

# *"The Dogs of War"*

## Private versus Social costs of Torts

K. J. Wainwright

*Simon Fraser University*

July 27, 2004

### I. INTRODUCTION

A great body of literature has been devoted to analyzing the tort system to promote economic efficiency in cases of liability<sup>1</sup>. The fundamental issue is whether the type of damage rules employed by the courts produce a socially efficient level of care by *injurers*<sup>2</sup>. When the type of accidents are *unilateral*, by which is meant that only the actions of the injurers but not the victims are assumed to influence the probability or severity of the loss, the only relevant damage rules are *strict liability* or *negligence*. When the accidents are *bilateral* in nature, the types of damage rules become much more complex<sup>3</sup>. This paper confines itself to types of accidents which are unilateral

---

<sup>1</sup>See Posner, *Economic Analysis of Law* (3rd ed) chapter 4.

<sup>2</sup>Strictly speaking, we are discussing *potential injurers*, since the accident may not actually happen. However, we will refer to potential injurers and potential victims as *injurers* and *victims* respectively.

<sup>3</sup>In fact, there are 6 possible damage rules for bilateral accident cases. For a thorough discussion of each, see John Prather Brown, *Toward an Economic Theory of Liability*, 323 *Journal of Legal Studies* (1973).

in nature.

A number of important articles analyze the economic effects and incentives of liability rules<sup>4</sup>. Shavell<sup>5</sup> presents one of the more noted formal treatments of negligence versus strict liability. In his model he demonstrates that, in the case of unilateral accidents, both strict liability and an appropriately set negligence rule will produce socially efficient levels of care by injurers.

However, the efficiency results of Shavell and others ignore the costs of using the legal system. In an extension of his own work, Shavell<sup>6</sup> demonstrates that once legal and court costs are considered, social and private incentives diverge. In Shavell's model social and private incentives diverge for two reasons. First, because plaintiffs are not responsible for the defendant's legal fees. Second, plaintiffs do not take into account the safety incentives created by the possibility of lawsuits. Shavell shows that socially inefficient suits may be brought while socially beneficial suits will not be brought.

Menell<sup>7</sup> challenges the second of Shavell's results. Menell purports to show that under strict liability the injurer's cost benefit equals society's cost benefit.. Kaplow<sup>8</sup> demonstrates that Menell's result is correct but fails to address the cost externality in

---

<sup>4</sup>See Guido Calabresi, *The Costs of Accidents: A Legal and Economic Analysis* (1970); Guido Calabresi, and Jon Hirschoff, *Toward a Test for Strict Liability in Torts*, 81 *Yale Law Journal* 1055 (1972); R. H. Coase *The Problem of Social Cost*, 3 *Journal of Law and Economics* 1 (1960); Harold Demsetz, *When Does the Rule of Liability Matter?*, 1 *Journal of Legal Studies* 13 (1972); Richard Posner, *A Theory of Negligence*, 1 *Journal of Legal Studies* 29 (1972); John Prather Brown, *Supra* note 3

<sup>5</sup>Steven Shavell, *Strict Liability Versus Negligence* 1 *Journal of Legal Studies* (1980).

<sup>6</sup>Shavell, Steven, "The Social versus Private Incentive to Bring Suit in a Costly Legal System", 11 *Journal of Legal Studies* 333 (1982)

<sup>7</sup>Menell, Peter S., "A Note on Private versus Social Incentives to Bring Suit in a Costly Legal System", 12 *Journal of Legal Studies* 371 (1986)

<sup>8</sup>Kaplow, Louis, "Private versus Social Costs in Bringing Suit", 15 *Journal of Legal Studies* 371 (1986)

the plaintiff's decision to bring suit. Using the Menell model, Kaplow demonstrates that under certain circumstances a prohibition on law suits may be socially desirable.

Rose-Ackerman and Geistfeld<sup>9</sup> demonstrates that both Menell and Kaplow fail to emphasize the essential difference between their model and Shavell. When the problem is formulated with greater generality, Shavell and Menell become special cases. Further, with a switch to the British rule, the Menell-Kaplow results hold in general.

