LIABILITY RULES WHEN INJURERS AS WELL AS VICTIMS SUFFER LOSSES

Avon K. Leong

Discussion Paper No. 34

3/88

Program in Law and Economics
Harvard Law School
Cambridge, MA 02138

The Program in Law and Economics is supported by a grant from the John M. Olin Foundation.

LIABILITY RULES WHEN INJURERS AS WELL AS VICTIMS SUFFER LOSSES

Avon K. Leong*

---

*Ph.D. Candidate (Public Policy), Harvard University; and John M. Olin Fellow, Harvard Law School. I would like to thank Steven Shavell, Wong Hon Wai, and participants in the Law and Economics Seminar at Harvard Law School for their valuable comments on earlier drafts of this paper. I also want to thank the Olin Foundation for financial support.

LIABILITY RULES WHEN INJURERS AS WELL AS VICTIMS SUFFER LOSSES

Avon K. Leong

Abstract

This paper studies a model of liability in which injurers as well as victims may suffer losses. It is found that under the rule of strict liability with a defense of contributory negligence, it may not be possible to induce parties to take optimal care; and under negligence rules, it will not be possible to induce them to take optimal care. This contrasts with the result, in the usual model of liability where only victims suffer losses, that under both forms of liability, it is always possible to induce parties to take optimal care.

I. Introduction

When an accident occurs, a rule of liability may be applied. Such a rule not only determines whether an injurer is to compensate a victim for his losses, but also influences how much care injurers and victims exercise when engaging in their activities, as well as how often they choose to participate in those activities. Brown [1973] first constructed a model explaining how different liability rules influence levels of care, and Shavell [1980] extended the model to take into account levels of activity. (Calabresi [1975] and Posner [1972] have also informally examined the effects of liability on behavior).

This now standard model of liability does not recognize the possibility that injurers along with victims may suffer losses in accidents. Consider, for instance, an accident where a driver runs his automobile off the road and into someone's fence (the automobile as well as the fence are damaged); or where a fire spreads from one property to another (the first property burns together with the other); or where an oil tanker runs aground and creates an oil spill (the tanker and oil are lost in addition to the pollution being produced). Clearly, accidents in which injurers suffer losses along with victims are not unusual.

It therefore seems worthwhile to take into consideration in the model of liability the possibility that injurers, as well as victims, may bear accident losses. I do this in the present paper, and reach conclusions that may be summarized as follows.[1]

First, victims will not take optimal care under the negligence rule (with or without the defense of contributory negligence). Specifically, as injurers will be induced to take due care to avoid liability, victims will be left bearing their own losses. However, because victims will not be

bearing *injurers'* losses in the event of an accident, victims will take less than optimal care -- where optimal care reflects the risk to injurers as well as to victims.[2] This contrasts with the result, in the usual model of liability where only victims suffer liability, that both victims and injurers will take optimal care under negligence rules.

Second, victims may not take optimal care under the rule of strict liability with the defense of contributory negligence. While victims may be led to exercise optimal due care in order to receive compensation from injurers, this is not assured. Because optimal care reflects the risk of injurers' losses as well as victims', victims may prefer to take less than optimal due care even though they will then have to bear their own losses. Again, this contrasts with the result in the usual model that victims will always be led to take optimal care.

Third, injurers' levels of activity under the negligence rule, and their levels of care and activity in the absence of liability, will not be as undesirable as postulated in the usual model where victims alone suffer losses. The reason is obvious: Since injurers may suffer their own losses, they have a natural reason to moderate their levels of activity and to take some care.

This third difference diminishes the need for liability as a means of controlling risk. For example, the need for liability in the area of automobile accidents is lessened by drivers' fear of suffering injuries in accidents they cause.

