Strict Liability, Settlement, and Moral Concern

Chulyoung Kim (Yonsei University)
S. David Kim (Ohio State University)
Sangyoon Nam (Yonsei University)

May 22, 2018

Abstract

We investigate the consequences of introducing a settlement stage to the environment of Deffains and Fluet (2013) in which an injurer has moral concern about harming a victim. Focusing on the unique interior solution, we characterize the Perfect Bayesian Equilibrium that has a cutoff property: high-moral types are willing to settle whereas low-moral types reject the victim's settlement offer and proceed to trial. We show that the injurer's equilibrium level of precautionary effort increases as the injurer's moral type increases and becomes constant at the marginal moral-type who is indifferent between settlement and trial. We also discuss the settlement's effect in reducing the high types' precautionary effort and the cost shifting rule's effect on the equilibrium outcomes.

Keywords : legal liability; settlement; moral concern; tort.

JEL: C72; D82; K41.

I. Introduction

Although traditional economic models assume that economic agents respond only to monetary incentives, there has been a growing interest among economists in investigating the ways in which non-monetary incentives, such as a moral cost, influence an economic agent's decision-making. In a tort context, as Kaplow and Shavell (2002) argued, people often have incentive to avoid harming others, even in the absence of monetary punishment, because of their moral concern. In fact, as

Gneezy and Rustichini (2000) show in their experiments, higher monetary incentives may even deteriorate an individual's incentive not to harm others.

Despite the fact that moral concern is an important factor in an individual's decision-making problem, the law and economics literature has largely neglected such an aspect of an individual's preference in a formal analysis.[1] A notable exception is a recent paper by Deffains and Fluet (2013) who studied the consequences of an individual's moral concern on the optimal design of legal liability. They incorporated an injurer's normative motivation to the unilateral precaution model of tort and investigated the relationship between legal sanctions and norms under various legal regimes. Their main results demonstrate that the legal sanction and normative motivation complement each other in the sense that normative motivation drives the injurer's precautionary effort level closer to the optimal one.

In the current paper, we introduce the possibility of settlement[2] between an injurer and a victim to the model studied by Deffains and Fluet so as to study how settlement opportunities interact with the injurer′s moral concern and influence the injurer′s precautionary effort. In our model, an injurer initially chooses the level of precautionary effort that determines the probability of an accident. When an accident occurs, a victim suffers a monetary loss and has an opportunity to propose a take-it-or-leave-it settlement offer to the injurer. If the injurer agrees to this settlement term, a transfer is made and the case is closed. Otherwise, settlement fails and they proceed to trial where each party wins with an exogenously fixed probability.

Our settlement stage is reminiscent of the screening model of settlement developed by Bebchuk (1984) because there is asymmetric information about the degree of moral concern of the injurer in our model. Thus, by proposing a settlement offer, the victim separates the injurer types who are willing to settle from the other types who reject the settlement offer and proceed to trial. Our analysis shows that it is the high types, i.e., the injurer with a high degree of moral concern, who are willing to settle rather than to proceed to trial. Moreover, we show that the injurer

1) See, for instance, Landes and Posner (1987) and Shavell (1987) for the basic economic models in law and economics.

2) Eisenberg and Lanvers (2009) observed that approximately 82 percent of filed cases in two court districts were settled prior to trial.

exerts more precautionary effort as his moral concern becomes larger, and the injurer's effort level is constant regardless of moral concern if he expects to settle with the victim. We also find that settlement opportunities are likely to reduce the high-type injurers' precautionary effort whereas they have no effect on the low-type injurers' precautionary effort.

Our paper is related to the large literature on the standard unilateral model of tort, initiated by early contributions including Brown (1973), Polinsky (1980), and Shavell (1980).[3] Our paper is also related to the literature on the role of moral concern in an individual's decision-making. Kaplow and Shavell (2002) argue that an individual has strong incentive, out of moral concern, to avoid harming other individuals and to make compensation for the losses they incur. See also Posner (1997), Posner and Rasmusen (1999), and Posner (2000) for a discussion of the role of moral concern in decision-making.

The remainder of our paper is organized as follows. Section 2 details our model, and Section 3 provides the main analysis in which we find and study the Perfect Bayesian Equilibrium of our model. Section 4 provides an extension in which we study the effect of the cost shifting rule on the equilibrium outcomes. Finally, Section 5 offers concluding remarks.