Finally, Rose-Ackerman and Geistfeld argues that a move from strict liability to negligence will generate the optimal outcome so long as the standard of care is the same as would be optimal in the absence of lawsuits, However this conclusion requires either the British system of a situation where the plaintiff's court costs are below damages at the optimal level of care.

In the above models of tort the courts are assumed to be perfectly efficient at zero cost. Legal fees in these models are sunk costs incurred by the relevant parties to the tort. The only uncertainty in there models is the probability of an accident (or, in some models, the size of the damage), which is a function of the care taken by one or both of the parties involved.

After an accident has occurred it is assumed that the courts will assign damages with perfect certainty, as a function of the damage rule that applies. The role of the courts in these models is the enforcement of the appropriate rule.

In fact, outcomes of court cases are not known with certainty. Instead, court cases tend to be probabilistic in nature. The probability of winning or losing tends to be a function of: a) the particular circumstance; b) the court's interpretation of precedence; and, c) the efforts of the disputing parties legal representatives. It is

---

<sup>9</sup>Rose-Ackerman, Susan, and Geistfeld, Mark, "The Divergence Between Social and Private Incentives to Sue: A Comment on Shavell, Menell, and Kaplow", 16 *Journal of Legal Studies* 483 (1987)

the third component mentioned that allows for strategic behavior on the part of the two parties involved in the tort. This includes the amount of resources devoted to litigation and the pre-trial bargaining process.

In almost all cases, the frame of reference used by a judge is the *Learned Hand Rule*<sup>10</sup>. To the economist, applying the Learned Hand rule simply means asking the following question: "Given the level of care currently taken by the injurer, would the marginal cost of an additional unit of care exceed the marginal benefit of that unit of care?". If the answer is no, then a tort has occurred. Therefore, the role of the lawyers is to convince the judge as to the location of the marginal cost and benefit curves that apply in their particular case. Beyond that, they try to negotiate the best deal for their client.

This paper presents a two stage model of negligence and legal action. In the first stage the defendant decides on the level of due care to take while carrying out an action or activity. In the second stage an accident has occurred and the plaintiff brings suit. Lawyers (agents) invest in actions that are designed to increase the probability of success on behalf of their respective clients.

## II. THE MODEL

This model is a two-stage game that involves an injurer and a victim. In the first stage the injurer decides on both the frequency and the level of care taken in an activity or production process. The level of care will be chosen to maximize the net private benefit of the injurer. The injurer will be referred to as the defendant and the victim will be referred to as the plaintiff. It is assumed that the victim does not influence the probability or magnitude of the loss.

In the second stage a suit is brought by the plaintiff against the defendant. Both parties invest in legal services which are assumed to increase each parties likelihood

---

<sup>10</sup>Posner, R. *Supra Note ???*

of success in court. Each party takes the level of legal services purchased by the other party as given, and chooses their level of legal service to maximize their expected utility. It is assumed that all parties are risk neutral. The stage two equilibrium is a *Nash Equilibrium*.

If we assume all players have foresight, the outcome of the second stage game will, in turn, determine the equilibrium level of care taken in stage one. Therefore, to solve the model, we start by finding the equilibrium in the second stage game. The solution to stage two is used in the solution to the first stage of the game.

### Initial Conditions

The defendant engages in an activity, denoted by  $y$ . The gross benefit to the defendant of activity  $y$  is

$$B(y) \quad \text{where} \quad B'(y) > 0 \quad \text{and} \quad B(0) = 0 \quad (1)$$

Let  $x$  denote the level of care taken by the defendant while engaging in activity  $y$ , and  $c(x)$  be the cost to the defendant of taking care of level  $x$ . Assume that  $c'(x) > 0$  and  $c''(x) \geq 0$ .

