Introduction

- In the model of accidents, victim and injurer were strangers.
- Things change when victim and injurer are commercially or otherwise related:
  - Producer and consumer (products liability)
  - Firm and worker (work related injuries)
  - Service provider and customer (e.g. medical malpractice)

- Two opposite views:
  - Liability should protect defenseless consumers/patients/workers from reckless manufacturers/employers/doctors.
  - Producer liability threatens viability of business and innovation.

Other tools

- Framework:
  - Firms can launch a product or not.
  - Product might be safe or unsafe.

- Social goal: that firms only launch sufficiently safe products.
  - **Producer liability**: ex-post. If product is unsafe, firm bears the costs.
  - **Approval mechanisms**: ex-ante. firm has to prove the product is safe *before* selling it.

- Why not use always approval mechanism?
  - More costly.

Overview

Products Liability

- Increasing in importance over the last 50 years.
- Usually, a defendant-manufacturer is held liable if a defective product produces a damage. A defect can mean:
  - Defect in design.
  - Defect in manufacture.
  - Failure in warning.
- We will abstract from this considerations.

Model

- Competitive market.
- Firms produce at marginal cost c. No fixed costs.
- $b(q)$: inverse demand for safe product.
- p: (exogenous) probability of accident.
- D: damage involved in the accident.

Socially optimal allocation

- Total surplus:

$$TS = \int_0^q b(\tilde{q})\ d\tilde{q} - c \cdot q - q \cdot p \cdot D$$

- Solution: $\underbrace{b(q^*)}_{\text{wtp}} = \underbrace{c + p \cdot D}_{\text{total marginal cost}}$.

Equilibrium

- Equilibrium depends on liability rule: who bears the cost of damages.
- α: proportion of damages that seller bears.

- Competitive Equilibrium:
  - price equals marginal cost.
  - willingness to pay equals price.

$$b(q) - (1 - \alpha)pD = P = c + \alpha pD$$

Independence result

Independence

The equilibrium quantity in the model is independent of the liability rule. Moreover, it is efficient.

- Equilibrium price P does depend on α.

Market Power

- Independence is robust to other competition environments.
  - Instead of a competitive market, consider a single monopolist.
  - Inverse demand for safe product: $1 - a \cdot q$
  - Demand given α: $1 - a \cdot q - (1 - \alpha)p \cdot D$.
  - Profit maximized when marginal income equals marginal cost.

Breaking the Independence Result

- What can then break the independence result?
- Some ideas:
  - Unobservable care.
  - Fixed price.
  - Strategic delegation.
  - Risk misspercepti on.

Endogenous probability of accident

Same model as before, with the following modifications.

- x safetiness of the product (choice variable).
- $p(x)$: probability of damage.
- $c(x)$: marginal cost.

Two cases:

- Ex-ante observable care.
- Ex-ante unobservable care.

Efficient Allocation

- Social problem:

$$\max_{x,q} \quad \int_0^q b(\tilde{q})\, d\tilde{q} - q \cdot c(x) - q \cdot p(x) \cdot bD$$

- Independently of how many units are sold, efficient to choose care that minimizes total cost per unit.

$$x^* = \arg\min_{x} \quad c(x) + p(x) \cdot D$$

- Optimal quantity given by FOC

$$\underbrace{b(q^*)}_{\text{social marginal benefit}} = \underbrace{c(x^*) + p(x^*) \cdot D}_{\text{social marginal cost}}$$

Ex-ante observable care

- Let $P(x)$ denote the equilibrium price (might depend on safety).
- Profit zero condition:

$$P^{\circ}(x) = c(x) + \alpha \cdot p(x) \cdot D \tag{1}$$

- Individual of value B (that buys) chooses product safetiness:

$$\max_{x} \quad B - (1-\alpha) \cdot p(x) \cdot D - P(x) \tag{2}$$

- (1) and (2) imply that any individual that buys chooses x^*.

Ex-ante observable care

- Who buys? Those whose WTP is greater than price.
- Thus, equilibrium q is determined by

$$\underbrace{B(q) - (1-\alpha) \cdot p(x^*) \cdot D}_{\text{WTP}} = P^{\circ}(x^*)$$

- Using P° from (1) again, equilibrium quantity is q^*.

Ex-ante unobservable care

- Unobservability $\Rightarrow$ P cannot depend on x.
- **No liability**:
  - for any price P firms choose minimum safetiness.
  - In equilibrium, $x = 0$.
  - q and P determined as if p was exogenous, with $p = p(0)$.
- **Strict liability**:
  - For any price P and quantity q, firm problem:

$$\max_{x} \qquad q \cdot [P - c(x) - p(x) \cdot D]$$

  - Solution at x^*.

Fixed Prices

- A vaccine has a p chance of having a dangerous side effect of size D.
- Fixing price, if the vaccine is implemented it generates
  - PS: producer surplus.
  - CS: consumer surplus.
- For vaccines, CS $>>>>>>>>>$ PS.
- Expected damage: $ED = p \cdot D$.

- Liability affects whether vaccine is implemented:
  - If developer is liable for damages, they implement if $PS \geq ED$.
  - A social planner would like to implement if $PS + CS \geq ED$.

Strategic Delegation

Sometimes, firms don't maximize profits.

