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THE WELFARE IMPLICATIONS OF COSTLY LITIGATION IN THE THEORY OF LIABILITY

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ABSTRACT

One of the principal results in the economic theory of liability is that, assuming litigation is costless, the rule of strict liability with compensatory damages leads the injurer to choose the socially appropriate level of care. This paper reexamines this result when litigation is costly. It is shown that strict liability with compensatory damages generally leads to a socially inappropriate level of care and to excessive litigation costs. Social welfare can be increased by adjusting compensatory damages upward or downward, with the desired direction depending on the effect of changes in the level of liability on the injurer's decision to take care and on the victim's decision to bring suit.

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1. Introduction

The central concern of the economic theory of liability is how to induce an injurer to take the socially appropriate level of care--the level that minimizes the sum of the cost of taking care and the losses of victims.[1] An important result in this theory is that, assuming litigation is costless, the rule of strict liability with compensatory damages (in which the injurer pays the victims' losses) leads the injurer to choose the appropriate level of care. This follows because, under strict liability with compensatory damages, the injurer's problem--of minimizing his cost of care plus his cost of liability--is identical to society's problem.

The analysis of strict liability with compensatory damages is affected in two ways when litigation costs are taken into account. First, it is no longer true (as was implicitly assumed in the preceding argument) that whenever a victim suffers harm he will sue the injurer; only victims whose losses exceed their cost of litigation will sue. This difference could lead the injurer to take less care (because he will not have to pay for all of the losses he causes) or more care (because, for example, by reducing the harm suffered by victims, he can reduce the number who sue). Second, the social problem now becomes one of minimizing the sum of the cost of care, the losses of victims, and the cost of litigation. With these changes, it may no longer be optimal to set the level of liability equal to the victim's loss.

The principal contribution of this paper is to analyze the socially optimal adjustment to compensatory damages when

litigation is costly.[2/] Among other things, it will be shown that the rule of strict liability with compensatory damages generally will result in the injurer choosing an inappropriate level of care, and in the parties incurring excessive litigation costs. Thus, it is generally not socially optimal to use compensatory damages. Whether compensatory damages should be adjusted upward or downward will be seen to depend on the effect of changes in the level of liability on the injurer's incentive to take care and on the victims' incentives to sue.

The possibility that the optimal adjustment to compensatory damages is positive can be illustrated by a simple example involving one injurer and one victim. Suppose there are only two levels of care that can be chosen by the injurer, "low care" and "high care." If the injurer takes low care, the victim's loss is $700, while if the injurer takes high care, the victim's loss is $500. The injurer's cost of taking high care is $100 more than his cost of taking low care, and the victim's cost of litigation is $1,000. (For simplicity, it is assumed that the injurer's cost of litigation is zero.) Thus, in the ideal outcome, the injurer would take high care; also, no litigation costs would be incurred.

First consider whether this outcome can be achieved under strict liability with compensatory damages. Regardless of whether the injurer takes low care or high care, the victim will not sue since his loss is less than his cost of litigation. Consequently, the injurer will take low care, and the ideal outcome will not be attained. Now consider strict liability with

liability equal to compensatory damages plus $301. If the injurer takes low care, the victim will sue because his loss plus the adjustment exceeds his cost of litigation ($700 + $301 > $1,000). But if the injurer takes high care, the victim will not sue (since $500 + $301 < $1,000). Therefore, the injurer will choose to take high care because the extra cost of taking care ($100) is less than his liability if he takes low care ($700 + $301). Since there will then not be any litigation, the ideal outcome will be achieved.

The possibility that the optimal adjustment to compensatory damages is negative can be shown by slightly modifying the example. Assume now that the injurer's extra cost of taking high care is $600, and that the victim's cost of litigation is $300. Then the ideal outcome is for the injurer to take low care and, as before, for there to be no litigation costs. Under strict liability with compensatory damages, the victim will sue regardless of whether the injurer takes low care or high care. Consequently, the injurer will choose to take low care. However, if compensatory damages are adjusted downward by $401, the victim will not sue when the injurer takes low care (since $700 - $401 < $300). Thus, the ideal outcome will be attained.

The results in these examples reflect some more general principles, the statement of which will serve to summarize the paper.[3/] With respect to the injurer's choice of care, adjusting damages upward when the injurer's care would otherwise be too low with compensatory damages, or downward when care would be too high, will increase social welfare. And with respect to the

costs of litigation, adjusting compensatory damages downward to reduce the victims' incentives to sue--thereby reducing litigation costs--will increase social welfare. The optimal adjustment to compensatory damages takes both of these considerations into account and may be positive or negative.

The main points of the paper are developed in section 2 using a model in which there is a single injurer and a group of identical victims, and in section 3 using a model with two groups of victims. (An appendix shows that the results of sections 2 and 3 hold more generally.) Section 4 takes the possibility of settlement into account. In section 5 the model is extended further to allow for the use of a negligence rule and for damage adjustments that vary with victims' losses. Section 6 contains some concluding remarks.4/

2. A Model with Identical Victims

This section analyzes the rule of strict liability in a model in which there is a single risk-neutral injurer and a fixed number of identical risk-neutral victims. The injurer chooses a level of care that determines the losses suffered by the victims.[5] The victims sue if the damage award exceeds their cost of litigation (assuming they bear their own litigation costs). The social problem is to choose the level of the damage award so as to minimize the sum of the injurer's cost of taking care, the victims' losses, and the injurer's and the victims' litigation costs. The optimal award will be divided into two components: compensatory damages and an adjustment to compensatory damages.

