Law And Economics

Tort Law: Bilateral Care

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The Bilateral Care Model

The Bilateral Care Model

- x: investment in precaution by injurer.
- y: investment in precaution by the victim.
- a: accident in $\{0,1\}$
- $p(x,y) := \Pr(a = 1|x,y)$. Probability of accident.
- D: dollar losses suffered by the victim.
- Let $D(x,y) = E_{x,y}[D|a = 1]$

Probability of Accident

- We assume diminishing returns: $p_{yy} > 0$ and $p_{xx} > 0$.

Definition

Precautions are *strategic substitutes* if $p_{xy} < 0$

Definition

Precautions are *strategic complements* if $p_{xy} > 0$

Social Problem

$$\min_{x,y} \quad E_{x,y}[x + y + aD] \quad = \quad \min_{x,y} \quad x + y + p(x,y) \cdot D(x,y)$$

- Let the (unique, interior) solution to this problem be (x^*, y^*).
- FOC:

$$1 + p_x(x^*, y^*)D(x^*, y^*) + p(x^*, y^*)D_x(x^*, y^*) = 0$$
$$1 + p_y(x^*, y^*)D(x^*, y^*) + p(x^*, y^*)D_y(x^*, y^*) = 0$$

- To simplify analysis: deterministic damage D (given accident).

Decentralized Problem

- Problem of the injurer:

$$\min_{x} \quad x + p(x, y) \cdot \psi$$

- Problem of the victim:

$$\min_{y} \quad y + p(x, y) \cdot (D - \psi)$$

- Equilibrium will depend on the liability rule $\psi(x, y)$.

No Liability

$\psi(x, y) = 0$

- The injurer chooses $\hat{x} = 0$.
- Given this, the Victim's problem is:

$$\min y + p(x, y) \cdot D$$

- FOC:

$$1 + p_y(1, y) \cdot D = 0$$

- Notice that:

$$p_y(1, \hat{y}) = \frac{1}{D} = p_y(x^*, y^*)$$

- When precautions are strategic complements, $p_y(x^*, \hat{y}) < p_y(1, \hat{y}) = p_y(x^*, y^*)$
- So, $\hat{y} < y^*$.

Strict Liability

$\psi(x, y) = D$

- The victim chooses $\hat{y} = 0$.
- Given this, the Injurer's problem is:

$$\min_x \quad x + p(x, 1) \cdot D$$

- The first order condition is:

$$1 + p_x(x, 1)D = 0$$

General Constrant Liability

Claim

There is no constant ψ that achieves efficiency.

- For the injurer to be efficiently careful, his cost from the accident ψ should be equal to D.
- For the victim to be efficiently careful, the same is true: $D - \psi = D$.

What if what the injurer pays is not transfered to the victim?

Strict Liability Without Victim Compensation

$\psi^I = D$, $\psi^V = 0$.

- Problem of the injurer:

$$\min_x \quad x + p(x, y) \cdot D$$

- Problem of the victim:

$$\min_y \quad y + p(x, y) \cdot (D - 0)$$

Negligence

$$\psi(x, y, D) = 1_{\{x<\bar{x}\}} \cdot D$$

- This rule achieves efficiency.

Contributory Negligence

- The negligence rule focuses on the precautions taken by the injurer.
- Contributory negligence focuses on the precautions taken by the victim.
  - Negligence with Contributory Negligence:

$$\psi(x, y) = 1_{x<\bar{x}} \cdot 1_{\{y \geq \bar{y}\}} \cdot D.$$

  - Strict Liability with Contributory Negligence:

$$\psi(x, y) = 1_{\{y>\bar{y}\}} \cdot D.$$

Activity Levels

Bilateral Care with Activity Level

- x: investment in precaution by injurer.
- $q \in [0,1]$: activity level of injurer.
- y: investment in precaution by the victim.
- $r \in [0,1]$: activity level of the victim.
- a: accident in {0,1}
- $q \cdot r \cdot p(x,y) := \Pr(a = 1|x,y,q,r)$. Probability of accident.
- D: deterministic dollar losses suffered by the victim in case of accident.

Social Problem

$$\max_{x,y,q,r} \quad u(q) + v(r) - x - y - q \cdot r \cdot p(x, y)$$

Observability

- We assume that Liability Rule can depend on the level of care, but not on the activity level.

Impossibility of Implementing the First Best

Claim

There is no liability rule that implements the efficient levels of care and activity.

- If $\psi(x^*, y^*) < D$, the injurer would take an inefficiently high level of activity.
- If $\psi(x^*, y^*) > 0$, the victim would take an inefficiently high level of activity.

Combination of Liability and Pigouvian Taxes

Efficiency can recovered if liability is combined with different tools that afect incentives.

- For example, a negligence rule with a Pigovian tax for to the injurers.

Sequential Care