring suit because it would cost them \$125 to obtain \$100 in damages; and not facing the risk of suit, injurers will not spend \$1 to prevent harm, so harm of \$100 will result. However, were victims to be willing to bring suit, injurers would spend \$1 to prevent harm, no harm and no suits would in fact result, so that \$1 (rather than \$100) would comprise total social costs. This outcome does not occur because victims are not motivated to bring suit by the deterrent effect that would produce.

⁴Suppose as in the previous note that litigation costs are \$125 both for victims and for injurers, but now that injurers will cause harm of \$500 that they can do nothing to prevent. Then a suit is socially undesirable because it does not lead to the deterrence of harm but does generate litigation costs. Yet suit will be brought because a victim can obtain \$500 through suit at a cost of only \$125.

corrective fees or subsidies for bringing suit. It implies as well that levels of care should be lower than in the basic model, meaning that court awards paid by injurers should be augmented by a tax reflecting only the expected costs of settlements.⁵

Additionally, an important question arises in the model that allows for settlement. Namely, how does the motive of the victim and of the injurer to settle rather than go to trial relate to what is socially best?⁶ The answer is that private incentives to settle are inadequate—the amount of trial is socially excessive—if there is asymmetry of information between the parties about trial outcomes. The essential reason is that asymmetry of information may lead to trial despite the litigation cost savings that settlement would allow. Yet, as I discuss informally in the concluding section of the article, in situations different from that examined in the model it is possible for there to be too many settlements, because the parties do not take into account the deterrent effect of a trial as opposed to that of settlement.

As a byproduct of the analysis of the optimal amount of settlement, I note two misleading views about the social desirability of settlement and that of trial. The first is that because settlement allows injurers to pay less than they would were they to go to trial, settlement might undesirably dilute deterrence. The error in this view is that a general problem of inadequate deterrence can be alleviated by the socially inexpensive means of imposing a tax on settling injurers (or by increasing court awards, which would be reflected in settlements). It is hardly necessary for society to incur the real resource costs of trial to augment deterrence. The other incorrect view is that because settlement is cheaper than a trial, settlement might lead more victims to bring suit and thus would exacerbate the problem of excessive numbers of suits. The mistake in this view is that the problem of excessive numbers of suits can be remedied by use of a proper fee for bringing suit.

II. Basic Model

Assume that there is a population of risk-neutral injurers and risk-neutral victims. Injurers can exercise care to reduce the risk of harm. Define the following notation.

- x = expenditure on care of an injurer; $x \geq 0$;
- $p(x)$ = probability of an accident given x ; $1 > p(x) > 0$; $p'(x) < 0$; $p''(x) > 0$;
- h = harm if an accident occurs.

Victims differ in the harm each would suffer in an accident; further, each injurer knows the magnitude of the harm that he would cause for the particular victims exposed to the risk that he generates.⁷

Also, suppose that if an accident occurs and the victim brings suit, the injurer will be

⁵The payment of a tax to the state by injurers who settle raises an issue about enforcement: Would not the victim and the injurer have a joint incentive to settle secretly to avoid the tax and divide its amount as surplus? On this issue, see Comment (1) after Proposition 6.

⁶Somewhat surprisingly, before the 1996 version of this article was written, the question of the social versus the private incentive to settle had not been addressed in a focused way in the economic literature on settlement bargaining and asymmetric information. That literature has been essentially descriptive in nature; see, for example, Bebchuk (1984) and Cooter and Rubinfeld (1989). However, citing Shavell (1996), Kathryn Spier (1997) examines the social versus the private incentive to settle under the negligence rule; see also her comment on social versus private incentives to settle in note 6 of Spier (1994).

⁷One can imagine that the potential harm associated with different pairs of injurers and victims varies either because

strictly liable and have to pay the victim h in damages (the negligence rule will be discussed in the concluding section). Further, suppose that the victim, the injurer, and the public each bear a litigation cost if a suit is brought.⁸ Let

c_V = cost of litigation to a victim; $c_V \geq 0$;

c_I = cost of litigation to an injurer; $c_I \geq 0$;

c_P = cost of litigation to the public; $c_P \geq 0$,

and define total litigation cost by $c = c_V + c_I + c_P$. Assume that c_V , c_P , and the function p are common knowledge and that h is observable.

Finally, suppose that the social goal is the minimization of expected total costs: the cost of care, expected harm from accidents, and expected total litigation cost.

Let us now discuss a second-best social optimum: the social optimum, given that suit is costly. This is defined to be the minimum level of expected total costs achievable by a dictator who can order whether or not victims bring suit and who can also determine how much injurers who are sued must pay (but not their level of care x).

PROPOSITION 1. The social optimum, given that suit is costly, is such that

- (a) suits are not brought if harm is below a unique positive threshold of harm h_o , and suits are brought when harm is at least equal to this level;
- (b) injurers who are sued bear total expenses equal to harm caused plus total litigation cost.

Notes. The explanation for (a) is that if and only if harm is sufficiently high will the incentive benefit of suit—the reduction in total accident costs due to injurers' incentive to take care from the prospect of suit—outweigh the expected litigation costs of suit.⁹ The explanation for (b) is that when accidents occur and they are followed by suit, the total social harm done is not only the direct harm h but also the total litigation costs.

PROOF. If suits are brought when accidents of type h occur, total costs due to an accident will be $h + c$. Hence, the level of care that will be best for injurers to exercise minimizes

$$x + p(x)(h + c); \quad (1)$$

Let us denote this level of care by $x^*(h + c)$.¹⁰ Injurers will choose this level of care if their total expenses when sued are $h + c$. Hence, if suits are brought, minimized social costs will be

$$x^*(h + c) + p(x^*(h + c))(h + c). \quad (2)$$

If suits are not brought when accidents of type h occur, injurers will not take care, so that social costs will be

$$p(0)h. \quad (3)$$

injurers differ (for example, gasoline tanker trucks will cause more harm than light pick-up trucks) or because victims differ (for example, a bicyclist is likely to sustain greater harm in an accident with a truck than would a driver of a car).