Let

c = injurer's level of care.

Units of care are defined so that one unit of care costs one dollar. Let

$l_0 - kc$ = each victim's loss, given injurer's care,

where $l_0 > 0$ and $k > 0$ are constants.[6] Obviously, $l_0 - kc \geq 0$. Note that k measures the "productivity" (or, more precisely, the marginal benefit) of the injurer's care; the higher is k, the more productive is care. Let

s = each victim's cost of litigation ($s < l_0$),[7]

r = injurer's cost of litigation per suit.

The number of victims is normalized to be unity; accordingly, reference often will be made to a single victim. Finally, let

d = adjustment to compensatory damages.

To help interpret later results, it will be useful to derive the first-best level of care. This level of care minimizes the sum of the cost of care and the victims' losses, $c + (l_0 - kc)$.[8] Thus, the first-best level of care is:

$$c^* = \begin{cases} l_0/k, & \text{if } k > 1, \\ 0, & \text{if } k < 1. \end{cases} \tag{2.1}$$

If $k > 1$, the marginal benefit of care, k, is greater than the marginal cost of care, 1. Therefore, it is socially desirable for the injurer to take enough care to eliminate the victims' losses. If $k < 1$, it is not socially desirable for the injurer to take any care.[9]

The first-best outcome consists of achieving the first-best level of care without incurring litigation costs. Normally, the first-best outcome will not be attainable for two reasons. First, the victims may sue the injurer in order to receive compensation; and second, the injurer may choose his level of care knowing that he will not have to pay for all of the losses he causes and that his choice may affect the victims' decisions to sue.

Now consider the victims' and the injurer's behavior. A victim will sue if the award of compensatory damages plus the adjustment to compensatory damages exceeds his cost of litigation:[10]

$$(l_0 - kc) + d > s.$$

Equivalently, the victim will sue if $c < \hat{c}$, where

$$\hat{c} = (l_0 + d - s)/k. \tag{2.2}$$

The injurer chooses care to minimize the sum of his cost of care, cost of liability, and cost of litigation.[11] This sum is:

$$(2.3)\qquad \begin{cases} c + (l_0 - kc + d) + r, & \text{if } c < \hat{c} \text{ (suits occur)}, \\ c, & \text{if } c \geq \hat{c} \text{ (no suits occur)}. \end{cases}$$

Because the marginal benefit of care is constant between zero care and care equal to $\hat{c}$--the lowest level of care that forestalls suits--the injurer will choose one of these levels of care. If care is productive, $k > 1$, the injurer chooses care equal to $\hat{c}$ because the extra cost of care (relative to zero care) is less than the reduction in liability costs; in addition, the injurer avoids his litigation costs. If care is unproductive, $k < 1$, the extra cost of care is greater than the reduction in liability costs; thus, the injurer will take zero care unless his savings in litigation costs from taking care equal to $\hat{c}$ are sufficiently great.[12]

Before deriving the socially optimal adjustment to compensatory damages, it will be useful to consider the outcome when there is no adjustment, i.e., when $d = 0$. Suppose first that $k > 1$. The injurer's choice of care will be $\hat{c} = (l_0 - s)/k$ (see (2.2)). This level of care forestalls suits, and thereby eliminates litigation costs, but it is less than the first-best level of care, l_0/k (see (2.1)). Now suppose that $k < 1$. If the injurer's cost of litigation is sufficiently high, he will again take care equal to $\hat{c}$; although this level of care will forestall suits and eliminate litigation costs, it exceeds the first-best

level of care (zero care). If the injurer's cost of litigation is sufficiently low, he will choose to take no care, which is the first-best level of care. However, suits will occur (since $c < \hat{c}$). Thus, regardless of the productivity of care, compensatory damages do not achieve the first-best outcome; either an inappropriate level of care is taken or litigation costs are incurred.

The socially optimal adjustment to compensatory damages, d*, depends on the productivity of care. If $k > 1$, the injurer's care is $\hat{c} = (l_0+d-s)/k$ and, given this level of care, no suits occur. The first-best level of care is l_0/k. Therefore, the first-best level of care can be obtained by:

$$d^* = s > 0.$$

This adjustment to compensatory damages makes suing more attractive to victims and thereby requires the injurer to take greater care to forestall suits. Thus, if $k > 1$, the first-best outcome can be achieved.

If $k < 1$, the first-best level of care is zero care. It is possible to obtain this level of care without incurring litigation costs by adjusting compensatory damages downward sufficiently to discourage victims from suing (even when the injurer takes no care). From (2.2), it follows that:

$$d^* = s - l_0 < 0,$$

again resulting in the first-best outcome.[13/]

3. A Model with Two Types of Victims

In the model of the previous section the optimal adjustment to compensatory damages always achieved the first-best outcome. With the extension of the model in this section, the optimal adjustment might not be able to accomplish this.