Now suppose that the probability of loss (accident) is a function of both the frequency of the activity and the level of care. Let the probability of loss be

$$\pi = \pi(x, y) \quad \text{where} \quad \pi_x < 0 \quad \text{and} \quad \pi_y > 0 \quad (2)$$

Let the loss incurred by the plaintiff (victim) be denoted by  $L$ . The loss incurred by the plaintiff may, or may not, be a function of the level of care taken by the defendant, i.e.

$$\text{either} \quad L = \bar{L} \quad \text{or} \quad L = L(x) \quad \text{where} \quad L'(x) \leq 0 \quad (3)$$

In this section we will assume that  $L$  is exogenously determined

Therefore, social welfare can be expressed as

$$W(x, y) = B(y) - c(x) - \pi(x, y)\bar{L} \quad (4)$$

The socially optimal levels of  $x$  and  $y$  maximize equation 4, or satisfies the following first order conditions:

$$\begin{aligned} B'(y) - \pi_y(x, y)\bar{L} &= 0 \\ c'(x) + \pi_x(x, y)\bar{L} &= 0 \end{aligned} \quad (5)$$

Equation system 5 implicitly defines the socially optimal  $x$  and  $y$ .

### Stage Two Game

In stage two an accident has happened. Each party retains legal services and the process of litigation begins. Let lawyer one represent the defendant and let lawyer two represent the plaintiff. The activity of lawyer one is denoted  $a_1$ , and the activity of lawyer two is denoted  $a_2$ . The activities of the lawyers are assumed to influence the probability of conviction if the suit goes to court. Both lawyers know the nature of probability function and the level of activity by the other lawyer.

Let

$$P = P(a_1, a_2; x) \quad (6)$$

be the probability of conviction.  $P$  is a function both parties legal activities *and* the level of care taken by the defendant. Since  $x$  is determined by the defendant in stage one, it is treated as exogenous in stage two.  $P$  is assumed to be continuous and twice differentiable and has the following properties:

$$P_1 < 0 \quad P_2 > 0 \quad P_{11} > 0 \quad P_{22} < 0 \quad P_{12} = P_{21} < 0 \quad P_x \leq 0$$

As before, let  $L$  denote the loss incurred by the plaintiff and  $D$  denote the damages awarded by the courts. Note that  $L$  may, or may not, equal  $D$ . Since pre-trial bargaining is permitted in the stage two game, let  $S$  denote any out of court settlement.

Each party must make a compensation payment to their respective lawyers. Therefore the compensation functions for lawyers one and two respectively are  $w_1(a_1)$  and  $w_2(a_2)$ .

The defendant's expected payoff function is

$$v = -[P(a_1, a_2; x)D + w_1(a_1)] \quad (7)$$

And the plaintiff's expected payoff function is

$$u = P(a_1, a_2; x)D - L - w_2(a_2) \quad (8)$$

Each lawyer will maximize (minimize) his client's expected gain (loss) by choice of his level of legal activity<sup>11</sup>, taking the level of legal activity of his adversary as given. Therefore the equilibrium levels of legal activity will be a *Nash equilibrium*.

Differentiating the pay-off function of the defendant gives us

$$\frac{dv}{da_1} = -\frac{\partial P(a_1, a_2)}{\partial a_1} D - \frac{dw_1}{da_1} = 0 \quad (9)$$

or

$$-\frac{\partial P(a_1, a_2)}{\partial a_1} D = \frac{dw_1}{da_1} > 0$$

and differentiating the pay-off function of the plaintiff gives us

$$\frac{du}{da_2} = \frac{\partial P(a_1, a_2)}{\partial a_2} D - \frac{dw_2}{da_2} = 0 \quad (10)$$

or

$$\frac{\partial P(a_1, a_2)}{\partial a_2} D = \frac{dw_2}{da_2} > 0$$

Equations 9 and 10 implicitly define the defendant and plaintiffs' respective *best response functions*

---

<sup>11</sup>It is assumed that there exists no agency problem on the part of lawyers, such that lawyers may in engage in excessive legal activities to maximize their own reward. Introducing agency issues is a natural extension of the model and will be discussed in the conclusion.