⁸This cost will be interpreted here as the total cost of litigation. In the next section, in which the possibility of settlement is investigated, litigation cost will be divided into pretrial costs and trial costs.

⁹Note that this logic applies because of the assumption that litigation costs are independent of h . If litigation costs increased with h , the threshold h_o might not exist. Similarly, the logic relies on the assumption that the function p relating care x to the risk of harm does not depend on h ; if it did, the threshold h_o might not exist.

¹⁰It is readily verified that the function $x^*(h + c)$ is increasing in $h + c$, and that the minimized value of equation (1) is increasing in $h + c$.

Thus, it is socially optimal for suits to be brought if and only if (2) is less than or equal to (3),¹¹ or if and only if

$$p(0)h - [x^*(h+c) + p(x^*(h+c))(h+c)] \geq 0, \quad (4)$$

which is equivalent to

$$p(0)h - [x^*(h+c) + p(x^*(h+c))h] \geq p(x^*(h+c))c. \quad (4')$$

Note that the left side of (4') measures the incentive benefit of suit and the right side is expected litigation costs. There is a unique positive h at which (4) holds with equality, which we will denote by h_o ; h_o is determined by

$$p(0)h - [x^*(h+c) + p(x^*(h+c))(h+c)] = 0. \quad (5)$$

That h_o exists and is positive follows from the facts that the left side of (4) is continuous in h , is negative at $h = 0$, and is positive for h sufficiently large.¹² That h_o is unique follows from the fact that the derivative of the left side of (4) with respect to h is¹³

$$p(0) - p(x^*(h+c)) > 0, \quad (6)$$

establishing the proposition. Q.E.D.

Next, let us examine what will occur in the absence of state intervention. Our conclusion is:

PROPOSITION 2. In the absence of state intervention,

- (a) the threshold of harm above which victims will choose to bring suit is their own litigation cost c_V .
- (b) The socially optimal threshold for bringing suit, h_o , may exceed c_V —in which case there will be too many suits—or h_o may fall below c_V —in which case there will be too few suits.
- (c) In either case, injurers who are sued will take too little care.

Notes. Part (a)¹⁴ is true because victims will clearly bring suit when harm h exceeds their own litigation cost c_V . That Part (b) is true will follow from our examples below (and it will also follow from the next paragraph). Part (b) can be understood along the lines explained in the Introduction. A victim's costs and benefits from bringing suit are different from society's: the victim compares c_V to his benefit, h ; society in effect compares its cost, $c_V + c_I + c_P$, to its benefit, the incentive benefit from suit [see equations (4) and (4')]. These are different comparisons, suggesting that there could be too many or too few suits, depending on (among other factors) whether the incentive benefit of suit is low or high. Part (c) is evident because injurers who are sued do not bear the direct harm plus total litigation costs but only their own litigation costs;

¹¹I adopt the convention that suits ought to be brought if (2) and (3) are equal, and I adopt similar conventions elsewhere without comment.

¹²When $h = 0$, (4) is $-[x^*(c) + p(x^*(c))c] < 0$. When h is sufficiently large, (4) must be positive: it is clear that $x^*(h+c) > 0$ for all large h ; for such h , the first derivative of the left side of (4) is (6), which is positive, and the second derivative is $-p'(x^*(h+c))x^{*'}(h+c) > 0$; hence, the left side of (4) grows unboundedly with h .

¹³Differentiation of equation (4) yields (6), assuming that $x^*(h+c) > 0$, for then the first-order condition from the minimization of equation (1) applies (namely, $1 + p'(x^*(h+c))(h+c) = 0$). This assumption is justified at h_o : At h_o , the left side of (4) is zero, whereas if $x^*(h+c) = 0$, the left side of (4) is negative.

¹⁴These Notes suffice to establish the Proposition; a formal proof is unnecessary.

injurers who are sued and pay damages of h will take care of $x^*(h + c_I)$, whereas it is optimal for them to care of $x^*(h + c)$, which is higher.

Part (b), concerning the relationship between c_V and h_o , merits further consideration. Recall from (4') that h_o is the level of harm above which the incentive benefit from suit exceeds expected litigation costs. The incentive benefit from suit is different from, and largely independent of, the victim's net benefit from suit, which is $h - c_V$. This suggests that if the incentive benefit is weak, there will be too many suits and h_o will exceed c_V , and that otherwise there will be too few suits and c_V will exceed h_o . To make this hypothesis precise, let us parameterize the function p by a positive t ,

$$p(x, t) = p(tx), \quad (7)$$

and let us assume that $p(tx) \rightarrow 0$ as $x \rightarrow \infty$. Note that the higher is the parameter t , the greater is the effectiveness of care in reducing the probability of accidents. I claim that if t is below a positive threshold t_o , then $c_V < h_o$, and that if t exceeds t_o , $c_V > h_o$. Rewrite equation (5) as a function of t ,¹⁵

$$p(0)h - [x^*(h + c) + p(tx^*(h + c))(h + c)] = 0. \quad (8)$$

This equation determines h_o as a function of t , denoted by $h_o(t)$. It is easily shown that $h_o(t)$ is decreasing in t (the more effective is care in reducing accident risks, the lower the threshold of harm above which suit becomes socially worthwhile).¹⁶ It is also readily established that for t close enough to 0, $h_o(t) > c_V$.¹⁷ It can be demonstrated as well that $h_o(t) < c_V$ for t sufficiently high.¹⁸ Consequently, the claimed t_o exists and is unique.

The following proposition is self-evident in light of the previous propositions.

PROPOSITION 3. The socially optimal outcome can be achieved under appropriate policy.

- (a) Victims can be induced to bring suit if and only if that is socially desirable, through use of a proper fee or subsidy: where there are too many suits, because the socially optimal threshold for bringing suit, h_o , exceeds victims' litigation costs, c_V , the state can set a fee for bringing suit equal to $h_o - c_V$; and where there are too few suits, because h_o is less than c_V , the state can set a subsidy for bringing suit equal to $c_V - h_o$.
- (b) In either case, injurers who are sued can be induced to exercise the socially desirable level of care by the state's imposing a tax equal to the public litigation costs, c_P , plus the victim's litigation costs c_V .