II. Model

There are two players in our litigation game, an injurer and a victim. In the beginning of the game, the injurer participates in a harmful activity, which could result in an accident and inflict a monetary loss of L on the victim with probability $p \in (0,1)$. The injurer can exert precautionary effort to reduce the probability of accident, but it is costly for him to do so: the cost for having p is given by $c(p)$ such that $c' < 0$, $c'' > 0$, $\lim_{p \to 0} c'(p) = -\infty$, and $\lim_{p \to 1} c'(p) = 0$.

The injurer's utility is expressed as follows:

3) See Shavell (2007) for an excellent survey on this topic.

$$U = b - c(p) - \theta x + \beta e$$

where the first part, $b - c(p)$, is the material payoff including the benefit b from the activity and the cost of choosing the accident probability.

The injurer also obtains non-traditional utility. First, when an accident occurs, the injurer suffers disutility from uncompensated harm, x. The degree to which the injurer is concerned about the level of uncompensated harm is denoted by θ, which is his private information. We refer to θ as the injurer's moral type. The prior distribution on θ is $f(\theta)$ with support $[\theta_l, \theta_h]$, which we assume to be continuous and positive. It seems plausible to assume that θ is less than 1: that is, the injurer's disutility from imposing one dollar worth uncompensated harm on the victim is less than his utility from material gain of one dollar.

Second, the injurer obtains positive utility from social esteem denoted by e: if society believes that the injurer's moral type is e, the injurer obtains utility of βe where β represents the degree to which the injurer values his social esteem. More precisely, the social esteem is society's *ex post* belief about the injurer's moral type given by

$$e \equiv E(\theta | I)$$

where I stands for the information available to society regarding the injurer's moral type. One may view this positive utility arising from the injurer's social esteem concern is based on the injurer's 2nd order belief: that is, the injurer obtains a higher utility from social esteem if he believes that the society believes that his moral type is high. In this view point, we implicitly assume that the injurer's inference about the societal belief about his own moral type is always correct.

When an accident occurs, the victim suffers a monetary loss of L and has an opportunity to make a take-it-or-leave-it settlement offer S to the injurer. If the injurer agrees to settle and pay S to the victim, the game ends and they do not move to trial. If the injurer rejects the settlement offer, they proceed to trial. At trial, we assume that the victim wins with probability $q \in (0,1)$, in which case the injurer is required to pay L to the victim. If the victim loses, the injurer pays nothing. For simplicity, we assume that litigation costs are negligible for both players.

Thus, the timeline of our litigation game is as follows:

- Stage 1: The injurer chooses p.
- Stage 2: If an accident occurs, the victim suffers a loss L, and makes a take-it-or-leave-it settlement offer S to the injurer. If the injurer accepts to pay S to the victim, the game ends. Otherwise, they proceed to trial in the next period.
- Stage 3: At trial, the victim wins with probability q, in which case the injurer pays L. If the victim loses, the injurer pays nothing.

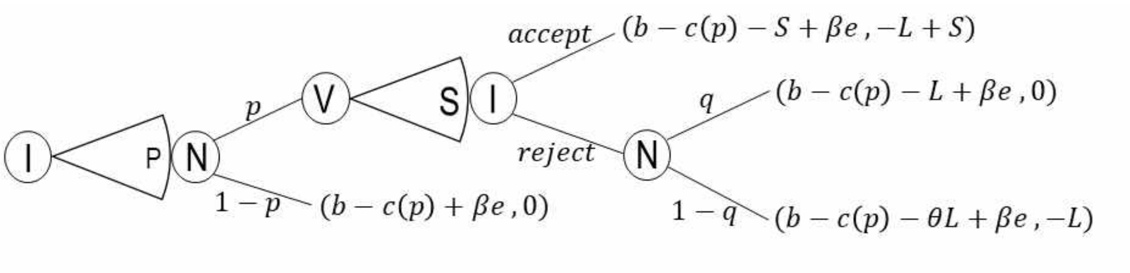

Figure 1. Game Tree for the Basic Model

To demonstrate our main intuitions and results succinctly, we make the following assumptions:

Assumption 1. $\theta_l = 0$ and $\theta_h < L/(\beta + L)$.