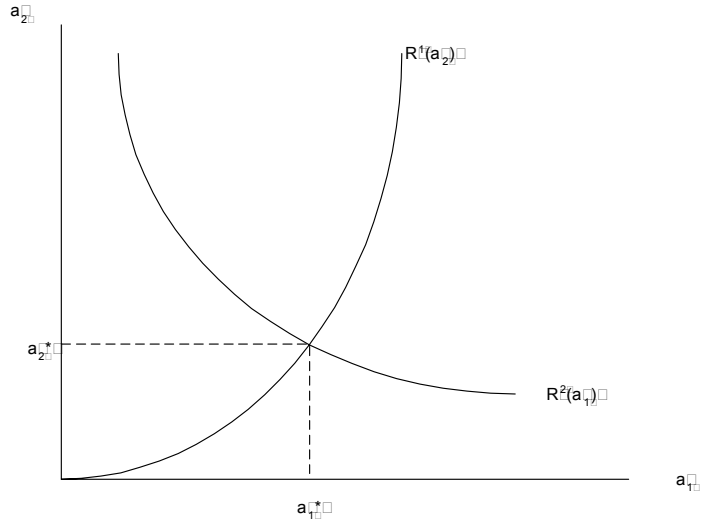


FIG. 1. Best response functions of defendant and plaintiff and nash equilibrium in legal activities.

$$a_1 = R^1(a_2) \quad \text{where} \quad dR^1/da_2 > 0 \quad (11)$$

and

$$a_2 = R^2(a_1) \quad \text{where} \quad dR^2/da_1 < 0 \quad (12)$$

The best response functions for the plaintiff and defendant are illustrated in figure one. It is of interest to note the asymmetry of the two response functions. The defendant's best response to an increase in  $a_2$  is to increase  $a_1$ , whereas the plaintiff's best response to an increase in  $a_1$  is to reduce the level of  $a_2$ <sup>12</sup>. As shown in figure one, the intersection of the best response functions determines the *Nash equilibrium*

---

<sup>12</sup>In other words, from the perspective of the defendant legal activity can be viewed as *strategic compliments*, whereas the plaintiff views legal activities as *strategic substitutes*.



values,  $a_1^*(x)$ ,  $a_2^*(x)$ .

Once  $a_1^*$  and  $a_2^*$  are determined, the probability of conviction is also known by both parties, or

$$P^* = P(a_1^*(x), a_2^*(x)) = P^*(x) \quad (13)$$

Since both parties are risk neutral, each side would be indifferent between going to trial or accepting an out of court settlement of the form

$$S^*(x) = P^*(x) \times D \quad (14)$$

If it is assumed that courts set  $D = \bar{L}$ , then equation 14 can be re-written as

$$S^*(x) = P^*(x) \times \bar{L} \quad (15)$$

### The Stage One Game

Given  $S^*$  from above, the stage one objective function of the defendant can be written as

$$V(x, y) = B(y) - c(x) - \pi(x, y)S^*(x) \quad (16)$$

In comparing equation 16 to equation 4, we can see the private objective function of the injurer will coincide with the social welfare function only if  $S^* = \bar{L}$ . Differentiating 16 with respect to  $y$  and  $x$  gives us

$$\begin{aligned} B'(y) - \pi_y(x, y)S^* &= 0 \\ c'(x) + \pi_x(x, y)S^* + \pi \frac{dS^*}{dx} &= 0 \end{aligned} \quad (17)$$

equation system 17 determines the injurer's optimal  $x$  and  $y$ , which are denoted  $x^s$  and  $y^s$ .