Examples. To illustrate these conclusions, it is useful to consider an example where there are excessive numbers of suits and one where there are too few suits. With regard to the former, suppose that $p(x) = 0.05/(1 + 0.004x)$.¹⁹ Thus, note, $p(0) = 0.05$ and

¹⁵Note that $x^*(h + c)$ now implicitly depends on t . The injurer's problem is to minimize $x + p(tx)(h + c)$. The first-order condition for the injurer is thus $1 + p'(tx)t(h + c) = 0$ or $p'(tx) = -1/[t(h + c)]$; this equation determines $x^*(h + c)$.

¹⁶By definition, equation (8) is satisfied at t by $h_o(t)$. Let t' be greater than t , and consider (8) when evaluated at the same x and h , that is, at $x^*(h_o(t) + c)$ and $h_o(t)$. Because $p(t'x^*(h_o(t) + c)) < p(tx^*(h_o(t) + c))$, the left side of (8) must be positive. This implies that $h_o(t') < h_o(t)$.

¹⁷Substitute c_V for h in equation (8). We want to show that the left side of (8) is negative if t is small enough; this will imply that h_o for such t must exceed c_V . Now as $t \rightarrow 0$, the term in brackets tends toward $p(0)(c_V + c)$, which exceeds $p(0)c_V$, so that (8) is negative.

¹⁸Substitute c_V for h in equation (8). We want to show that the left side of (8) is positive if t is large enough; this will imply that h_o for such t must be less than c_V . Consider an x , say x' , such that $x' < p(0)c_V$. Now $[x' + p(tx')(c_V + c)] \rightarrow x'$ as $t \rightarrow \infty$ because $p(tx) \rightarrow 0$. As the term in brackets by definition minimizes $x + p(tx)(c_V + c)$, the term in brackets approaches a limit less than or equal to x' as $t \rightarrow \infty$, implying that (8) is positive for t sufficiently high.

¹⁹This is a function of the form $p(x) = a/(1 + tx)$, where $a = 0.05$ and $t = 0.004$. The following may readily be

that p is decreasing in x . Also, assume that $c_V = \$5,000$, $c_I = \$8,000$, and $c_P = \$3,000$, so that $c = \$16,000$. In this case, $h_o = \$22,888$. Thus, there are excessive numbers of suits: Victims bring suit whenever harm exceeds their legal costs of \$5,000, yet suit ought to be brought only when harm exceeds \$22,888.²⁰ To illustrate the inefficiency, when the harm is \$7,000, the victim will bring suit and will obtain \$2,000 after his costs. This is socially undesirable: If there were no suit and injurers did not take care, the probability of an accident would be 0.05, and social costs would be $0.05 \times \$7,000 = \350 ; given suit, injurers are induced to expend \$183.01 on care,²¹ lowering the probability of an accident to 0.0289, so that social costs are $\$183.01 + 0.0289(\$7,000 + \$16,000) = \847.71 , which is higher than \$350. To remedy the problem of excessive numbers of suits, victims should pay a fee for bringing suit of \$17,888 (equal to $\$22,888 - \$5,000$). Also, to induce those injurers who are sued to take proper care, they should pay a tax to the state of \$8,000; this is the sum of victim's legal costs of \$5,000 and the public cost of \$3,000, and it represents the social costs of an accident beyond the harm (and beyond the injurer's own litigation costs, which he bears).

Now instead suppose that $p(x) = 0.05/(1 + x)$. Note that care is more productive here in lowering the probability, so we would expect suit to be more desirable; and indeed, $h_o = \$1,151$, which is much lower than above. There are too few suits because victims bring suit only when harm exceeds \$5,000. To illustrate the inefficiency in this case, suppose that harm is, say, \$1,500. Because the victim does not bring suit, the probability of an accident is 0.05, so social costs are $0.05(\$1,500) = \75 . If victims were to bring suit, injurers would be led to spend \$28.58 on care, reducing the probability to 0.0017, so that social costs would be only $\$28.58 + 0.0017(\$1,500 + \$16,000) = \58.33 . Observe that it is socially desirable for suits to be brought when harm is as low as \$1,500, even though total litigation costs are much higher than the harm, namely, \$16,000; this is because the expenditure of the \$16,000 is incurred with only a small probability and serves to induce injurers to lower the probability of an accident. To solve the problem of inadequate numbers of suits, the state can employ a subsidy of \$3,849 (equal to $\$5,000 - \$1,151$); and for injurers to take appropriate care, they should continue to pay a tax of \$8,000.

Comments. (1) There are other ways of inducing the optimal volume of suits. For example, if there are too many suits, the state could simply prohibit the bringing of suits unless $h \geq h_o$.

(2) There are also other ways of inducing optimal care, that is, of ensuring that injurers who are sued pay $h + c$ in total. For example, shifting the victim's legal fees to the injurer in combination with a tax equal to public litigation costs would induce injurers to take appropriate care: Injurers would then pay victims $h + c_V$, incur a tax of c_P , and bear their own litigation costs c_I . Note, though, that because such fee shifting would increase victims' incentive to sue, the state would have to make an offsetting

verified for the general function $a/(1 + tx)$: (1) $p(0) = a$; (2) $x^*(h) = [\sqrt{ath} - 1]/t$; (3) $p(x^*(h)) = \sqrt{a/(th)}$; (4) $h_o = 1/(at) + 2\sqrt{c/(at)}$.

²⁰From equation (4) in the preceding note, we have $h_o = 1/(at) + 2\sqrt{c/(at)} = 1/0.0002 + 2\sqrt{16,000/0.0002} = 22,888$.