Now assume that there are two types of victims, who suffer different losses.[14/] The level of care chosen by the injurer determines the losses suffered by each type. It is also assumed that the cost of litigation, as well as the adjustment to compensatory damages, is the same for both types of victims.[15/]

Except for the following changes, the notation will be identical to that used in the previous section. Let

l_1-kc = loss of victims of type 1,

l_2-kc = loss of victims of type 2,

t = fraction of victims who are of type 1.

It will be assumed that $l_2 > l_1 > s$; hereafter, the first type of victim will be referred to as a "low-loser" and the second type as a "high-loser."

The first-best level of care minimizes

$$c + t(l_1-kc) + (1-t)(l_2-kc).$$

Therefore, the first-best level of care is:

$$c^* = \begin{cases} l_2/k, & \text{if } k > 1/(1-t), \\ l_1/k, & \text{if } 1 < k < 1/(1-t), \\ 0, & \text{if } k < 1. \end{cases} \tag{3.1}$$

This expression can be explained as follows. The marginal benefit of care depends on the level of care. The first unit

of care benefits both low-losers and high-losers and therefore has a marginal benefit of k. However, once care is high enough to eliminate the losses of the low-losers, but not high enough to eliminate the losses of the high-losers, the marginal benefit of care falls to (1-t)k. And when care is high enough to eliminate the losses of both groups, the marginal benefit of care is zero. The marginal cost of care is always 1. Therefore, if $k > 1/(1-t)$, the marginal benefit of care exceeds the marginal cost of care up to the level of care that eliminates the losses of the high-losers, l_2/k. If $1 < k < 1/(1-t)$, the marginal benefit of care exceeds the marginal cost of care only up to the level of care that eliminates the losses of the low-losers, l_1/k. And if $k < 1$, the marginal benefit of care is less than the marginal cost of care at all levels of care.

Low-losers will sue if

$$(l_1-kc) + d > s,$$

or, equivalently, if $c < \hat{c}_1$, where

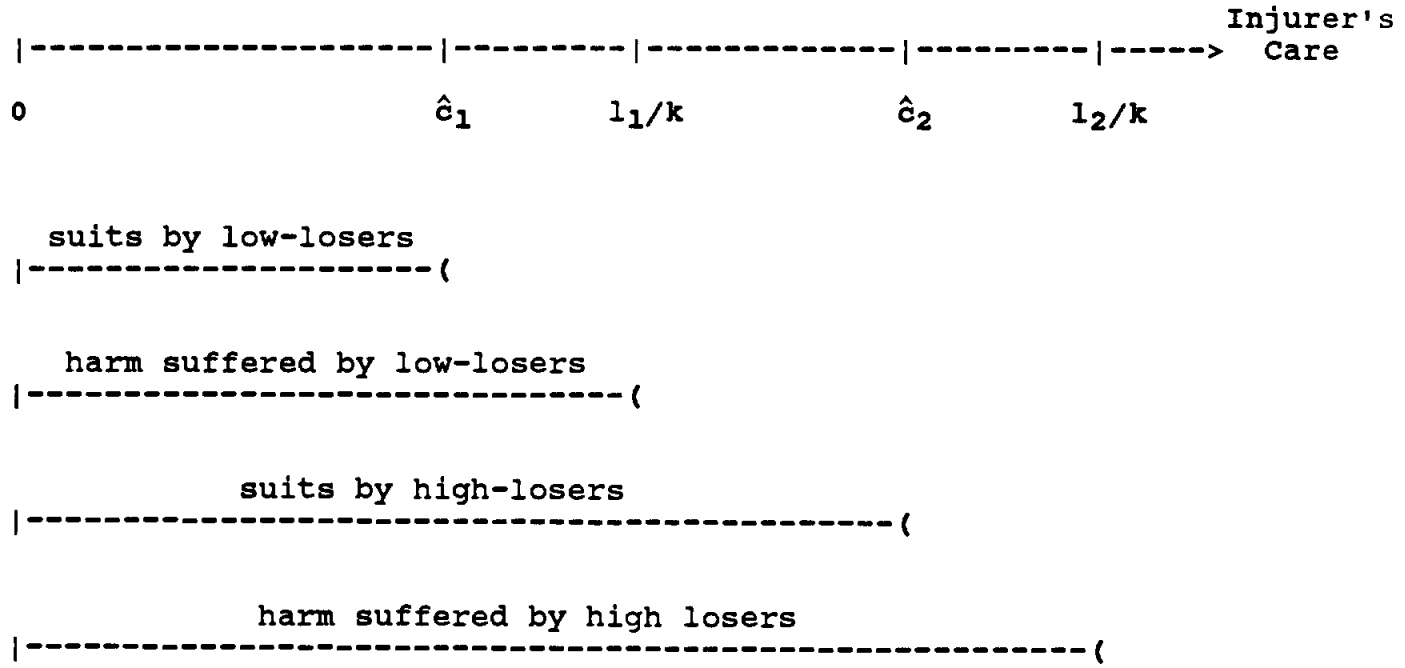
$$\hat{c}_1 = (l_1+d-s)/k. \tag{3.2}$$

Similarly, high-losers will sue if $c < \hat{c}_2$, where

$$\hat{c}_2 = (l_2+d-s)/k. \tag{3.3}$$

Before proceeding, it will be useful to refer to Figure 1. This figure shows, for each type of victim, the range of care over which harm occurs and the range over which suit

FIGURE 1*/



*/ This figure is based on the assumption that $s-l_1 < d < s$.

occurs. Note that for some levels of care, low-losers will be harmed but will not sue, while for other levels of care, high-losers will be harmed but will not sue.