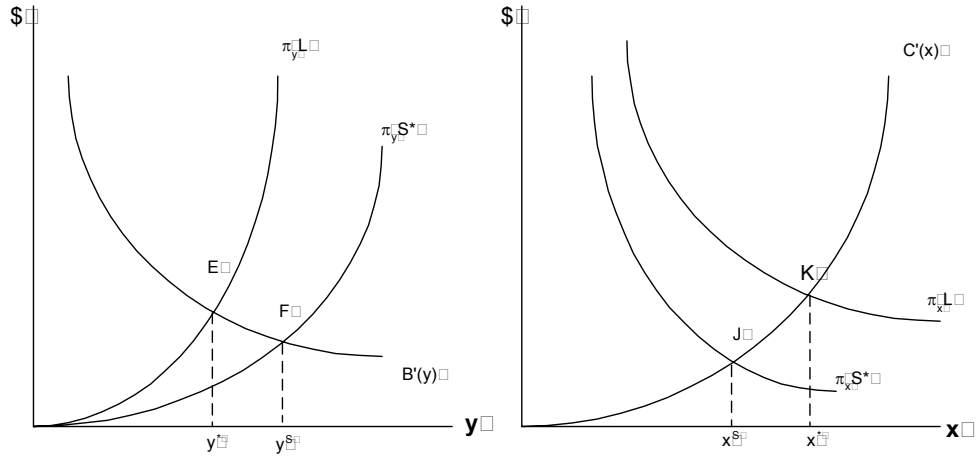


FIG. 2. Comparison of the private and socially optimal levels of the injurers activity ( $y$ ) and care ( $x$ )

Figure two illustrates the results. The first graph shows the socially optimal and privately optimal frequency of the activity. When the true level of damages, or loss, are taken into account by the injurer, he will set the marginal benefit of the activity ( $B'(y)$ ) equal to the true marginal expected damage function ( $\pi_y L$ ) and the equilibrium will occur at point  $E$ . When the injurer equates the marginal benefit of the frequency of the activity to his personal marginal expected damages ( $\pi_y S^*$ ) equilibrium will occur at point  $F$ .

The second graph in figure two illustrates both the socially optimal and private choice of care. When the injurer equates the marginal reduction in expected damages ( $\pi_x L$ ) to the marginal cost of care ( $C'(x)$ ), the socially optimal level of care occurs at point  $K$ . However, when the injurer equates the marginal reduction in expected settlement costs ( $\pi_x S^*$ ) to the marginal cost of care, equilibrium occurs at point  $J$ .

### III. COMPARATIVE STATICS

#### Strategic investment

It is often the case that large firms pre-invest in legal services. This usually involves an annual retainer which the firm views as a sunk cost and effectively gives the firm "free" legal services up to the point that the retainer is exhausted. This creates a discontinuity in the firm's cost of legal services, whether it is the plaintiff or defendant.

Consider the case where the defendant (injurer) has made an ex-anti sunk investment in legal services. Let  $a_{sunk}$  be the amount of legal services that the defendant has retained. therefore equation 9 becomes

$$\frac{dv}{da_1} = \begin{cases} -\frac{\partial P(a_1, a_2)}{\partial a_1} D = 0 & \text{for } a_1 \leq a_{sunk} \\ -\frac{\partial P(a_1, a_2)}{\partial a_1} D - \frac{dw_1}{da_1} = 0 & \text{for } a_1 > a_{sunk} \end{cases} \quad (18)$$

This result is illustrated in figure three.

In figure three the original equilibrium is point E. This represents the equilibrium illustrated in figure one above. When the defendant makes ex-anti investment in a sunk level of legal services, his response function rotates outward to the right until the defendant expends legal services of  $a_{sunk}$ . At  $a_{sunk}$  the response function returns to the original response function as the defendant must now incur additional legal services at the variable rate of  $w_1$ . Assuming the investment is large enough, the plaintiff's response function will intersect the defendant's at point such as F. In this case, the defendant has effectively changed the equilibrium point in his favour. An equilibrium at point F corresponds to a lower probability of success for the plaintiff than an equilibrium such as point E. Given our earlier assumptions, this implies a lower out of court settlement.