²¹This follows because injurers bear \$15,000 when accidents occur (\$7,000 in damages and \$8,000 in legal costs), so that, according to formula (2) from note 19, the level of care is $x^*(15,000) = [\sqrt{(0.05)(0.004)(15,000)} - 1]/0.004 = 183.01$. (The figures mentioned in the rest of this and the next example are derived similarly, so further explanation will be omitted.)

adjustment in the otherwise optimal fee or subsidy for suit (for instance, if a fee had been optimal, the state would have to raise the fee by c_V).

(3) For the state to determine the optimal fee or subsidy, it must calculate the optimal volume of suit (determined by h_o in the model), which requires it to know the incentive benefits of suit (and thus the function p) as well as the litigation costs. For the state to determine the optimal tax, to induce the correct level of care, the state need only ascertain litigation costs.

(4) The results in Propositions 1 to 3 may be related to those in previous articles. Shavell (1982), Menell (1983), Kaplow (1986), and Rose-Ackerman and Geistfeld (1987) consider the social versus the private incentive to bring suit but give little attention to how to correct a difference between the two, and they do not examine the optimal degree of care given suit. Polinsky and Rubinfeld (1988a) consider the incentive to bring suit and injurers' level of care, presuming that the only policy instrument is the magnitude of damages. Under this assumption, the state is not able to induce both the optimal volume of suit and the optimal level of care (the higher are damages, the greater is deterrence and the level of care, yet so also is the volume of suit), and the best level of damages may be less than harm.²² Hylton (1990) observes that the optimal level of care given the volume of suit can be achieved by imposing an appropriate tax on injurers in addition to damages equal to harm.²³ Finally, Polinsky and Che (1991) allow for the state effectively to control the probability of suit and also the magnitude of payments by injurers. They find that the optimal amount for injurers to pay is their entire wealth (or whatever is deemed the maximal sanction), regardless of the level of harm caused.²⁴

III. The Model with Settlement

Let us now incorporate settlement into the foregoing model. Suppose that if suit is brought and the parties settle, they bear only pretrial costs. Let

s_V = pretrial cost of a victim; $s_V > 0$;

s_I = pretrial cost of an injurer; $s_I > 0$;

s_P = pretrial cost of the public;²⁵ $s_P > 0$.

²² The optimal level of damages is less than harm when the desirability of reducing the incentive to sue outweighs the desirability of raising levels of care. (By contrast, in the model in the present article, the state does not need to lower damages to discourage suit; it can use a fee for bringing suit to accomplish that.) Or the best level of damages might exceed harm (but then only by coincidence equal $c_P + c_V$).

²³ In Hylton's model, the optimal tax equals litigation costs not directly borne by the injurer plus expected harm caused for which suit would not be brought because harm is less than victims' litigation costs (harm is assumed to be stochastic in magnitude).

²⁴ However, the probability of suit rises with the magnitude of harm. The logic underlying the conclusion that optimal sanctions are maximal is analogous to that behind the same conclusion in the law enforcement literature. Namely, if the sanction is less than maximal, the state can raise the sanction to the maximum and lower the probability of suit (this is accomplished in the Polinsky-Che model by altering the amount that victims receive if they bring suit) so as to maintain the expected sanction, and thus the behavior of injurers, at the initial level. This will raise social welfare because it will conserve litigation costs. In the present article, I have implicitly assumed that suit does not occur probabilistically.

²⁵ The public may bear pretrial costs associated with initial filings and the making of various motions, such as those concerning legal discovery.

These pretrial costs will sometimes be referred to as settlement costs. If the parties do not settle, they bear additional trial costs. Let

t_V = additional cost of trial to a victim; $t_V > 0$;

t_I = additional cost of trial to an injurer; $t_I > 0$;

t_P = additional cost of trial to the public; $t_P > 0$.

Assume that the various pretrial costs and trial costs are known to the state. Let total pretrial costs be $s = s_V + s_I + s_P$, and let total trial costs be $t = t_V + t_I + t_P$; note that $c_V = s_V + t_V$, and similarly for c_I and c_P , so that $c = s + t$.

Social costs now include pretrial and trial costs; the second-best social optimum is the minimum level of expected costs that can be achieved by a dictator who can command not only when victims bring suit but also when suits are settled, and what injurers pay when they settle as well as when they go to trial.

I examine first the situation when there is no asymmetry of information between the parties that might hamper settlement bargaining and then the situation when there is asymmetry of information.

Information Is Symmetric. Recall that we have assumed that injurers know the harm victims suffer; thus information about harm is symmetric. The following conclusion holds.

PROPOSITION 4: The social optimum, given that settlement is a possibility, is such that

- (a) suits are not brought if harm is below a unique positive threshold h_o' , and suits are brought if harm is at least this level;
- (b) the threshold h_o' is lower than the threshold h_o that applies when settlement is assumed not to be possible;
- (c) all suits settle;
- (d) injurers who are sued (and then settle) bear total expenses equal to harm plus total settlement costs s .

Notes. That there is a positive threshold, h_o' , as indicated in (a) follows because settlement is costly. And, as mentioned in the Introduction, the explanation for (b) is that because settlement effectively makes suit less costly, it is socially preferable for suits to be brought more often. That suits should all settle is due, on one hand, to avoidance of trial costs, and, on the other hand, to the absence of any incentive-related advantage that would flow from trial. That injurers who settle should bear direct harm h plus total settlement costs s is true because s is the social cost associated with bringing suit.

PROOF: Observe first that (c) and (d) must hold if suits are brought when accidents of type h occur and they settle. Then total costs due to an accident are $h + s$; because injurers can be induced to minimize total social costs, $x + p(x)(h + s)$, and to choose $x^*(h + s)$ by making them pay $h + s$, so that total social costs will be

$$x^*(h + s) + p(x^*(h + s))(h + s). \quad (9)$$

Expression (9) is lower than (2), the total costs if the bringing of a suit is not followed by settlement.

Part (a) follows from the proof of Proposition 1 (let s play the role of c). That $h_o' < h_o$ also follows because, from equation (5), it is clear that h_o is decreasing in c .²⁶ Q.E.D.