The injurer's choice of care and the optimal adjustment to compensatory damages will now be analyzed within each of the three relevant ranges of the productivity of care, k (see (3.1)). Recall that a different value of the first-best level of care is associated with each range.

3.1 Care Very Productive $(k > 1/(1-t))$

In this case, the first-best level of care is l_2/k. Neither low-losers nor high-losers suffer harm at this level of care.

Given the high productivity of care, the injurer will keep increasing care if either group is suing. Since the lowest level of care that forestalls suits by both groups is $\hat{c}_2 = (l_2+d-s)/k$, the injurer will take this amount of care.

If compensatory damages ($d = 0$) are used, the level of care chosen by the injurer, $(l_2-s)/k$, will be too low. The high-losers will be harmed and the low-losers may be harmed, although neither group will sue. However, if the adjustment to compensatory damages is set equal to each victim's cost of litigation, $d = s$, then care will increase to l_2/k, the first-best level of care. Since, at this level of care, no one sues (because no one suffers harm), the first-best outcome is achieved.

3.2 Care Moderately Productive $(1 < k < 1/(1-t))$

In this case, the first-best level of care is l_1/k. At

this level of care, the high-losers suffer harm, but the low-losers do not.

The injurer will invest in care at least up to the level of $\hat{c}_1$; below that level, the marginal benefit of care to the injurer exceeds the marginal cost of care since both groups will be suing. Between $\hat{c}_1$ and $\hat{c}_2$, additional care is not productive at the margin since only the high-losers are suing. However, by taking care equal to $\hat{c}_2$, the injurer can forestall suits by the high-losers and thereby totally eliminate his litigation costs. Taking care above $\hat{c}_2$ is never worthwhile to the injurer since no one is suing. Thus, the injurer's choice of care will be either $\hat{c}_1$ or $\hat{c}_2$.

At $\hat{c}_1$, the sum of the injurer's cost of care, liability, and litigation is:

$$\hat{c}_1 + (1-t)(l_2-k\hat{c}_1+d) + (1-t)r = (l_1+d-s)/k + (1-t)(l_2-l_1+s) + (1-t)r. \tag{3.4}$$

At $\hat{c}_2$, the corresponding sum is:

$$\hat{c}_2 = (l_2+d-s)/k. \tag{3.5}$$

Thus, the injurer will choose $\hat{c}_2$ over $\hat{c}_1$ if

$$(l_2-l_1)/k < (1-t)(l_2-l_1+s) + (1-t)r. \tag{3.6}$$

In other words, the injurer will choose $\hat{c}_2$ when the extra cost of care, $(l_2-l_1)/k$, is less than his savings in liability and litigation costs, $(1-t)(l_2-l_1+s) + (1-t)r$.[16/]

The optimal adjustment to compensatory damages depends on

whether the injurer's choice of care is $\hat{c}_1$ or $\hat{c}_2$. Suppose first that the injurer chooses $\hat{c}_1$. If compensatory damages are used, the injurer's care, $(l_1-s)/k$, would be less than the first-best level, l_1/k, and litigation costs would be incurred because of suits by the high-losers. By setting the adjustment to compensatory damages equal to the victim's cost of litigation, $d = s$, the injurer can be induced to take the first-best level of care (see (3.2)). However, the first-best outcome cannot be achieved because litigation costs remain.

Now suppose the injurer's choice of care is $\hat{c}_2$. If compensatory damages are used, care, $(l_2-s)/k$, could be either less than or greater than the first-best level, l_1/k; however, no litigation costs will be incurred. By setting d equal to $s-(l_2-l_1)$, the injurer can be induced to take the first-best level of care (see (3.3)), again without litigation costs being incurred. Thus, the first-best outcome can be achieved. Note that the optimal adjustment, $s-(l_2-l_1)$, is positive when the injurer's care would be inadequate under compensatory damages--that is, when $(l_2-s)/k < l_1/k$--and negative when the injurer would take excessive care.

3.3 Care Unproductive ($k < 1$)

In this case, the first-best level of care is zero. At this level of care, both low-losers and high-losers suffer harm.

If damages are compensatory, the injurer will take one of three levels of care: zero care, resulting in suits by both groups; $\hat{c}_1$, resulting in suits only by the high-losers; or $\hat{c}_2$,

resulting in no suits. Everything else equal, the higher the injurer's litigation costs, the greater the level of care he will take. Regardless of the level of care chosen by the injurer, the first-best outcome will not be achieved with compensatory damages. Either litigation costs will be incurred (if care is zero), or excessive care will be taken (if care is $\hat{c}_2$), or both (if care is $\hat{c}_1$).