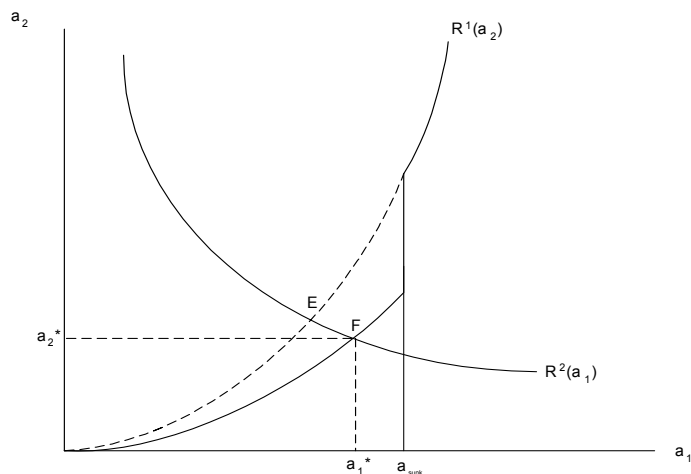


FIG. 3. The nash equilibrium in legal activity when the defendant pre-commits to a sunk level of legal services denoted  $a_{sunk}$ .

### Costs of discovery

An aspect of the legal process, that has so far been ignored in our simple framework, are the costs of pretrial discovery. Under the rules of law<sup>13</sup>, both parties to a suit must disclose all information in their possession. The rationale of holding discovery is to facilitate settlement and avoid a costly trial. However, the process of discovery is, in itself, a cost. Since the plaintiff cannot proceed with suit unless there has been a day of discovery, these costs can be viewed as fixed costs. Let  $d$  denote the costs of discovery. We will assume that the cost of discovery is the same for both parties.

The expected return to the plaintiff then becomes

$$u = S^*(x) - w_2(a_2^*(x)) - d \quad (19)$$

---

<sup>13</sup>Posner, Richard, *Economic Analysis of Law* 3rd edition, Little, Brown and Co. (1986) pp 525-526

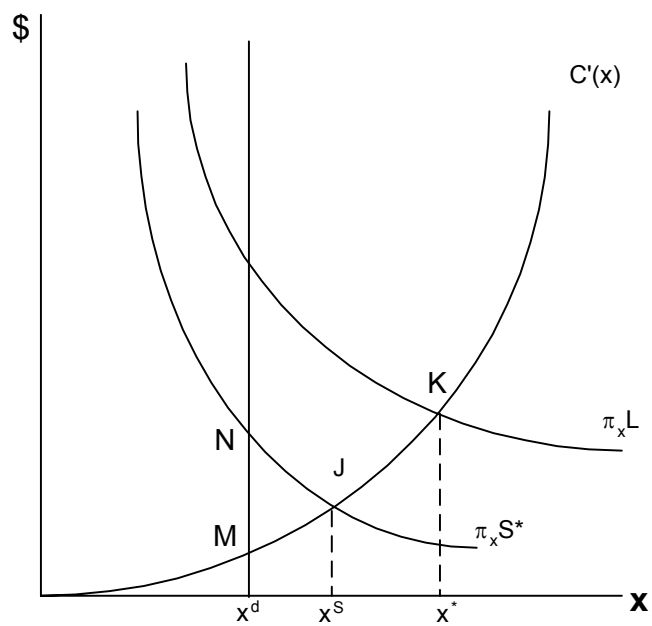


FIG. 4. Equilibrium level of care in the presence of pre-trial costs of discovery.

If equation 19 is negative, then no suit would ever be brought. Setting equation 19 equal to zero solves for the minimum level of care necessary to deter a lawsuit. Let  $x^d$  denote the  $x$  that solves equation 19 equal to zero. If  $x^d < x^s$ , then the defendant will take even less care than in the absence of discovery costs.

This result is illustrated in figure four. As before, point  $K$  represents the socially optimal level of care ( $x^*$ ) and point  $J$  represents the level of care determined by the outcome of the stage two game. In this case  $x^d < x^s < x^*$  which implies that an injurer can avoid a potential law suit by supplying up to  $x^d$ . At  $x^d$  the marginal benefit of care exceeds the marginal cost of care ( $M$  to  $N$ ), therefore an inefficient level of care is taken. The additional costs of discovery create a discontinuity in the injurer's care function and create an opportunity for the injurer to choose a "limiting" level of care that just deters entry<sup>14</sup>.

**Alternative Fee structures.**

#### IV. CONCLUSION

---

<sup>14</sup>This case is analogous to an incumbent firm using a limit output, or limit price, strategy to deter entry into a monopoly market.