Now let us determine what will occur. To do so, we have to describe bargaining between injurers and victims. We will assume for concreteness that an injurer makes a single offer to a victim, who knows this and thus either accepts the offer and settles or goes to trial.²⁷ We have

PROPOSITION 5: Assume that settlement is a possibility and that information is symmetric. Then

- (a) the threshold of harm above which victims will choose to bring suit is their own cost of suit and trial, $c_V = s_V + t_V$.
- (b) The socially optimal threshold for bringing suit h_o' may exceed c_V —in which case there will be too much suit—or h_o' may fall below c_V —in which case there will be too few suits.
- (c) Settlement will always occur.
- (d) Injurers who are sued will take too little care.

Notes.²⁸ To explain (a) and (c), victims who sue will be offered and will accept $h - t_V$ in settlement. Thus victims will sue when $h - t_V$ exceeds their settlement cost s_V , which is to say, when h exceeds c_V . Part (b) follows along the lines of Part (b) in Proposition 2. Part (d) is analogous to Part (c) in Proposition 2 and is true because injurers do not bear the total costs of settlement, only their own.

Optimal social policy is described in the following proposition, which is proved in the Appendix.

PROPOSITION 6: Assume that settlement is a possibility and that information is symmetric. Then the socially desirable outcome can be achieved under appropriate policy.

- (a) Victims can be induced to bring suit if and only if that is socially desirable through use of a proper fee or subsidy: where there are too many suits, because the socially optimal threshold for bringing suit h_o' exceeds victims' litigation costs c_V , the state can set a fee for bringing suit equal to $h_o' - c_V$; and where there is too little suit, because h_o' is less than c_V , the state can set a subsidy for bringing suit equal to $c_V - h_o'$.
- (b) Because settlement always occurs, there is no need for the state to induce it.
- (c) Injurers who are sued can be led to take the socially desirable level of care by the state's imposing a tax on injurers (whether or not there is a settlement) equal to the public's pretrial costs s_P plus the victim's total litigation costs c_V .

Example. Let us illustrate the previous three propositions by reconsidering the first of the examples from before, that is, with $p(x) = 0.05/(1 + 0.004x)$, but modified to allow for settlement. Specifically, suppose that the victim's total litigation costs of \$5,000 are made up of settlement costs s_V of \$2,000 and trial costs t_V of \$3,000, that for the injurer, $s_I = \$4,000$ and $t_I = \$4,000$, and that for the public, $s_P = \$1,000$ and $t_P = \$2,000$. Then, it is optimal for suit to be brought whenever harm exceeds $h_o' = \$16,832$, whereas before, when settlement was not a possibility, it was optimal for suit to be brought only when harm exceeded \$22,888. The reason for the difference is that here, the social cost

²⁶ Because equation (5) holds at $h_o(c)$, and because the term in brackets falls for c' if $c' < c$, (5) must be positive at c' and $h_o(c')$. Consequently, $h_o(c') < h_o(c)$.

²⁷ It will be clear that the qualitative nature of the results to be obtained would not be altered were I not to assume that the injurer makes a single offer to the victim, for instance, that the injurer obtains only a fraction of the surplus from settlement.

²⁸ These Notes will suffice to establish the proposition; a formal proof is not necessary.

of suit is only the pretrial cost of settlement, \$7,000, whereas before it was \$16,000.²⁹ Further, because victims will bring suit whenever harm exceeds \$5,000,³⁰ the optimal fee for bringing suit is \$11,832 rather than \$17,888. Also, to induce injurers who are sued to take proper care, they should pay a tax of only \$6,000, the sum of the publicly borne settlement costs and the victim's total litigation costs, rather than the \$8,000 tax that was appropriate before.

Comments. 1. It is implicitly assumed in Proposition 6 that parties cannot secretly settle and thereby escape having to pay fees and taxes. The justification for this assumption is that the state can prevent secret settlements by refusing to enforce them. In that case, were an injurer to settle secretly, nothing would stop the victim from turning around and bringing suit; thus the injurer would not agree to a secret settlement.

2. As noted in the Introduction, the idea that settlement might be socially undesirable because it encourages litigation by lowering its effective cost to victims is incorrect in the model; as stated in Part (a) of Proposition 6, the state can employ an appropriate fee to counter any tendency toward excessive numbers of suits. Further, the notion that settlement might be undesirable because it dilutes deterrence is incorrect in the model, for taxes imposed on settling defendants can increase deterrence; this is the point of Part (c) of Proposition 6.³¹

3. Symmetry of information plays a dual role above in promoting social optimality. First, because it means that no party misgauges another's situation, parties always settle, saving social resources. Second, because symmetry of information means that settlement amounts are well calibrated to harm (the settlement amount is $h - t_v$), settlement-related incentives to take care are as well calibrated to harm as trial-related incentives would be.³²

Information Is Asymmetric. Let us now allow for parties to have imperfect information about each other. In this case, the parties might not settle. Because the analysis will often parallel that given above, it will only be sketched in certain respects.

To examine asymmetry of information during litigation, we need to amplify the model. Consider the following source of asymmetry of information: *ex ante*, injurers and victims know only the expected harm that a victim will suffer in an accident; after an accident occurs, the victim will know his actual harm, but the injurer will not know the actual harm unless a trial takes place. Specifically, let h now denote the expected harm a victim will suffer in an accident, and let a victim's actual harm be $h + \epsilon$, where ϵ is observed by the victim but cannot be observed by the injurer until and unless there is a trial; ϵ is distributed on $[-m, m]$ according to a positive probability density $f(\epsilon)$ and $E(\epsilon) = 0$ (where E denotes expectation).³³ Otherwise, the model is as before (care x influences $p(x)$, injurers make settlement offers, and so forth). The definition of the second-best social optimum continues to be the minimum level of total expected costs achievable by a dictator who can order whether or not victims bring suit, whether or not

²⁹ Because the cost of settlement is only \$7,000, we have $h_o' = 1/(at) + 2\sqrt{c/(at)} = 1/0.0002 + 2\sqrt{7,000/0.0002} = 16,832$.

