Law and Economics

Review of Economic Concepts

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Tort Law

- **Tort Law**: area of the law that is concerned with civil suits. *Mostly* related to accidental injuries.

  Examples of accidental torts:
  - Some personal injuries.
  - Product Liability.
  - Workplace Accidents.
  - Medical Malpractice.
  - Environmental Accidents.

- Risk zero is, generally, not efficient! However, incentives to curb risks are important.

Tort Law

- **Examples of intentional torts**:
  - Battery (act of physical violence),
  - Assault,
  - Trespass (land, computer, car.)
  - Defamation,
  - Intentional Infliction of Emotional Distress (e.g. threats).

- Here we focus on *unintentional* torts.
  - Incentives to mitigate risks.
  - Model of precaution.

Other ways to control risk

- Tools to mitigate risky behavior:
  - Safety & Hygine regulations.
  - Criminal penalties.

Tort law: private remedy that gives the right of accident victims to sue injurers for damages.

$$\text{Victim} \sim \text{Plaintiff} \qquad \text{Injurer} \sim \text{Defendant}$$

Elements of Tort Claim

- Enforcement in hands of the victim.

- Burden of the proof? Plaintiff has to show that:
  - She sustained some damages.
  - Defendant was the *cause* of those damages.

Causation

- Self-driving technology example.
  - Self-driving cars are safer than regular cars.
  - However, they produce accidents that would not have happenend otherwise.

"The Coming Collision Between Autonomous Vehicles and the Liability System" by Gary Marchant and Rachel Lindor.

Causation

- Golf driving range next to a parking lot.
  - x height of the safe net.
  - $y \sim F(x)$ height of the ball. (support in $[0, 1]$).
  - D: damage caused if $y > x$ (deterministic).

- Who caused the damage? The golfer or the range owner that didn't put a taller net?

Actions and outcomes

But-for test: but-for the action, would the outcome be different?

- Golf example: two actions combined cause the damage.
  - Both actions pass the but-for test.

- Other cases where two actions *independently* would have generated the damage.
  - Example: firing squad.
  - No single shooter passes the but-for test.

- For now, we consider a single injurer.

Liability Rules

- How damages should be split between the injurer and the victim?
  - *No liability*: victim bears all damages.
  - *Strict liability*: injurer bears all damages, independently of the actions.
  - *Negligence rule*: Injurer is fully liable if he is found to be *at fault*.
  - *Contributory negligence*: Injurer is fully liable unless the victim is found to be *at fault*.

- What does it mean for the injurer or the victim to be *at fault*?

Tort Law

- **Costs of accidents**:
  - Damaged suffered by victims.
  - Cost of precautions by potential injurers.
  - Cost of precautions by potential victims.

- In this section we present a *unilateral* model of precaution:
  - only injurers can affect the probability of accident.

Overview

Model

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

Assumption: $p(\cdot)$ and $D(\cdot)$ are decreasing convex functions.

Social Optimum

$$\min_{x \geq 0} \quad E_x[x + D] \quad = \quad \min_{x \geq 0} \quad x + p(x)D(x)$$

Solution x^*.

Care choice by the injurer

- What level of care would the injurer choose?
  - Depends on the liability rule: $\psi(x, D)$.
- Implicit assumption:
  - level of care x is ex-post observable.
  - total damages are ex-post observable.

- Decision problem:

$$\min_{x \geq 0} \quad E_x[x + \psi(x, D)]$$

  - Any ψ such that $x^* \in \arg\min_{x \geq 0} E_x[x + \psi(x, D)]$ recovers efficiency.
  - What would Coase theorem say about this?

No Liability

$$\psi(x, D) = 0$$

$$\min_{x \geq 0} \quad x$$

- Efficiency is not achieved.

Strict Liability

$$\psi(x, D) = D$$

$$\min_{x \geq 0} \quad E_x[x + D]$$

- This achieves efficient care: injurer fully internalizes the costs.
- Advantages: low informational requirements.
- Disadvantages: limited liability $\psi < \bar{\psi}$.

Strict (Expected) Liability

$$\psi(x, D) = a \cdot D(x)$$

$$\min_{x \geq 0} \quad E_x[x + aD(x)] \quad = \quad \min_{x \geq 0} \quad x + p(x)D(x)$$

- This achieves efficient care: injurer fully internalizes the costs.
- Limited liability constraint is more likely to be satisfied.
- How informational requirements compare to Strict Liability? More on this **later**.
- Disadvantages: sometimes $\psi > D$. More on this **later**.