- One reason is that, for strategic considerations, having a CEO that has a different objective function turns out to be more profitable.
- Strategic Delegation.
- e.g. CEOs maximize total income.
- In that case, the independence breaks.
  - *'Product Liability and Strategic Delegation: Endogenous Manager Incentives Promote Strict Liability'* by Tim Friehe, Cat Lam Pham and Thomas Miceli.

Strategic Delegation

$$\pi(q) = P(Q) \cdot q - c(q)$$

- Higher liability means higher P, but also higher c.
- These forces compensate each other, so that optimal q is the same *for a profit maximizing CEO*.
- Higher prices mean higher marginal effect of quantity on total income.
- So, with an *income maximizing CEO*,

$$\text{higher liability} \Rightarrow \text{higher quantity produced}$$

Risk Misperception

- **Behavioral observation**: individuals tend to overestimate the probability of low probability events.

- Model as before but with:
  - p exogenous true probability of faulty product.
    - Correctly perceived by firms.
  - $p^* = \gamma \cdot p$ probability of faulty product perceived by consumers.

- Equilibrium condition:

$$\underbrace{b(q) - (1-\alpha) \cdot \gamma \cdot p \cdot D}_{\text{Demand}} = \underbrace{c + \alpha \cdot p \cdot D}_{\text{Marginal cost}}$$

Risk Misperception

- Rearranging:

$$b(q) = c + p \cdot D + (1 - \alpha) \cdot (\gamma - 1) \cdot p \cdot D$$

  - Strict liability: $q = q^*$.
  - No Liability: equilibrium q depends on γ.

Overview

Learning about Product's risk

- Firms can invest in learning about the safeness of their products before launching them to the market.

- 'Liability and the incentive to obtain information about risk'. Shavell (1992).

Model

- c: cost of acquiring information about whether there is a risk or not.
- s: binary variable that takes value 1 if information is acquired.
- p: ex-ante probability of risk, exogenous and unknown.
- x: investment in care.
- $D(x)$: expected damage size. (Decreasing and convex in x)

Social Optimum

Backward induction:

- **Case 1**: Information is not acquired.

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

$$D'(x_0^*) = \frac{-1}{p}$$

- **Case 2**: Information was acquired and there is a risk.

$$\min_x \quad x + \cdot D(x)$$

$$D'(x^*) = -1$$

- **Case 3**: Information was acquired and there is no risk.
  - Optimal care is zero.

Social Optimum

- What is the *social* value of information?

$$v = x_0^* + pD(x_0^*) - p(x^* + D(x^*))$$

$$v = p\cdot\underbrace{[(x_0^* + D(x_0^*)) - (x^* + D(x^*)]}_{\text{advantage when risky}} \quad + \quad (1-p)\cdot \underbrace{x_0^*}_{\text{advantage when safe.}}$$

Social Optimum

- It is socially optimal to acquire the information when $v > c$.

Behavior under different Liability Rules

- No liability: Agent will not take care and will acquire no information.
- Strict liability: Agent will take optimal care and optimal information acquisition.
- Negligence Rules:
  - **N0** (Complete Negligence): Party liable if failed to exercise optimal care or obtain information when she should have done so. (Knew or should have known.)
  - **N1**: Negligence based on the optimal level of care *given optimal information acquisition*. (Knew or should have known.)
  - **N2**: Negligence based on the level of care that was optimal *given the information that the party actually possesses*. (Knew)
  - **N3**: Negligence based on the level of care that was optimal *assuming that a party has obtained information*. (Should have known)

Behavior under N0 (Complete Negligence)

Claim

Under N0 (Complete Negligence), the firm acquires information efficiently and takes the efficient level of care.

- If it is efficient not to acquire information, the firm is in a similar situation as in the model of unilateral care, where negligence was efficient.
- If information was acquired (sunk cost), the firm will choose the efficient level of care.

$$x^* < x^* + D(x^*) < x + D(x)$$

- If it is efficient to acquire information, the individual will do so:

$$px^* + c < p[x^* + D(x^*)] + c < x_0^* + pD(x_0^*)$$

- Requires to know if the firm acquired information or not.

Behavior under N1

- Suppose it was efficient to acquire information ($v > c$).
  - What is the value of information for the firm?

$$\tilde{v} = \max\{x^* - px^*, x_0^* + pD(x_0^*) - px^*\}$$

  - Definitely, $\tilde{v} > x^*(1-p)$.
  - One can show that $\tilde{v} > x^*(1-p) > v$.
- Firm does not acquire information to avoid liability (as in the case of Complete Negligence).
- Instead, firm acquires information because if not, it doesn't know whether she has to take care or not to avoid liability.

Behavior under N2 and N3

Claim

Under N2, firm might fail to acquire information when it was optimal to acquire (never the contrary). Level of care will be optimal given information acquisition.

$$\tilde{v} = x_0^* + pD(x_0^*) - px^*$$

Claim

Under N3, firm might acquire information when it was optimal to not do so ($v < c$). If firm obtains information, takes optimal level of care given information. But when firm does not obtain information it might choose excessive care level.

$$\tilde{v} = \min\{x^*, x_0^* + pD(x_0^*)\} - px^*$$

Shavell, S. (1992). Liability and the Incentive to Obtain Information about Risk. *The Journal of Legal Studies*, 21(2):259–270.