³⁰ When harm just equals \$5,000, injurers will offer victims \$2,000, which they will just accept, but it will cost victims \$2,000 to reach settlement.

³¹ In Polinsky and Rubinfeld (1988b) it is emphasized that settlement might dilute deterrence, but they comment that this does not mean that settlement is undesirable because of the possibility of raising deterrence through means other than trial.

³² To induce optimality, settlement amounts have to be raised by use of a tax, as the reader knows, but the point being made is that trial is not needed to ensure that the amounts paid correctly reflect harm.

³³ The results to be shown would still hold if the density function $f(\epsilon)$ were to depend on h .

parties settle, and what injurers pay when they settle as well as when they are sued. The following result, which is proved in the Appendix, summarizes socially desirable outcomes and what occurs in the absence and in the presence of state intervention.

PROPOSITION 7: Assume that settlement is a possibility and that injurers do not observe victims' levels of harm unless there is a trial.

- (a) The social optimum is qualitatively identical to that in Proposition 4: There is a threshold of harm above which victims should bring suits, suits should always be settled, and injurers who are sued and settle should bear $h + s$, the expected harm of the type of the victim plus pretrial costs.
- (b) Behavior in the absence of state intervention will not be socially desirable: The threshold of harm above which victims will bring suit generally will not be desirable; further, there will be some trials; and the amount paid by injurers and the care they are induced to exercise will generally be undesirable.
- (c) Socially optimal behavior can be achieved if the state sets an appropriate fee or subsidy for bringing suit, and also an appropriate tax or subsidy for settling and a higher tax for going to trial (so as definitely to induce settlement).

Notes. Part (a) is true mainly for reasons analogous to those establishing Proposition 4. A point worth explaining, however, is why settlement is socially optimal even though injurers' payments will accurately reflect harm only if there are trials in which the true magnitude of harm is revealed (settlement amounts, by contrast, will not be calibrated to actual harm because injurers do not know it). The answer, in essence, is that when injurers choose their level of care x , they do not know what the true harm $h + \epsilon$ will be, they know only the expected harm, h . Thus, their incentives to take care will be as good as is possible if their payments reflect only h , which will be the case for the amounts they pay in settlements; there is no incentive advantage that can be secured from having injurers' payments more accurately reflect actual harm.³⁴

The first claim of Part (b) is true for familiar reasons. Additionally, the reason why some trials will occur is that, when an injurer makes a settlement offer to a plaintiff and does not know the true harm $h + \epsilon$, he will find it best to offer an amount that many, but not all victims will accept. Those victims with relatively high harm will reject and go to trial. It may also be remarked that, because no party bears the public costs of trial t_p , the likelihood of trial is higher than it would otherwise be.

Part (c) is also valid for reasons that are now largely familiar. The state can optimally regulate the volume of suits through fees or subsidies and the amount of injurers' care through taxes on settlements; it can further induce settlements by imposing a sufficiently high additional tax for trial.

IV. Concluding Comments

Let me conclude with several remarks about the importance of the analysis and about its generality and limitations. As to the former, I should say that the basic point made here—that the private and the social incentives to use the legal system are divergent—is likely to be of substantial empirical significance. A reason for believing this is that the costs of the legal system are large: The sum of litigation and the related costs of

³⁴This point is similar to the point that the cost of achieving accuracy in the assessment of damages may not be socially justified by the improvement in incentives that it brings about, as emphasized in Kaplow and Shavell (1996) and Spier (1994).

providing a dollar to a victim through the legal system appear to be on the order of a full dollar.³⁵ Given its roughly 100% transaction costs, the deterrence benefits of the legal system must be considerable to justify its use. One suspects, however, that deterrence is sometimes not sufficient to make the transaction costs of the legal system socially advantageous to bear. For example, this might be the case for product liability and automobile accident litigation;³⁶ we should not take the vigor of legal dispute activity in these areas of accident as evidence that the litigation is socially worthwhile. At the same time, it is quite plausible that in some domains, litigation needs to be promoted. One can readily imagine, for instance, situations in which firms know that the harms that they cause will not be in a typical victim's interest to pursue because the harm is individually small or hard to prove, even though the incidence of the harms could be reduced substantially by modest precautionary expenditures.

With regard to the generality of the analysis and its limitations, it should be observed that although I assumed that the social benefit of litigation inhered in its incentive effect, most commentators presume the compensation of victims to be a primary social benefit of litigation. But consideration of compensatory objectives would not alter the essential nature of the conclusions I reached, for compensation can be much more cheaply accomplished through the insurance system than through the legal system. Two other commonly advanced social benefits of litigation are the development of the law through its judicial interpretation and the setting of precedent; and reinforcement of social values through their legal application and pronouncement. These benefits of litigation are not usually counted as private benefits by litigants. The benefits thus constitute a positive externality and, like the incentive effect of litigation, suggest the possibilities of too few suits and too many settlements.

Another point worth mentioning is that I did not investigate the level of litigation expenditures (given parties' decisions about suit and settlement); I assumed that the amount spent on suit and on trial was fixed in magnitude. It seems clear, though, that the divergence of private and social costs that I discussed would apply to the level of litigation expenditures. That is, when a litigant is deciding whether to increase his level of expenditures, for instance, whether to hire an expert, he will not count as a cost to himself the effect this has on the expenditures of the other side and the court, nor will he credit the marginal effect his expert's report will have on incentives. Thus, the level of litigation expenditures per case may be either socially excessive or socially inadequate, depending on the context.³⁷

An additional factor to be noted is that I assumed liability was strict rather than being based on the negligence rule—under which a party must pay for harm only if his behavior was judged to be negligent. Somewhat surprisingly, if this rule functions perfectly, it will be socially advantageous for suit always to be subsidized: injurers will

³⁵That is, litigation costs on average may equal (or exceed) the amount that victims receive, when averaged over all cases—even though over 90% of cases settle. See the sources cited in Shavell (1987) at 263.