However, if the adjustment to compensatory damages is sufficiently negative--equal to $s-l_2$--neither group will sue (see (3.3)). The injurer then will choose to take zero care. Hence, the first-best outcome can be achieved by an appropriate downward adjustment to compensatory damages.

3.4 Summary

The results of this section show that the optimal adjustment to compensatory damages balances two considerations--the desire to achieve the first-best level of care, and the desire to avoid litigation costs. At one extreme, if care is very productive, the injurer will take enough care to avoid suits, but, when damages are compensatory, not enough to prevent harm. In this case, it is desirable to adjust compensatory damages upward in order to encourage the injurer to take more care. At the other extreme, if care is unproductive, the injurer's choice of care will result in litigation costs and/or excessive care. In this case, it is desirable to adjust compensatory damages downward in order to discourage suits and/or prevent excessive care. At both extremes, the adjustment to compensatory damages leads to the first-best outcome. Between the extremes, if care is moderately

productive, the conflict between encouraging appropriate care and reducing litigation costs cannot always be resolved as successfully. In this case, even with the optimal adjustment to compensatory damages--which may be positive or negative--some litigation costs may be unavoidable.

4. Settlement versus Trial

Thus far, it has been assumed that settlement is not an alternative to trial. It will be shown in this section that allowing for the possibility of settlement lowers the optimal adjustment to compensatory damages and may increase or decrease social welfare. These points will be illustrated using the model with two types of victims.

For simplicity, it is assumed that there are no costs incurred by the parties in the settlement process, and that the probability of settlement is exogenous.[17] Let

b = probability of settlement, given suit.

The settlement amount is assumed to be greater than the victim's gain from trial net of his litigation costs, but less than the injurer's loss from trial, including his litigation costs.[18] For low-losers, the net gain from trial is $(l_1-kc)+d-s$, while the injurer's loss from trial is $(l_1-kc)+d+r$. Thus, let the settlement amount be

$$(4.1) \qquad (l_1-kc)+d-s+a(r+s),$$

where a is a constant between zero and one. Similarly, for high-losers, the settlement amount is assumed to be

$$(4.2) \qquad (l_2-kc)+d-s+a(r+s).$$

If a is close to zero, the settlement amount makes the victim only slightly better off than he would be if he went to trial, while it makes the injurer better off than the trial outcome by nearly the amount of the parties' joint litigation

costs. Similarly, if a is close to one, the settlement amount makes the victim much better off than the trial outcome, while it makes the injurer only slightly better off. The important point to note is that, regardless of the value of a, both the victim and the injurer are better off if there is a settlement.

A victim will sue if the expected gain from suing (a weighted average of the settlement amount and the net gain from trial) exceeds the expected cost of litigation. Thus, low-losers will sue if

$$b[(l_1-kc)+d-s+a(r+s)] + (1-b)[(l_1-kc)+d] > (1-b)s.$$

Equivalently, suit will occur if $c < \hat{c}_1$, where

$$\hat{c}_1 = (l_1+d-s+w)/k, \tag{4.3}$$

and

$$w = ab(r+s).$$

Note that w is the increase in the victim's expected gain from suing due to the possibility of settlement. Similarly, high-losers will sue if $c < \hat{c}_2$, where

$$\hat{c}_2 = (l_2+d-s+w)/k. \tag{4.4}$$

Equations (4.3) and (4.4) represent a generalization of the model of the previous section. When b = 0, all cases are litigated; then, since w = 0, (4.3) and (4.4) are equivalent to (3.2) and (3.3), respectively.

Introducing the possibility of settlement increases the magnitudes of $\hat{c}_1$ and $\hat{c}_2$--the care levels that forestall suits by the low-losers and the high-losers, respectively. (To see this formally, observe from (4.3) and (4.4) that $\hat{c}_1$ and $\hat{c}_2$ are

increasing in w.) This result has the following intuitive explanation. Since a victim receives more from a settlement than from a trial (net of his litigation costs), the possibility of settlement makes suit more attractive. Hence, it is necessary for the injurer to take more care in order to discourage victims from suing.

As in the previous section, the injurer's choice of care and the optimal adjustment to compensatory damages depend on the productivity of care. However, it would not be particularly instructive to reexamine all three of the cases discussed earlier; in the remainder of this section it will be assumed that care is moderately productive.[19/]

4.1 Care Moderately Productive

Since the possibility of settlement does not affect the sum of the injurer's cost of care and the victims' losses, the first-best level of care is unchanged. Thus, the first-best level of care in this case is l_1/k. Recall that, at this level of care, the high-losers suffer harm but the low-losers do not.