II. Assumptions of the Model

The assumptions of the model will be as follows: There is a single good in terms of which all variables are defined. Parties are risk neutral and the measure of social welfare is the sum of parties' expected utilities. Parties are of two types, injurers and victims, and are strangers to one another. Injurers are all identical, as are all victims, and both the injurers and victims suffer losses, although victims are not held liable for injurers' losses. The probability and severity of accidents may be influenced by parties' behavior. If an accident occurs, a rule of liability will apply. This rule will determine whether and how much the injurer involved shall pay the victim.[3]

III. The Model where Levels of Care are the Only Determinant of Risk

Consider the case of unilateral accidents where an injurer's behavior alone affects risk. Let

x = the level of care of an injurer, measured as the cost of taking care; $x \geq 0$;

$v(x)$ = expected accident losses to a victim caused by an injurer given x; $v(x) \geq 0$; $v'(x) < 0$ and $v''(x) \geq 0$ where v is positive;

and introduce

$i(x)$ = expected accident losses to an injurer given x; $i(x) > 0$; $i'(x) < 0$ and $i''(x) \geq 0$,

noting that in the standard model, $i(x)$ is assumed to be 0 for all x.

The social goal is to minimize total accident costs,

(1) $\quad x + v(x) + i(x)$.

Let x^* denote the x that minimizes Exp.(1) and assume x^* to be unique. Also denote x^{**} as the x that minimizes $x + v(x)$, and note that $x^* = x^{**}$ when $i(x) \equiv 0$.

Under strict liability, the injurer bears his cost of taking care and both his own losses as well as the victim's. He thus bears

$$x + v(x) + i(x)$$

which is identical to Exp.(1). The injurer will therefore choose a level of care $x = x^*$.

In the absence of liability, the injurer bears

(2) $x + i(x)$.

Let $x\hat{}$ be the x that minimizes Exp.(2) and also assume $x\hat{}$ to be unique; the injurer will choose $x\hat{}$ and total social costs will be

$$x\hat{} + v(x\hat{}) + i(x\hat{}).$$

It is easily shown from our assumptions that

(3) $x\hat{} < x^*$,

and the injurer will generally choose a level of care that is too low.[4] However, because $i'(x)$ is assumed to be negative for $x > 0$, $x\hat{}$ will be greater than 0, unlike the case where injurers do not suffer losses and set $x = 0$.

Under the negligence rule, injurers will be liable for accident losses they cause if their level of care is less than a due care level $x^{\#}$, specified by the courts. If $x^{\#} = x^*$, it is apparent, following the now standard arguments and from Exp.(3), that the injurer will choose x^*.[5] However, if the courts do not realize or recognize the possibility of losses to the injurer[6] and set $x^{\#} = x^{**}$, the result will not be optimal.[7] The results can be summarized as follows:

> **PROPOSITION 1.** In the absence of liability, injurers will take some care, though it will not be optimal. Under strict liability, and under the negligence rule (assuming the courts set due care to equal the socially optimal level), injurers will choose the socially optimal level of care.

Let us now consider the case of bilateral accidents, in which victim's behavior also affects risks. Let

y = the level of care of a victim, measured as the cost of taking care; $y \geq 0$;

and redefine v and i as

v(x,y) = expected accident losses suffered by victim given x and y; $v(x,y) \geq 0$; $v_x(x,y) < 0$ and $v_y(x,y) < 0$ where v is positive; v is a strictly convex function of x and y where v is positive;

i(x,y) = expected injurer's losses given x and y; $i(x,y) > 0$; $i_x(x,y) < 0$; $i_y(x,y) < 0$; i is a strictly convex function of x and y where i is positive.

The social goal is to minimize total accident costs,

(4) $x + y + v(x,y) + i(x,y)$.

Let x^* and y^* denote the (unique) socially optimal values of x and y; x^* and y^* satisfy the first order conditions,

(5) $v_x(x,y) + i_x(x,y) = -1$, and

(6) $v_y(x,y) + i_y(x,y) = -1$.

Also, let $x^*(y)$ be the value of x that minimizes Exp.(4) given y, and similarly for $y^*(x)$; and let $y^{**}(x)$ be the value of y that minimizes

$y + v(x,y)$.

With strict liability, the victim has no incentive to take care and will set y = 0. The injurer will thus choose $x = x^*(0)$ and the equilibrium will not be optimal. Under strict liability with the defense of contributory negligence (standard set at y^*), the victim can avoid bearing his own losses by meeting the negligence standard and setting $y = y^*$. He will do so if

(7) $y^* \leq [y^{**}(x^*) + v(y^{**},x^*)]$.