³⁶What, for example, is the effect of product liability on product safety, given that firms have strong market-related incentives not to sell unsafe products and given that they often face safety regulation? And what are the effects of liability for automobile accidents, given that drivers have the powerful motive of avoiding injury to themselves and also face traffic regulation and criminal sanctions for driving infractions? Studies of the incentive effects of liability in these two areas are sparse and somewhat contradictory, but leave open the possibility that the incentive effects of liability do not justify society bearing its costs. For a survey of the empirical literature on product liability and automobile accidents, see Chapters 2 and 4 of Dewees et al. (1996).

³⁷The point that each side will not take into account as a social cost the expenditure that the other side makes is emphasized in Braeutigam et al. (1984).

then decide to act nonnegligently; no suits will in fact be brought; and no litigation costs will be incurred. However, if one assumes that courts may err in the negligence determination and/or that victims may not be able to tell whether injurers are non-negligent, suits will in fact be brought under the negligence rule. In consequence, the general qualitative results reached under strict liability will apply under the negligence rule as well, although the likelihood of excessive litigation would seem to be lower.³⁸

A further remark is that I assumed in the analysis that the courts had information sufficient to allow them to calculate precisely when suit would be worthwhile, and that this could be expressed purely in terms of the magnitude of harm. In reality, however, whether suit is worthwhile would be difficult for courts to determine, especially because it would require them to assess the incentive effects of suit, and the desirability of bringing a suit would not always be a function only of the magnitude of harm.³⁹ However, one supposes that courts (or legislatures) could make reasonable approximations, at least for certain case categories, and thereby could improve the performance of our legal system.

Last, let me comment on the analysis of the private versus the social motive to settle. I found that settlement was always socially desirable, but that because of the asymmetry of information, private parties might go to trial. The reasons that settlement was socially desirable were chiefly the avoidance of litigation costs and the fact that any dilution of incentives caused by low settlements can be remedied by imposition of taxes on settling defendants. Although these reasons suggest that settlement might be desirable in a wider class of situations than I studied,⁴⁰ one can certainly construct models of accidents in which some trial is desirable.⁴¹ Moreover, if we look beyond the typical models of accident, we can easily adduce factors that may make trials socially desirable and that also may make it socially desirable to promote trial over parties' private interests in settlement. Consider, for instance, the possibility I mentioned that trial would result in

³⁸ On the social versus the private incentive to sue under the negligence rule, see Shavell (1982) and Shavell (1987) at 268 and 274–275.

³⁹ For example, the social desirability of suit might not be a function only of the magnitude of harm if, contrary to the assumption made in the analysis, harm is stochastic in nature. In that case, additional information about an act and its harm might need to be ascertained to determine whether suit would be desirable.

⁴⁰ For example, it is readily shown that, if there is asymmetry of information about the victim's litigation costs, there will generally be some trials and a policy inducing settlement would be socially desirable.

⁴¹ Suppose that the cause of harm will be unclear unless it is resolved at trial. Then a trial may be socially beneficial because it means that parties who truly cause harm will pay more than they otherwise would and thus will have stronger incentives to take care. Moreover, for this reason, it may be desirable for the state to encourage trial where settlement would otherwise occur. Let me sketch a case where this is so. Harm occurs due to natural factors with probability p , or due to a true injurer; victims are unable to tell before trial whether they face true injurers or only apparent injurers; a true injurer causes harm with probability q if he does not spend x on care, which would reduce the probability to q' . Hence, the probability r that harm is due to a true injurer is $q/(q + p)$ if true injurers do not take care, and it is $q'/(q' + p)$ if they do. Victims are assumed to make a single settlement demand. It is clear that a victim will either ask for t_f —in which case all injurers will settle—or a victim will ask for $h + t_f$ —in which case true injurers will settle but apparent injurers will reject settlement and go to trial (where they will be found innocent). If r is less than a threshold (equal to $(t_f + t_v)/h$) victims will ask only for t_f . In this case, where settlements always occur, it might be socially desirable to induce some trials. To see why, suppose that true injurers do not take care but could be led to do so if they were to bear slightly more liability: For example, assume that $(q - q')t_f = x$, so that a true injurer just decides against taking care given victims' settlement demands of t_f . Now suppose the state induces trial in a small fraction of cases. This will lead a true injurer to take care, reducing social costs by $(q - q')h$. The litigation cost necessary to induce this reduction in social costs is arbitrarily small, for the fraction of trials can be any positive fraction. Hence, inducing some trials is socially desirable.

the setting of a socially valuable precedent,⁴² or the possibility that trial would result in the public release of socially valuable information, such as about a product defect,⁴³ or the possibility that trial would result in a criminal conviction.⁴⁴ It therefore appears that further theoretical effort is merited to develop a better understanding of the circumstances under which a trial is socially preferable to settlement and in which private and social incentives to settle diverge.

Appendix

Proof of Proposition 6

Observe that if a victim has brought suit, his having paid a fee or received a subsidy will not affect the settlement amount that he will be offered; for given that he has brought suit, his gain from trial will remain $h - t_V$ and there will be a settlement for this amount.⁴⁵ Part (a) is then clear. For example, if $h_o' > c_V$ and a fee of $h_o' - c_V$ is imposed for bringing suit, the victim's gain after he settles will be $h - t_V - s_V - (h_o' - c_V) = h - h_o'$, so he will bring suit if and only if $h > h_o'$. Part (b) requires no comment. With regard to Part (c), note that because the injurer will pay $h - t_V$ when sued and bears s_P , his total expenses will be $h - t_V + s_I$ in the absence of a tax. Because he must pay the tax of $s_P + s_V + t_V$, his total expenses will be $h - t_V + s_I + s_P + s_V + t_V = h + s$, so he will exercise the correct level of care. Q.E.D.

Proof of Proposition 7

The demonstration of Part (a) is, as stated in the text, essentially that of Proposition 4. The only addition that should be noted concerns why settlement is always socially optimal (the argument that follows is cast differently from that in the text). Consider a situation in which there is some trial. An injurer facing a victim of type h will bear an expected sanction given that an accident occurs equal to the sum of two components: e_s , the expected expenses associated with settlements, and e_t , the expected expenses associated with trial. Suppose that the dictator orders that all suits be settled and chooses an additional payment to be made in settlements such that the new expected sanction associated with settlements is $e_s' = e_s + e_t$. Then the behavior of injurers will be the same, yet social costs will have been saved because the costs of trial will have been avoided. Thus, settlement is always optimal.