When settlement was not possible, it was worthwhile for the injurer to choose enough care either to just keep the low-losers from suing, $\hat{c}_1$, or to keep both groups from suing, $\hat{c}_2$. The injurer's decision to forestall suits by one or both groups is not affected by the possibility of settlement.[20/] However, as observed above, the possibility of settlement increases both $\hat{c}_1$ and $\hat{c}_2$. Since greater care will be taken by the injurer, the optimal adjustment to compensatory damages does not need to be as high. Specifically, if $\hat{c}_1$ is chosen, it is clear from (4.3) that

setting d equal to s-w induces the injurer to take the first-best level of care. And if $\hat{c}_2$ is chosen, it is clear from (4.4) that setting d equal to $s-(l_2-l_1)-w$ accomplishes this. Note that, whether the injurer chooses $\hat{c}_1$ or $\hat{c}_2$, the optimal adjustment to compensatory damages falls by w--the increase in the victim's gain from suing due to the possibility of settlement.[21]

Comparing the sum of the injurer's costs of care, liability, and litigation at $\hat{c}_1$ and $\hat{c}_2$, it is easy to show that the injurer will choose $\hat{c}_2$ over $\hat{c}_1$ when

$$(4.5) \quad (l_2-l_1)/k < (1-t)[l_2-l_1+(1-b)(r+s)].$$

Since $b > 0$, (4.5) implies that the possibility of settlement makes it more likely that the injurer will choose $\hat{c}_1$. The intuitive explanation of this result is straightforward: Since the settlement amount is less than the injurer's loss from trial, including his litigation costs, the injurer does not have as strong an incentive to keep the high-losers from suing.

Thus, the possibility of settlement has two conflicting effects on social welfare. It makes the choice of $\hat{c}_1$ more likely, which is undesirable because suits (by the high-losers) will occur. But it lowers litigation costs if $\hat{c}_1$ is chosen, which is desirable. (The possibility of settlement does not matter if $\hat{c}_2$ is chosen since neither group will sue.) In other words, the possibility of settlement increases the number of suits but lowers the expected cost of litigation per suit.

4.2 Summary

As in section 3, the optimal adjustment to compensatory

damages balances the desire to achieve the first-best level of care and the desire to avoid litigation costs. However, because the possibility of settlement increases the victim's incentive to sue (since the settlement outcome makes the victim better off than the trial outcome), the injurer has to take more care in order to forestall suits. Consequently, the optimal adjustment to compensatory damages does not need to be as high.

Moreover, the possibility of settlement makes it more likely that the injurer will choose a level of care which does not forestall suits by the high-losers (since the cost to the injurer of being sued falls if some cases are settled). While high-losers will sue more often, the possibility of settlement lowers the expected cost of litigation per suit. Thus, social welfare may increase or decrease.

5. Other Extensions

This section further extends the model with two types of victims to allow for the use of a negligence rule and for damage adjustments that vary with victims' losses. To simplify the exposition, the possibility of settlement will be ignored.

5.1 Negligence

Thus far, it has been assumed that the applicable legal rule is strict liability. An often-considered alternative to strict liability is the rule of negligence. It will now be shown that the use of a negligence rule generally increases social welfare within the model because it can achieve the same level of care as strict liability without encouraging as much litigation.

Under a negligence rule, the injurer is liable for the victims' losses (and for any adjustment to compensatory damages) only if the injurer does not take some minimum level of care. This minimum--referred to as the standard of care--will be assumed to equal the first-best level of care.[22/]

It can be demonstrated that the rule of negligence with an appropriate adjustment to compensatory damages can achieve the first-best outcome regardless of the productivity of care.[23/] Recall that the rule of strict liability also can achieve the first-best outcome if care is either very productive or unproductive (see subsections 3.1 and 3.3). Thus, in order to show that negligence is able to do better than strict liability, it will be assumed that care is moderately productive.

In this case, the first-best outcome can be achieved under the negligence rule by setting d equal to s; the explanation is

as follows. If care is moderately productive, the first-best level of care is l_1/k. The injurer clearly will not take care in excess of this level of care since it is the standard of care. Below l_1/k, both low-losers and high-losers will sue; this is because, with $d = s$, $\hat{c}_1 = l_1/k$ (and, as always, $\hat{c}_2 > \hat{c}_1$). Thus, for care below l_1/k, the negligence rule and the strict liability rule are equivalent. It was shown previously that, within this range, strict liability led the injurer to take care equal to l_1/k. Consequently, the negligence rule also will lead the injurer to choose this level of care. And since the injurer will have met the standard of care, no suits will occur. Hence, the first-best outcome will result under the negligence rule.

Recall that, when care is moderately productive, strict liability leads the injurer to choose care equal to $\hat{c}_1$ or $\hat{c}_2$. If $\hat{c}_2$ is chosen, the first-best outcome can be achieved, so strict liability and negligence are equivalent. However, if $\hat{c}_1$ is chosen, suits by the high-losers will occur, in which case negligence is preferable to strict liability.

To summarize: Regardless of the productivity of care, the negligence rule can achieve the first-best outcome. It is therefore generally superior to strict liability. The advantage of the negligence rule in the model is that it can lead the injurer to take the desired level of care without encouraging suits by the victims.[24/]

5.2 Variable Damage Adjustments

Thus far, it has been assumed that the adjustment to compensatory damages is the same for low-losers and high-losers.

It will now be shown in the context of the strict liability rule that allowing for a variable adjustment can increase social welfare. Moreover, the optimal adjustment is lower for the high-losers than for the low-losers.

If care is either very productive or unproductive, it was seen that the first-best outcome can be achieved by an adjustment to compensatory damages that is the same for each group. Therefore, it is not necessary to consider varying the adjustment in these cases.