Assumption 1 guarantees that the injurer does not voluntarily compensate the victim's accident loss, thus making legal measures employed in our framework meaningful. To be more precise, following Deffains and Fluet (2013), the injurer's utility from not voluntarily compensating the victim is given by the following:

$$U_0 = b - c(p) - \theta L + \beta \overline{\theta_0}$$

where $\overline{\theta_0}$ is the average moral type of the injurers who do not voluntarily compensate the victim. In contrast, if the injurer voluntarily compensates the victim, his utility is given by the following:

$$U_1 = b - c(p) - L + \beta \overline{\theta_1}$$

where $\overline{\theta_1}$ is the average moral type of the injurers who voluntarily compensate the victim. Then the injurer whose moral type is θ chooses not to voluntarily compensate the victim if $U_1 < U_0$, or equivalently, $\beta(\overline{\theta_1} - \overline{\theta_0}) < (1-\theta)L$. Since $\overline{\theta_1} - \overline{\theta_0}$ cannot exceed θ_h, this inequality always holds if $\beta\theta_h < (1-\theta_h)L$ which is Assumption 1 because

$$\beta(\overline{\theta_1} - \overline{\theta_0}) < \beta\theta_h < (1-\theta_h)L < (1-\theta)L$$

for $\theta < \theta_h$.

Assumption 2. $f(\theta)$ is a uniform distribution.

Thus, we have $f(\theta) = 1/\theta_h$ according to Assumption 2. This is for simplicity and does not restrict our main results.

Assumption 3. $\beta < L$ and $q < 1/2$.

Assumption 3 enables us to focus on the unique interior solution with partial settlement in which some injurer types are brought to trial and others are induced to settle with the victim.[4)]

Assumption 4. Information available to society is binary: $I \in \{G, B\}$ where $I = B$ if the injurer loses at trial and $I = G$ otherwise.

We follow Deffains and Fluet (2013) in making this assumption.[5)] Four possible histories exist in our litigation game: (i) an accident does not occur, (ii) an accident occurs and players settle, (iii) an accident occurs and the injurer wins at trial, and (iv) an accident occurs and the victim wins at trial. An interpretation of Assumption 4 is that society can only observe (iv) but not others. In particular, this means that if the injurer settles with the victim, the injurer can hide from public observation the fact that he is involved in an accident.

Assumption 5. Successful settlement does not impose any moral responsibility on the injurer.

For instance, if the injurer agrees to settle at $S < L$, Assumption 5 implies that he does not suffer any moral disutility from uncompensated loss, $L - S$. As the injurer pays the full amount of the settlement offer requested by the victim (i.e., S), we believe that this assumption is appropriate in our settlement context.

As our game is a dynamic game with incomplete information, an appropriate equilibrium concept is Perfect Bayesian Equilibrium, which is simply referred to as an equilibrium throughout this paper.

III. Analysis

1. Victim's Choice of Settlement Offer

---

4) To be more precise, without this assumption, we could have $\theta_c^* = 0$ in Proposition 1, which means that every case is settled.

5) See Deffains and Fluet (2013) page 937 for this assumption.

We begin our analysis from Stage 2. Consider type-θ injurer. If he goes to trial, his expected payoff is

$$b - c(p) - qL - (1-q)\theta L + \beta(q\overline{\theta}_B + (1-q)\overline{\theta}_G)$$

where $\overline{\theta}_I$ is the conditional expectation of θ given $I \in \{G, B\}$. The players take these values of social esteem as given, and we assume that $\overline{\theta}_B < \overline{\theta}_G$. If he settles at Stage 2, his expected payoff is

$$b - c(p) - S + \beta\overline{\theta}_G$$

Therefore, the injurer will choose to settle if his settlement payoff is larger and vice versa. In particular, the type-θ injurer will be indifferent if the following equation holds:

$$b - c(p) - qL - (1-q)\theta L + \beta(q\overline{\theta}_B + (1-q)\overline{\theta}_G) = b - c(p) - S + \beta\overline{\theta}_G \tag{1}$$

Observe that S uniquely determines θ_c from equation (1) such that the type-θ_c injurer is indifferent between settlement and trial. Moreover, the injurer with type $\theta < \theta_c$ strictly prefers to go to trial and the injurer with type $\theta > \theta_c$ strictly prefers to settle and pay S to the victim.