The injurer will in turn set $x = x^*$ and the result is optimal. However, if

Exp.(7) does not hold, the result will not be optimal as the victim will want to choose a level of care $y^{**}(x^*) < y^*$ when $x = x^*$.

Under the negligence rule, if $x^{\#} = x^*(y^*)$, the injurer will set $x = x^*$ to escape liability. The victim will set y at $y^{**}(x^*)$ and, unlike the case in the standard liability model, the outcome will usually not be optimal.[8] The defense of contributory negligence does not help: Because injurers still prefer $x = x^*$, victims have to bear their own losses even if they exercise due care, and thus will still choose $y = y^{**}(x^*)$.

In the absence of liability, the injurer minimizes

$$x + i(x,y)$$

while the victim minimizes

$$y + v(x,y).$$

In this case, the result will not be optimal. In fact, a unique Nash equilibrium may not exist, even though one exists when $i(x,y) \equiv 0$. This is another difference. The results of the bilateral case can be summarized as:

> **PROPOSITION 2.** With a strict liability rule, the outcome will generally not be optimal: the victim will take no care, while the injurer takes the optimal level of care given the victim's behavior. If injurers have the defense of contributory negligence, and the standard is set optimally, victims and injurers can be led to take optimal care, although it is not assured.
>
> Under a negligence rule, with due care set at the optimal level of care, the injurer will select his optimal level of care, but the victim will usually take less than optimal care.
>
> In the absence of liability, the levels of care taken is indeterminate, but will generally not be optimal.

IV. Levels of Care and Levels of Activity the Determinants of Risk

Let us now reconsider briefly the unilateral case under the assumption that the injurer may vary his level of activity as well as level of care. Define

s = level of activity of an injurer; $s \geq 0$;

$u(s)$ = gross utility to an injurer of engaging in his activity at level s; $u(s) \geq 0$, $u'(s) > 0$, $u''(s) < 0$ for $s < s^{\wedge}$; $u'(s^{\wedge}) = 0$.

The social goal is to maximize the net utility injurers obtain from their activities less expected accident losses,

$$u(s) - sx - sv(x) - si(x) = u(s) - s[x + v(x) + i(x)].$$

Denote the optimal values of s and x as s^* and x^*.

Consider now the injurer's behavior. If there is no liability, an injurer's utility will be $u(s) - s[x + i(x)]$, so he will choose $x = x^{\wedge}$ (the same $x^{\wedge}$ described earlier) and s such that

$$(8) \quad u'(s) = x^{\wedge} + i(x^{\wedge}).$$

Because the right hand side of Exp.(8) is positive, the injurer will choose $s < s^{\wedge}$, which is less than the case when $i(x) = 0$, but higher than s^*.

Following the same logic, it is then easy to prove

> **PROPOSITION 3.** In the absence of liability, the outcome will not be socially optimal, but the problem of excessive engagement in activities and not enough taking of care is mitigated by the fact that injurers will be bearing some costs themselves if they participate in an activity.
>
> Under strict liability, the outcome will be socially optimal: injurers will take optimal care and will choose the optimal level of activity.
>
> Under the negligence rule, the outcome will not be socially optimal: if due care equals the socially optimal level of care, injurers will take optimal care, but their level of activity will be excessive.[9]

V. Concluding Remarks

(a) I want to return briefly to the question whether courts consider the injurer's losses when they calculate due care under the negligence rule (see note 6). It is not difficult to imagine courts failing to do this. In determining due care in the case, say, of a factory fire that spread to the surrounding neighborhood, it seems natural to think that a court will weigh only the losses suffered by the surrounding neighborhood -- and not the losses of the factory -- against the factory's cost of taking care. If courts overlook losses to injurers, due care levels will be too low, and injurers will take too little care (see note 7).