Negligence

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

$$\min_{x\geq 0} E_x[x + a \cdot 1_{\{x<\bar{x}\}} \cdot D(x)] \quad = \quad \min_{x\geq 0} \quad x + 1_{\{x<\bar{x}\}} p(x) D(x)$$

- Injurer would never choose $x > \bar{x}$.
- If the thinks he is going to be liable, then he chooses x^*.
- We have to compare $\bar{x}$ with x^*.

$$\bar{x} \qquad \text{vs} \qquad x^* + p(x^*)D(x^*)$$

- Chooses $\bar{x}$ iff $\bar{x} \leq x^* + p(x^*)D(x^*)$.
- Efficient to set $\bar{x} = x^*$.

Comparing liability rules: Informational requirements

- Three rules that can achieve efficiency:
  - strict liability (SL).
  - strict expected liability (SEL).
  - negligence with parameter x^* (N^*).

- To implement these rules, different information is required:

	x	$p(\cdot)$	D	$D(\cdot)$
SL	NO	NO	YES	NO
SEL	YES	NO	NO	YES
N^*	YES	YES	NO	YES

Negligence with noisy observation of x

- Let $\psi(\tilde{x}, D) = 1_{\{\tilde{x}<x^*\}} \cdot D(\tilde{x})$ with $\tilde{x} = x + \epsilon$.
- Let ϵ be normal with an arbitrarily small variance.
- The injurer will not choose x^*.

$$x^* + a \cdot \Pr(\epsilon > 0) \cdot D(x^*)$$

- Then $\bar{x}$ should be chosen higher than x^* to account for this.

Comparing Liability Rules

- **Cost of trials**:
  - Higher informational requirements $\Rightarrow$ costlier trials.
  - Negligence trials are the most expensive ones but they *don't ocur in equilibrium*.
    - Reality might be noisy.
  - SL and SEL trials do occur.

Comparing Liability Rules

- **How damages are split**.
  - With Strict Liability the injurer bears the equilibrium damages,
  - With Negligence the victim does it.

Victim Compensation

Why to compensate victims?

Overview

Activity Levels

- Same model as before, with the difference that the injurer chooses also a quantity.
  - q: activity level.

$$\max_{x,q} \quad B(q) - q[x + p(x) \cdot D(x)]$$

  - We assume diminishing returns (B concave).
  - q is not observable ex-post.

Activity Levels

Example: Hunters and Joggers.

Two interpretations of q:

- Frequency.
- Heterogeneity.

Activity Levels

- Notice that the optimal level of care x^* is independent of q.
- Optimal activity level: $B'(q) = x^* + p(x^*)D(x^*)$.

- For the individual, the optimal activity level depends on the liability rule.

$$\max_{x,q} E_x \left[B(q) - q(x + a \cdot \psi(x, D)) \right]$$

No Liability and Strict Liability

- **No liability**: excesive activity level (and no precautions)

$$\max_{x,q} \quad B(q) - q \cdot x$$

- **Strict liability**: efficient activity level and precautions.

$$\max_{x,q} \quad B(q) - q[x + p(x)D(x)]$$

  - The injurer internalizes all social costs.

Negligence

- **Negligence** (with $\bar{x} = x^*$): excesive activity level (but optimal precautions)

$$\max_{x,q} \quad B(q) - q[\cdot x + \cdot 1_{\{x<x^*\}} \cdot p(x) \cdot D(x)]$$

  - Given optimal precautions,

$$\max_{q} B(q) - q \cdot x^*$$

  - One can show that it is always optimal for the injurer to choose x^*.

Proability of Escaping Liability

- Injurers might be able to escape liability for multiple reasons:
  - Conceal their identity.
  - Difficulty in proving specific cause of injuries.
  - Costs of litigation (prevent victims from bringing suits)
  - Limited liability.

- Therefore, even with strict liability, injurers might take too little precautions.

Exogenous Probability of Escaping Liability

- **Strict Liability:**

$$\min_{x} \quad x + p(x) \cdot \alpha \cdot D$$

- $\hat{x} < x^*$.
- Easy fix: $\psi(x, D) = D/\alpha$.
- This, however, generates problems because $\psi > D$.