Anticipating the injurer's decision, the victim will choose S to maximize her expected payoff at Stage 2:

$$\max_S \ V = \int_0^{\theta_c} qLf(\theta)d\theta + \int_{\theta_c}^{\theta_h} Sf(\theta)d\theta \tag{2}$$

Using equation (1), we can replace S with a function of θ_c in V, and turn the victim's problem to that of optimally choosing θ_c. Thus, we obtain the following first-order condition with respect to θ_c:

$$(1-q)L\left(\frac{\theta_h-\theta_c}{\theta_h}\right)=\frac{1}{\theta_h}(S-qL) \tag{3}$$

The left-hand side reflects the marginal benefit from increasing θ_c. From equation (1), one unit increase in θ_c is equivalent to $(1-q)L$ units increase in S; the victim obtains this additional settlement revenue from the injurer types who are already willing to settle with the victim, thus having a higher expected payoff from settlement. On the other hand, higher settlement offers induce the formerly indifferent type to reject settlement and proceed to trial. Thus, the victim loses from this injurer type by $S-qL$, which is captured by the right-hand side of equation (3).

From equations (1) and (3), we obtain the victim's optimal settlement offer as follows:

$$\theta_c^* = \frac{\theta_h}{2}-\frac{\beta q\Delta}{2(1-q)L}$$

$$S^* = \left(q+\frac{(1-q)\theta_h}{2}\right)L+\frac{\beta q\Delta}{2}$$

$$\Delta = \overline{\theta}_G-\overline{\theta}_B$$

which characterize the unique interior optimum because the second-order condition is satisfied.6)

Proposition 1. $\theta_c^* \in (0,\theta_h/2)$ and $S^* < L$.

Proof: We have $\theta_c^* < \theta_h/2$ because $\theta_c^* = \frac{\theta_h}{2}-\frac{\beta q\Delta}{2(1-q)L}$ where the second term is positive. Now, we want to show $\theta_c^* > 0$, or equivalently, $\frac{\beta q\Delta}{2(1-q)L} < \frac{\theta_h}{2}$. By Assumption 3, $q < 1/2$ and $\beta < L$. Thus, $q/(1-q) < 1$. Also, reputation penalty cannot exceed upper bound of moral concern which yields $\Delta < \theta_h$. Combining all these, we have $\theta_c^* > 0$. To show $S^* < L$, observe

6) More precisely, the second-order condition is $V'' = -2(1-q)L/\theta_h < 0$.

$$
\begin{aligned}
S^* &= qL + \frac{(1-q)\theta_h}{2}L + \frac{\beta q \Delta}{2} \\
&< qL + \frac{(1-q)\theta_h}{2}L + \frac{L(1-q)\theta_h}{2} \\
&= qL + (1-q)\theta_h L \\
&< qL + (1-q)L \\
&= L
\end{aligned}
$$

where the first inequality follows because $\beta < L$, $q < 1-q$ and $\Delta < \theta_h$, and the second inequality follows because $\theta_h < 1$ by Assumption 1. QED.

A few comments are in order. First, as there exists a unique interior solution, both settlement and trial occur in equilibrium. In particular, high moral types are willing to settle while low moral types reject the victim's settlement offer and proceed to trial.

Second, we can perform comparative statics with intuitive signs. It follows immediately from the expressions of θ_c^* and S^* that a higher conviction rate decreases θ_c^* and increases S^*. As a higher conviction rate reduces the injurer's trial payoff, the victim can extract more surplus from settlement with the injurer by increasing her offer, i.e., $\frac{\partial S^*}{\partial q} > 0$. However, a higher conviction rate has two countervailing effects on θ_c^*: a direct effect indicates that a higher likelihood of bad outcome at trial induces more injurer types to settle, while an indirect effect through higher S^* indicates that less injurer types are willing to settle. Our comparative statics result shows that the direct effect dominates the indirect effect, i.e., $\frac{\partial \theta_c^*}{\partial q} < 0$.