With respect to Part (b), let us discuss what occurs if a victim brings a suit. Assume for simplicity that $h - m - t_V > 0$, meaning that h is high enough that any victim who brings suit would be willing to go to trial.⁴⁶ Let the injurer's nonnegative settlement offer be

⁴²The parties themselves might well not care about a new precedent and thus want to settle to save litigation costs.

⁴³A defendant producer of a defective product would often want to keep information about the defect private, so the producer would have a stronger incentive to settle with the plaintiff than merely to save litigation costs, and the plaintiff might not much care about the revelation of information about the defect. In such a situation, it might well be socially desirable for a trial to occur despite the litigants' wishes to the contrary.

⁴⁴If I catch the person who burgles my house, he and I might decide to make a settlement in which he returns what he has taken (and perhaps promises to be on good behavior in the future). Yet such a settlement will tend to dilute deterrence of burglars (burglars might otherwise go to jail) and might well be socially undesirable (to deter burglars, a sanction exceeding the value of the items stolen is required, because they often escape capture). Indeed, for this reason, settlements between criminals and victims generally are not allowed as a substitute for criminal prosecution by the state.

⁴⁵Likewise, note that the tax the injurer will have to pay will not affect what he offers the victim.

⁴⁶If $h - m - t_V < 0$, some victims of type h would be unwilling to go to trial. In this case, injurers' problem will be more complicated, but for the point being made—that there might be trial—it is sufficient to consider the case at hand.

y . The victim will accept the offer if and only if his gain from trial, $h + \epsilon - t_V$, is less than or equal to y , or equivalently, if and only if $\epsilon \leq y + t_V - h$, and he will reject and go to trial otherwise. The injurer will choose y in $[h - m - t_V, h + m - t_V]$,⁴⁷ and his choice of y in this interval will minimize

$$q(y) = F(y + t_V - h)(y + s_I) + \int_{y+t_V-h}^m (h + \epsilon + s_I + t_I) f(\epsilon) d\epsilon, \quad (10)$$

where F is the cumulative distribution of ϵ . If the injurer's choice of y , denoted y^* , is interior to $[h - m - t_V, h + m - t_V]$, it will be determined by the first-order condition

$$F(y + t_V - h) - (t_V + t_I) f(y + t_V - h) = 0, \quad (11)$$

and there will be a positive probability of rejection of the injurer's offer, namely, $1 - F(y^* + t_V - h)$. Also, it was remarked after stating the proposition that the probability of trial is higher than it would be if one of the parties were to bear t_P . This follows because the probability of settlement increases if either party bears higher litigation costs. To show this, observe that the first-order condition (11) can be rewritten as

$$F(y + t_V - h) / f(y + t_V - h) = t_V + t_I. \quad (11')$$

The left-hand side of this equation is increasing in its argument $y + t_V - h$.⁴⁸ Consequently, if either t_V or t_I rises, the right-hand side of equation (11') rises, implying that the left side rises and that $y + t_V - h$ rises, which implies in turn that the probability of settlement rises.

Additionally, as $q(y^*)$ is generally unequal to $h + s$, injurers' level of care, namely, $x^*(q(y^*))$, will generally be undesirable. Also, it is evident for now familiar reasons that victims will not necessarily bring suits when that is socially desirable.

With regard to Part (c), observe first that if the state imposes on injurers a fee of α for settling and a fee of $\alpha + \beta$ for going to trial, an injurer will choose y to maximize not (10) but

$$r(y) = F(y + t_V - h)(y + s_I + \alpha) + \int_{y+t_V-h}^m (h + \epsilon + s_I + t_I + \alpha + \beta) f(\epsilon) d\epsilon. \quad (12)$$

The derivative of equation (12) is

$$F(y + t_V - h) - (t_V + t_I + \beta) f(y + t_V - h). \quad (13)$$

It is clear that if β is chosen sufficiently large, (13) will always be negative, so that the injurer will choose $y = h + m - t_V$, that is, all victims will settle.⁴⁹ Thus, the injurer's

⁴⁷All y below $y - m - t_V$ are equivalent, because such offers would definitely be rejected by victims; and no offer above $y + m - t_V$ would be made, because an offer equal to $y + m - t_V$ would be accepted by all victims.

⁴⁸Let z stand for $y + t_V - h$. We want to show that $F(z)/f(z)$ is increasing in z , or that its derivative, $[f(z)^2 - f'(z)F(z)]/f(z)^2$, is positive. Using equation (11'), we can express the numerator of the derivative as $f(z)[f(z) - f'(z)(t_V + t_I)]$, but the term in brackets must be positive because this is the second-order condition for a minimum for the injurer's optimal choice of y .

⁴⁹Note that it is the assumption that the error ϵ is bounded that allows the state to induce settlement in all cases through the use of taxes at trial. If the error were unbounded, then no matter how high a settlement offer the injurer makes, some plaintiffs would reject it because their true harm $h + \epsilon$ would exceed the offer. Still, the state could raise social welfare through the use of taxes at trial.

total costs will be $h + m - t_V + s_I + \alpha$. For optimality of injurers' care, this quantity must equal $h + s$. Hence, the optimal fee for settlement is determined by

$$\alpha = s_V + s_P + t_V - m. \quad (14)$$

Now, as victims of type h will obtain a sure settlement of $h + m - t_V$ and will bear s_V and a fee δ , and as we want them to sue if and only if $h \geq h_o'$, we want $h_o' + m - t_V - s_V - \delta = h_o'$ or $m - t_V - s_V - \delta = 0$. Thus, the optimal fee to impose on plaintiffs for bringing suit is

$$\delta = m - t_V - s_V. \quad (15)$$

This establishes the proposition. Q.E.D.

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