If care is moderately productive, it was seen that the first-best outcome is not achievable when the injurer chooses $\hat{c}_1$. With variable adjustments, however, the first-best outcome can always be attained. To see how, let the adjustments for the low-losers and the high-losers be $d_1 = s$ and $d_2 = s-(l_2-l_1)$, respectively. It then follows from (3.2) and (3.3) that the level of care that just keeps both groups from suing is l_1/k--the first-best level of care. If the injurer were to choose care lower than l_1/k, both groups would sue and it would be worthwhile for the injurer to increase care to l_1/k. Obviously, the injurer will not take care greater than l_1/k (neither group would be suing). Therefore, the injurer will choose care level l_1/k, neither group will sue, and the first-best outcome will be achieved.

Note that the optimal adjustment to compensatory damages is lower for the high-losers ($d_2 < d_1$ in the previous paragraph). This occurs for the following reason. The high-losers have a greater incentive to sue than the low-losers, everything else

equal. Thus, in order to keep both groups from suing (and thereby reduce litigation costs), the adjustment needs to be less for them.

6. Concluding Remarks

This paper has discussed several welfare implications of litigation costs in the theory of liability. Under strict liability, it is not optimal to use compensatory damages since this measure of damages generally will lead to a socially inappropriate level of care and to excessive litigation costs. The optimal adjustment to compensatory damages takes into account the effects of liability both on the injurer's decision to take care and on the victims' decisions to sue. Although these general conclusions are not affected when the model is extended to include settlements and variable damage adjustments, the optimal adjustment to compensatory damages, as well as the resulting level of social welfare, may be different. Also, the rule of negligence is superior to the rule of strict liability; this is because, within the model, there will not be any suits if the injurer meets the standard of care (which is the first-best level of care).

Appendix

This appendix generalizes the framework used in the text to allow for a continuum of victim types, a nonlinear loss function, and for the probability of harm to be dependant on the injurer's level of care. The notation will be the same as that used in the main body of the paper, except for the following changes. Let

z = index of victim type ($0 \leq z \leq 1$)

$p(c,z)$ = probability of harm to victims of type z ($p_1 < 0$, $p_2 > 0$)

$l(c,z)$ = loss of victims of type z ($l_1 < 0$, $l_2 > 0$)

$f(z)$ = probability density of z

A victim will sue if $l(c,z) + d > s$. Thus, the victims who sue can be identified by values of z greater than $\hat{z}(c,d)$, where $\hat{z}(c,d)$ is defined implicitly by $l(c,\hat{z}) + d = s$. Clearly, $\hat{z}_1 > 0$ and $\hat{z}_2 < 0$.

The injurer's problem is:

$$\underset{c}{\text{Minimize}} \quad c + \int_{\hat{z}(c,d)}^{1} p(c,z)[l(c,z)+d+r]f(z)dz.$$

Let $c(d)$ represent the optimal level of care for the injurer, given d. Assuming an interior optimum, it can be shown that $c'(d) > 0$. Intuitively, a higher d will induce more victims to sue, which will lead the injurer to take more care.

The court's problem is:

$$\underset{d}{\text{Minimize}} \quad c(d) + \int_{0}^{1} p(c(d),z)l(c(d),z)f(z)dz + \int_{\hat{z}(c(d),d)}^{1} p(c(d),z)(r+s)f(z)dz.$$

Differentiating this expression with respect to d yields:

$$c'(.) + \int_0^{\bar{l}} [p(.)l_1(.)+p_1(.)l(.)]c'(.)f(z)dz$$

$$+ \int_{\hat{z}(.)}^{\bar{l}} p_1(.)c'(.)(r+s)f(z)dz$$

$$- p(c(.),\hat{z}(.))(r+s)f(\hat{z}(.))[\hat{z}_1(.)c'(.)+\hat{z}_2(.)].$$

Compensatory damages are optimal only if the sign of this derivative is zero at d = 0. However, there is no reason to expect this to occur. As previously discussed, the first term is positive since a higher level of liability will cause the injurer to take more care. The second term is negative since higher care lowers the expected losses of victims. The third term is negative since higher care lowers the probability that victims suffer harm, and therefore lowers expected litigation costs. And the fourth term, also involving litigation costs, can be positive or negative, depending on whether the increase in the number of suits induced by a higher level of liability is greater or smaller than the decrease in the number of suits resulting from the injurer taking more care, and thereby lowering the harm suffered by victims. Thus, whether it is optimal to adjust compensatory damages upward or downward can be seen to depend on the factors focused upon in the main body of the paper: how productive care is in lowering the expected losses of victims and how litigation costs are affected by the change in the level of liability.[25/]

Notes

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1/ See, for example, Brown (1973). Issues concerning victim care, injurer and victim activity levels, and risk allocation will not be treated in this paper.

2/ Choosing an optimal adjustment to compensatory damages obviously is equivalent to choosing an optimal level of liability. The language of "adjusting compensatory damages" is used in order to facilitate the comparison of the results in this paper to the results in the conventional theory of liability (without litigation costs), in which compensatory damages are the benchmark.