Similarly, a higher valuation for social esteem decreases θ_c and increases S^*. As the injurer cares more about his reputation, he is willing to pay more for settlement so as to avoid bad reputation from trial. Accordingly, the victim can extract a higher surplus by increasing his settlement demand, $\frac{\partial S^*}{\partial \beta} > 0$. On the other hand, β has countervailing effects on θ_c^*: a direct effect indicates that a higher valuation for social esteem induces more injurer types to settle, while an indirect effect through higher S^* indicates that less injurer types are willing to settle. Our comparative statics result shows that the direct effect dominates the indirect effect, i.e., $\frac{\partial \theta_c^*}{\partial \beta} > 0$. We also find that a higher loss from an accident increases both θ_c^* and S^*, i.e., $\frac{\partial S^*}{\partial L} > 0$ and $\frac{\partial \theta_c^*}{\partial L} > 0$, with a similar interpretation.

2. Injurer's Choice of Precautionary Effort

Using backward induction, the injurer in Stage 1 chooses the accident probability to maximize his expected utility. As low moral types, those with $\theta < \theta_c^*$, anticipate trial, they solve the following problem:

$$\max_p \ b - c(p) - pqL - p(1-q)\theta L + \beta(pq\overline{\theta}_B + (1-pq)\overline{\theta}_G)$$

By contrast, high moral types, those with $\theta \geq \theta_c^*$, anticipate settlement, and therefore they solve the following problem:

$$\max_p \ b - c(p) - pS^* + \beta\overline{\theta}_G$$

To simplify notations, following Deffains and Fluet (2013), we define a function $P(t)$ as follows:

$$P(t) \equiv \arg\min_p \ c(p) + tp$$

where it is straightforward to verify that $P'(t) < 0$. This notation is useful because, as can be seen in the follwing analysis, it succinctly summarizes the factor behind the injurer's choice of precautionary effort.

Using this function, we can express the injurer's choice of the accident probability as follows: if $\theta \in [0, \theta_c^*)$, the injurer's optimal choice is $p^* = P(qL + (1-q)\theta L + \beta q \Delta)$ while if $\theta \in [\theta_c^*, \theta_h]$, the injurer's optimal choice is $p^* = P(S^*)$. We note that the injurer's precautionary effort is uniquely determined because of the assumptions on $c(p)$ and that $P(\cdot)$ provides us with a unique minimum because the second-order condition is satisfied. The following proposition summarizes our results.

Proposition 2. The following behavioral strategies form a unique equilibrium of our litigation game:

$$(i)\ \ p^* = P(qL + (1-q)\theta L + \beta q\Delta^*) \quad \forall\,\theta \in [0, \theta_c^*)$$

$$p^* = P(S^*) \quad \forall\,\theta \in [\theta_c^*, \theta_h]$$

$$(ii)\ \ S^* = qL + (1-q)\theta_h L/2 + \beta q\Delta^*/2$$

where θ_c^* and Δ^* are given by

$$\theta_c^* = \frac{\theta_h}{2} - \frac{\beta q\Delta^*}{2(1-q)L}$$

$$\Delta^* = \overline{\theta}_G^* - \overline{\theta}_B^*$$

$$\overline{\theta}_G^* = \frac{\int_0^{\theta_c^*} \theta(1-p^*)f(\theta)d\theta + \int_{\theta_c^*}^{\theta_h} \theta f(\theta)d\theta}{\int_0^{\theta_c^*} (1-p^*)f(\theta)d\theta + \int_{\theta_c^*}^{\theta_h} f(\theta)d\theta}$$

$$\overline{\theta}_B^* = \frac{\int_0^{\theta_c^*} \theta p^* f(\theta)d\theta}{\int_0^{\theta_c^*} p^* f(\theta)d\theta}$$

When the injurer has no moral concern, that is, $\theta = 0$, he has weak incentive to keep accidents from occurring, thus choosing $P(qL + \beta q\Delta)$. As the injurer's moral concern increases, he exerts more effort in curbing accidents up to the point where he is indifferent between settlement and trial. High moral types who anticipate settlement in Stage 2 choose $P(S^*)$, which is larger than low type injurers' precautionary effort because

$$qL + (1-q)\theta L + \beta q\Delta^* < S^*$$

for $\theta < \theta_c^*$. Thus, we find that the injurers who anticipate settlement exert higher precautionary effort than others who anticipate trial.