(b) This paper shows that when injurers also suffer losses, it is more difficult to design liability rules that will elicit socially optimal behavior from both injurers and victims. However, the outlook may not be as bleak as that predicted by the model. When injurers also suffer losses, the distinction between injurers and victims becomes blurred. If "injurers" are allowed to sue "victims" for damages and win, the "victims" in the bilateral liability model may be induced to act optimally. Specifically, under strict liability with the defense of contributory negligence, victims will meet the due care standard because they do not want to bear the injurers' losses in addition to their own. Similarly, under the negligence rule with the defense of contributory negligence, victims will exercise due care to avoid being held liable for injurers' losses, and vice versa. In this case, parties will bear their own losses while acting optimally.

References

Brown, John [1973]. "Toward an Economic Theory of Liability", *Journal of Legal Studies*; 2:323-350.

Calabresi, Guido [1975]. "Optimal Deterrence and Accidents", *Yale Law Journal*; 81:1054-1085.

Posner, Richard [1972]. "A Theory of Negligence", *Journal of Legal Studies*; 1:28-96.

Shavell, Steven [1980]. "Strict Liability versus Negligence", *Journal of Legal Studies*; 9:1-25.

_____ [1987]. *Economic Analysis of Accident Law*. Harvard University Press, Cambridge.

Footnotes

1. I describe in this summary the results for the bilateral liability model where both injurers and victims can affect losses. However, I also consider the unilateral case formally in the paper.

2. Suppose, for example, that by spending an extra \$10, a victim can reduce the injurer's losses by \$4 and his own by \$8. Under negligence rules, if the injurer is taking due care, the victim will have to bear his own losses no matter what. The victim, seeing that he can only save \$8, will not spend the extra \$10. However, this is not optimal as the total amount actually saved by spending the \$10 is \$12.

3. I shall be using much of the notation and assumptions from Shavell [1987, p32-46]. In order not to be repetitive, I shall only sketch the proofs that are along the lines of Brown [1973] and Shavell [1987].

4. At the minimum value of Exp.2, $i'(x^{\wedge}) = -1$, but at the social optimum, $i'(x^*) = -1 - v'(x^*) > -1$ (because $v'(x) < 0$). Since $i''(x) \geq 0$, this implies $x^{\wedge} < x^*$.

5. Injurers will obviously not choose $x > x^{\#}$ if they can escape liability by choosing $x^{\#} = x^*$ as $x^{\wedge} < x^*$. Injurers will also not choose $x < x^*$ when they can choose x^* because they will then be held liable. According to our assumptions, $\inf [x + i(x) + v(x)] = x^*$ when $x \in [0,x^*)$ and injurers will therefore minimize expected costs by choosing x^*. For more details, see Shavell [1987, p35-36].

6. When the focus is on the harm inflicted on the victim, it is quite conceivable that courts may ignore the effect of the injurer's losses, especially when they are small relative to that of the victim's. Also, injurer's losses may be in the form of goodwill and reputation which are not easily quantified and may also be easily overlooked. I discuss this issue further in Section V.

7. When $x^{\#} = x^{**}$, it is apparent, following the usual argument, that the injurer will want to avoid liability and choose at least x^{**}. The injurer wants to face $\min [x + i(x)]$ for $x \geq x^{**}$ and will therefore choose x^{**} if $x^{\wedge} < x^{**}$, and $x^{\wedge}$ otherwise. We know from above that $\max [x^{**}, x^{\wedge}] < x^*$, and the outcome will not be optimal.

8. Note that if victims set y very high, it is possible for a level x^+ to exist, $x^+ < x^* = x^{\#}$, such that $x^+ + i(x^+,y) + v(x^+,y) < x^* + i(x^*,y)$. In this case, the injurer will not want to adhere to the negligence standard. However, if the injurers set $x < x^{\#}$, the victim will be compensated for all losses and will not want to set y very high, but $y = 0$: $x = x^+ < x^{\#}$ is not a rationalizable strategy. Injurers will also not set $x > x^{\#}$ for the usual reasons, and will therefore set $x = x^{\#} = x^*(y^*)$.

The essential fact remains: (x^*,y^*) is not a Nash equilibrium.

9. The proof follows along the lines of Shavell [1987, p42].