3/ Although the principles to be discussed are not completely illustrated by the examples, the generality of the principles will become apparent.

4/ To our knowledge no previous paper has addressed the question of how the optimal level of liability is affected by the

presence of litigation costs. Other papers that formally consider the welfare implications of costly litigation in the theory of liability focus on different issues. For example, Green (1978) and Ordover (1981) have analyzed the optimal standard of care under the rule of negligence. Shavell (1982), and subsequently Menell (1983) and Kaplow (1985), have considered the distinction between the private and the social incentive to sue. There have also been several studies that analyze the effects of litigation costs in models of liability, but which do not focus on welfare issues. See, for example, Ordover (1978), P'ng (1984), and Simon (1981). Finally, Salop and White (1985) have, in the context of private antitrust enforcement, informally discussed several of the issues addressed in this paper.

5/ In the Appendix, care is allowed to affect the probability of harm occuring as well as the level of the loss.

6/ A linear loss function is assumed in order to explicitly solve for the optimal adjustment to compensatory damages. A general loss function is considered in the Appendix.

7/ The assumption that s is less than l_0 assures that there will be suits if the injurer does not take any care. Otherwise, the problem is uninteresting.

8/ Note that, because the number of victims is normalized to be unity, l_0-kc represents the losses of all victims.

9/ If k = 1, the optimal level of care is either 0 or l_0/k. For simplicity, this case is ignored. (Analogous cases of equality are ignored in equation (3.1) below.)

10/ The assumption that a suit will not be brought when the damage award just equals the cost of litigation does not affect the results of the paper. (Also, it is assumed that a positive loss must be incurred for a suit to be brought.)

11/ This presumes that the injurer's gain from participating in the harmful activity is greater than the sum of these costs when the injurer chooses care optimally.

12/ Strictly speaking, the statements in this paragraph are correct only for certain values of the adjustment to compensatory damages, d. For example, if d is sufficiently high so that $\hat{c} > l_0/k$, then the injurer would never consider choosing care greater than l_0/k since no harm is suffered at this level of care. Since the analysis will show that the optimal d is in a range which does not contradict the statements in the text, this complication was ignored. (An analogous issue arises in section 3.)

13/ This result is similar in spirit to Kaplow's (1985) demonstration that prohibiting suits may increase social welfare when litigation is costly.

14/ The Appendix allows for a continuum of victim types.

15/ The consequences of allowing the adjustment to vary by victim type are discussed in section 5.2 below.

16/ Note that condition (3.6) does not depend on d. This is because of the linearity of the victims' loss functions.

17/ These and subsequent simplifications allow for an explicit solution of the problem of finding the optimal adjustment to compensatory damages, although they obviously ignore game-theoretic considerations in the settlement process.

For a similar approach to the analysis of settlement, see, for example, Posner (1977, pp. 434-440) and Shavell (1982).

18/ If there were uncertainty in the model concerning the trial outcome, the statement in the text would be that the settlement amount is between the victim's expected net award from trial and the injurer's expected payment at trial.

19/ This case is the most interesting one because the possibility of settlement affects both the optimal adjustment to compensatory damages and the level of social welfare. In the other two cases, only the optimal adjustment is affected.

20/ This is because the marginal benefit and the marginal cost of care to the injurer are unchanged over the relevant range. To see why the marginal benefit is unchanged, consider, for example, care in the range in which both high-losers and low-losers are suing. An additional dollar of care reduces the injurer's liability at trial by k dollars for the fraction of cases that go to trial. For the remaining fraction of cases that are settled, the additional care also lowers the settlement amount by k dollars (see (4.1) and (4.2)). Obviously, the injurer's cost of taking care is unaffected by whether suits are tried or settled.

21/ Although this conclusion has been demonstrated when care is moderately productive, it holds in the other cases as well.

22/ This is the usual assumption made in economic analyses of the negligence rule. See, for example, Brown (1973).

23/ That this statement is correct when care is moderately productive will be shown in the text in the next paragraph.

When care is very productive, the first-best level of care is l_2/k. This level of care can be achieved under the negligence rule without incurring litigation costs by setting d equal to s. This is because, for care below l_2/k, the injurer would be liable under the negligence rule, making the negligence rule equivalent to the strict liability rule; and it was seen in section 3.1 that the strict liability rule with d equal to s leads the injurer to choose l_2/k.

When care is unproductive, the first-best level of care is zero. In this case, the first-best outcome can be achieved by the negligence rule with compensatory damages. An adjustment to compensatory damages is unnecessary because, when the injurer does not take any care, the standard of care is met and no suits will result.

24/ Although this advantage of the negligence rule is well known--see, for example, Posner (1977, pp. 441-443)--it has not previously been examined within a formal model. If the present model were extended to include uncertainty about what the standard of care is or about whether the injurer has met the standard, there would be some suits under the negligence rule. Since these suits generally will be more complicated than those under a strict liability rule, neither rule would clearly dominate.

25/ For example, if the derivative of the victims' expected losses with respect to care approaches zero, then it can be shown

that the optimal adjustment to compensatory damages becomes arbitrarily small (i.e., approaches minus infinity).

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