High moral types, those with $\theta > \theta_c^*$, choose the same level of precautionary effort, $P(S^*)$. It is interesting to observe that, keeping the level of social esteem constant, these injurers would have exerted higher levels of effort if there were no settlement opportunities. In other words, with no settlement stage, the injurers with $\theta > \theta_c^*$ would have chosen $P(qL + (1-q)\theta L + \beta q \Delta^*)$, which is larger than $P(S^*)$. This finding shows that the introduction of settlement opportunities has a direct effect of reducing the precautionary effort of high moral types. As high moral types can avoid bad events from trial by agreeing to settle with the victim, he suffers less social disgrace from an accident. Thus, they have less incentive to exert precautionary effort in Stage 1, thereby increasing the chances that the victim suffers an accident.

When discussing the direct effect of settlement, we assumed that the level of social esteem was constant. In general, if there were no settlement stage, society could hold different beliefs about the injurer's moral type, that is, Δ^* could change, thus generating an indirect effect on the injurer's choice of effort. It seems an interesting avenue for future research to investigate the ways in which settlement influences Δ^*.

IV. Extensions

1. Existence of Litigation Costs

Now we further assume that there exist litigation costs, denoted by $l = l_P + l_D$, where l_P is the litigation cost of the plaintiff (=victim), l_D is that of the defendant (=injurer), and l is the total litigation cost. Using this setting, we analyze the case in which each litigant pays for his own litigation costs, followed by the analysis of the case in which the losing litigant should bear the entire litigation costs including his opponent's.

At Stage 2, if the type-θ injurer goes to trial, his expected payoff is

$$b - c(p) - l_D - qL - (1-q)\theta(L + l_P) + \beta(q\overline{\theta}_B + (1-q)\overline{\theta}_G).$$

If he settles at Stage 2, his expected payoff is

$$b - c(p) - S + \beta\overline{\theta}_G.$$

Thus, the type-θ injurer will be indifferent if the following holds:

$$b - c(p) - l_D - qL - (1-q)\theta(L + l_P) + \beta(q\overline{\theta}_B + (1-q)\overline{\theta}_G) = b - c(p) - S + \beta\overline{\theta}_G.$$

Again, S uniquely determines θ_c, and the injurer with type $\theta < \theta_c$ strictly prefers to go to trial and the injurer with type $\theta > \theta_c$ strictly prefers to settle and pay S to the victim. From the equation, we get

$$S = l_D + qL + (1-q)\theta_c(L + l_P) + \beta q(\overline{\theta}_G - \overline{\theta}_B) \tag{4}$$

Considering the injurer's decision, the victim will choose S to maximize her expected payoff at Stage 2:

$$\max_s V = \int_0^{\theta_c} (qL - l_p) f(\theta) d\theta + \int_{\theta_c}^{\theta_h} S f(\theta) d\theta$$

which can be maximized with respect to θ_c by replacing S with a function of θ_c from equation (4). Then first-order condition yields the following equation:

$$(1-q)(L + l_P)\left(\frac{\theta_h - \theta_c}{\theta_h}\right) = \frac{1}{\theta_h}(S + l_P - qL) \tag{5}$$

Combining (4) and (5), we obtain the following:

$$\theta_c^{1*} = \frac{\theta_h}{2} - \frac{\beta q \Delta + l}{2(1-q)(L+l_P)}$$

$$S^{1*} = qL + l_D + \frac{(1-q)(L+l_P)\theta_h}{2} + \frac{\beta q \Delta - l}{2}$$

$$\Delta = \overline{\theta}_G - \overline{\theta}_B$$

Using backward induction, the injurer in Stage 1 chooses the accident probability to maximize his expected utility considering the consequence in Stage 2. If the injurer is of low moral type with $\theta < \theta_c^*$, his problem is given by:

$$\max_p \ b - c(p) - pq(L+l_D) - p(1-q)(l_D + \theta(L+l_P)) + \beta(pq\overline{\theta}_B + (1-pq)\overline{\theta}_G)$$

If the injurer is of high moral type with $\theta \geq \theta_c^*$, his problem is given by:

$$\max_p \ b - c(p) - pS^{1*} + \beta\overline{\theta}_G$$

By using the function $P(t)$ previously defined, the maximization problems above yield the following solution:

$$p^* = P(qL + (1-q)\theta(L+l_P) + l_D + \beta q \Delta) \qquad \text{if } \theta \in [0, \theta_c^{1*})$$

$$p^* = P(S^{1*}) \qquad \text{if } \theta \in [\theta_c^{1*}, \theta_h]$$

2. Cost Shifting Rule

In this part, we elaborate the case by assuming that the losing litigant must pay for the winner's litigation costs. At Stage 2, the type-θ injurer's expected payoff from trial is

$$b - c(p) - q(L+l) - (1-q)\theta(L+l) + \beta(q\overline{\theta}_B + (1-q)\overline{\theta}_G)$$

When he settles, the expected payoff is

$$b - c(p) - S + \beta\overline{\theta}_G$$

The injurer will be indifferent between trial and settlement if the following equation holds:

$$b - c(p) - q(L+l) - (1-q)\theta(L+l) + \beta(q\overline{\theta}_B + (1-q)\overline{\theta}_G) = b - c(p) - S + \beta\overline{\theta}_G$$

Rearranging the equation yields

$$S = q(L+l) + (1-q)\theta_c(L+l) + \beta q(\overline{\theta}_G - \overline{\theta}_B) \tag{6}$$

Knowing this, the victim will confront the following maximization problem:

$$\max_s V = \int_0^{\theta_c} (qL - (1-q)l) f(\theta) d\theta + \int_{\theta_c}^{\theta_h} S f(\theta) d\theta$$

Replacing S with a function of θ_c in (6), we obtain the following first-order condition:

$$(1-q)(L+l)\left(\frac{\theta_h - \theta_c}{\theta_h}\right) = \frac{1}{\theta_h}(S + (1-q)l - qL) \tag{7}$$

From equation (6) and (7), we obtain the victim's optimal settlement offer as follows:

$$\theta_c^{2*} = \frac{\theta_h}{2} - \frac{\beta q \Delta + l}{2(1-q)(L+l)}$$

$$S^{2*} = (q + \frac{(1-q)\theta_h}{2})(L+l) + \frac{\beta q \Delta - l}{2}$$

$$\Delta = \overline{\theta}_G - \overline{\theta}_B$$

Anticipating these in Stage 2, the injurer maximizes his expected utility by choosing the accident probability in Stage 1. If the injurer is of low moral type with $\theta < \theta_c^*$, his problem is given by:

$$\max_p \; b - c(p) - pq(L+l) - p(1-q)\theta(L+l) + \beta(pq\overline{\theta}_B + (1-pq)\overline{\theta}_G)$$

If the injurer is of high moral type with $\theta \geq \theta_c^*$, his problem is given by:

$$\max_p \; b - c(p) - pS^{2*} + \beta\overline{\theta}_G$$

Thus, the maximization problems yield the following solution:

$$p^* = P(q(L+l) + (1-q)\theta(L+l) + \beta q \Delta) \qquad \text{if } \theta \in [0, \theta_c^{2*})$$

$$p^* = P(S^{2*}) \qquad \text{if } \theta \in [\theta_c^{2*}, \theta_h]$$

3. Comparing the Results

Using the results from the previous sections, we can investigate the effect of the cost shifting rule. Comparing the settlement offer with and without the cost shifting, we obtain the following:

$$S^{1*} - S^{2*} = (1-q)(1 - \frac{1}{2}\theta_h)l_D - ql_P$$

Thus, the settlement offer decreases under the cost shifting rule if the defendant's (=injurer's) litigation cost is relatively large or the plaintiff's (=victim's) litigation cost is relatively small. This result is intuitive. Because the losing plaintiff must pay for the defendant's cost as well, the cost shifting rule imposes a relatively more burden on the plaintiff if the defendant's litigation cost is relatively larger than the plaintiff's. Therefore, the plaintiff has a higher incentive to settle under the cost shifting rule, which explains the above finding.

Proposition 3. The cost shifting rule reduces the settlement offer if the defendant's litigation cost is relatively larger than the plaintiff's litigation cost, and vice versa.

When the injurer expects to settle in Stage 2, i.e., he is of high moral type, his precautionary effort chosen in Stage 1 is given by $P(S^*)$ in which $S^* \in \{S^{1*}, S^{2*}\}$ depending on the presence of the cost shifting rule. Since $P(\cdot)$ is decreasing in its argument, Proposition 3 implies that, for high moral types, the level of precautionary effort could increase or decrease under the cost shifting rule depending on the relative magnitudes of the litigation costs.

For the level of precautionary effort chosen by low moral types who move to trial, we need to compare the following two quantities:

$$P(qL+(1-q)\theta(L+l_P)+l_D+\beta q\Delta) \text{ and } P(q(L+l)+(1-q)\theta(L+l)+\beta q\Delta)$$

where the former is the level of effort under no cost shifting and the latter is that under the cost shifting. Comparing the arguments of the function, we obtain

$$\begin{aligned}&[qL+(1-q)\theta(L+l_P)+l_D+\beta q\Delta]-[q(L+l)+(1-q)\theta(L+l)+\beta q\Delta]\\&=(1-q)(1-\theta)l_D-ql_P\end{aligned}$$

Thus, if this quantity is positive, the level of precautionary effort decreases under the cost shifting rule, and vice versa. Observe that the quantity above is positive if the defendant's litigation cost is relatively larger than the plaintiff's litigation cost, with a similar intuition as before. Summarizing these findings, we obtain the following proposition.

Proposition 4. The level of precautionary effort decreases under the cost shifting rule if the defendant's litigation cost is relatively larger than the plaintiff's litigation cost, and vice versa.

V. Concluding Remarks

When Deffains and Fluet (2013) examined the effect of the injurer's moral concern on his choice of precautionary effort, they did not allow the possibility of settlement in their model. Thus, in our paper, we investigated the consequences of introducing the settlement stage to their model. Focusing on the unique interior equilibrium, we showed that high moral types are willing to settle whereas low moral types reject the victim's settlement offer and move to trial. Moreover, we showed that high moral types exert more precautionary effort than low moral types. In particular, the level of precautionary effort is shown to increase in the injurer's moral type for the types proceeding to trial, and its level is constant for the types who settle with the victim. We also discussed the effect of settlement in reducing high moral types' precautionary effort.

In our paper, we focused our analysis on the strict liability regime. Another important liability regime often studied in the law and economics literature is the negligence regime, in which the injurer is free from liability as long as he exerted a due amount of care prespecified by the authority. Although we did not delve further into this line of research due to complexity of the model, it could be an interesting future research topic that could shed a light to the literature in search of an optimal legal regime. Another topic we leave for future research is the analysis of the effects of β and θ. In our model, the effects of β and θ on equilibrium outcomes are quite similar. Presumably, these two parameters could have different roles in determining the equilibrium outcomes, because the injurer's social esteem utility depends on the society's belief formation process thereby hinging on information available to the public whereas the injurer's moral concern is independent of such an information issue. Investigating these issues could be a promising avenue for future work.

References

Bebchuk, L. A. (1984): “Litigation and Settlement under Imperfect Information,” *RAND Journal of Economics*, vol. 15, 404-415.

Brown, J. P. (1973): “Toward an Economic Theory of Liability,” *Journal of Legal Studies*, 2, 323-349.

Deffains, B. and C. Fluet (2013): “Legal Liability when Individuals Have Moral Concerns,” *Journal of Law, Economics and Organization*, 29, 930-955.

Einsenberg, T and Lanvers, C (2009): “What is the Settlement Rate and Why Should We Care,” *Journal of Empirical Legal Studies*, vol.6, 111-146.

Gneezy, U. and Rustichini, A. (2000): “Pay Enough or Don't Pay at All” *Quarterly Journal of Economics*, vol. 115, 791-810.

Kaplow, L. and S. Shavell (2002): *Fairness versus Welfare*, Cambridge, MA: Harvard University Press.

Landes, W. M. and R. A. Posner (1987): *The Economic Structure of Tort Law*, Cambridge, MA: Harvard University Press.

Polinsky, A. M. (1980): “Strict Liability vs. Negligence in a Market Setting,” *American Economic Review*, 70, 363-367.

Posner, E. (2000): *Law and Social Norms*, Cambridge, MA: Harvard University Press.

Posner, R. A. (1997): “Social Norms and the Law: An Economic Approach,” *American Economic Review*, 87, 365-369.

Posner, R. A. and E. B. Rasmusen (1999): “Creating and Enforcing Norms, with Special Reference to Sanctions,” *International Review of Law and Economics*, 19, 369-382.

Shavell, S. (1980): “Strict Liability versus Negligence,” *Journal of Legal Studies*, 9, 463-516.

Shavell, S. (1987): *Economic Analysis of Accident Law*, Cambridge, MA: Harvard University Press.

Shavell, S. (2007): “Liability for Accidents,” in *Handbook of Law and Economics*, ed. by A. M. Polinsky and S. Shavell, Elsevier, vol. 1.