Manufacturer Liability for Harms Caused by Consumers to Others

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Introduction

Harms caused by consumers to others
- Accidentally harms as a result of a product malfunction.
- Intentionally harms made by the consumers

Sometimes, it’s difficult to distinguish between them.

Who should hold the liability for the harms
- Consumer (solvent, or insolvent)
- Manufacturer (enough money to cover the liability)
- Taxation or mandatory insurance
Introduction (cont’d)

This paper studied this topic in economic aspect

- A dangerous product
- A perfectly competitive market.
- Both consumers and manufacturers can affect the likelihood of damage
- Two basic liability:
  - Consumer liability and Residual-manufacturer liability
- Assumptions about the consumers
  - Homogeneity: The latter are preferred.
  - Heterogeneity: The latter may distort the markets.
Model Setup

A representative Consumer

- $w$ endowment to pay the liability
- $y$ the consumer’s precaution level when using the product
- $P(q)$ the marginal utility when using the $q$th unit of product, which is also the inverse demand.

Manufacturers

- Compete in the market by offering price-safety pair
- CRS technology
- $x$ investments in product safety (other costs normalized to zero)
Model Setup

The dangerous good

- \( d \) potential damage
- \( \pi(x, y) \), probability of damages to others
  decreasing in each argument, strictly convex, and \( \lim_{x \to 0} \pi_1(x, y) = -\infty \)

and \( \lim_{x \to 0} \pi_2(x, y) = -\infty \)

Social Welfare:

- \( S(x, y, q) = \int_0^q [P(z) - \pi(x, y)d - x - y]dz \)
- The first-best market outcome, \( x^*, y^*, q^* \), maximize social welfare.
Model Setup (cont’d)

Liability rules: \( \{\delta^c, \delta^m\} \)

- **Consumer-only liability:** \( \delta^c = \min\{d, w\} \) and \( \delta^m = 0 \)
- **Residual-manufacturer liability:** \( \delta^c = \min\{d, w\} \) and \( \delta^m = d - \min\{d, w\} \)

Market

- Manufactures choose price and product safety
- The consumer chooses his purchase quantity and precautions.
Model Setup (cont’d)

• In equilibrium, consumer surplus is maximized,

\[ \text{Max} \int_0^q [P(z) - \pi(x, y)\delta^c - x - y]dz \]

\[ \text{s.t.} \quad -\pi_2(x, y)\delta^c - 1 = 0 \]

\[ P(q) = \pi(x, y)\delta^c + y + p \]

\[ p \geq x + \pi(x, y)\delta^m \]

• The equilibrium outcome is compared to the social planner’s selection to study which liability rule is preferred.
Homogeneous Consumers

Proposition 1:
When the representative consumer is fully solvent then consumer-only liability achieves the first-best market outcome.
Now, the consumer pays in full for the damages. His unit cost will reflect the full social cost. So he purchases the socially optimal quantity.

Proposition 2:
When the representative consumer has limited financial assets then residual-manufacturer liability is optimal within the class of strict liability rules.
The consumer’s precautions fall short of first short of their first-best levels. The manufacturer changes the market price to reflect his share of the expected future damages in addition to the production cost. So the consumer’s unit cost also reflects the full social cost.
Heterogeneous Harm Levels

Two types of consumers with different price sensitivities

- L type: safe group consumers
- H type: harmful group consumer

Simplification of the model:

- Neither manufacturers nor consumers can affect the probability of damages to others
- Consumers are totally insolvent

Expected social harm of a single unit of the product:  \( \Delta_i = \pi_i d_i \)

- Assumption:  \( \Delta_H > \Delta_L > 0 \)

The demand curve is  \( D_i(p) \).

Result: Distortion in quantity.
Heterogeneous Harm Levels (cont’d)

The social planner’s decision:

- Can’t distinguish between two types of consumers. No first-best solution
- The second-best price reflects the marginal social harm, associated with the sale of one additional unit.

\[ p^* = \frac{\Delta_H D_H'(p^*) + \Delta_L D_L'(p^*)}{D_H'(p^*) + D_L'(p^*)} \]

The competitive equilibrium with the residual-manufacturer liability

- The manufacturer can’t distinguish too.
- The price reflects the average social harm.

\[ p^R = \frac{\Delta_H D_H(p^R) + \Delta_L D_L(p^{R*})}{D_H(p^R) + D_L(p^R)} \]
Heterogeneous Harm Levels (Main results)

Proposition 3:
If the harmful consumer group has a more elastic demand curve than the safe consumer group then the market quantity under residual-manufacturer liability is higher than the second-best quantity.

When the market price rises, the percentage of harmful consumers who leave the market is larger than the percentage of safe consumers who leave. The marginal purchaser is more likely to be a harmful consumer than the average purchaser in the market. Then the market price will be inefficiently lower than then second-best price. And the market quantity is inefficiently high.

Proposition 4 (part):
When the harmful consumer group has a less elastic demand then residual-manufacturer liability may perform better or worse than consumer-only liability.
Heterogeneous Financial Assets

Two types of consumers

- "0" type: completely insolvent. \( W=0 \)
- "1" type: fully solvent. \( W>d. \)

Simplification of the model:

- The probability of harm is additively separable in manufacturer and consumer precautions.

Incentive-compatible pairs of product offerings: \( \{p_0, x_0\} \text{ and } \{p_1, x_1\} \)

- Forming Competitive equilibrium if no manufacturer can earn positive profits by deviating to a different price-safety combination
- Pooling and separating equilibriums.
Heterogeneous Financial Assets (Main results)

Liability rules:

- **Consumer-only liability:** \( \{\delta^c_i, \delta^m_i\} = \{d, 0\} \) and \( \{\delta^c_0, \delta^m_0\} = \{0, 0\} \)
- **Residual-manufacturer liability:** \( \{\delta^c_i, \delta^m_i\} = \{d, 0\} \) and \( \{\delta^c_0, \delta^m_0\} = \{0, d\} \)

**Proposition 8:**
Suppose that consumer’s types are private information.

**Part 1**

With residual-manufacturer liability a pooling equilibrium does not exist.

If there exists a pooling equilibrium, the market price would rise to reflect the manufacturer’s liability associated with the insolvent consumers. The solvent consumers place greater weight on product safety. So a manufacturer can earn positive profits by providing a safer product at a price that only the solvent consumers would prefer.
Part 2

There exists a unique separating equilibrium when the proportion of insolvent consumers is not too small. The fully solvent consumers purchase excessively safe products and the insolvent consumers purchase optimally safe products. Conditional on the precaution levels, the efficient market quantities are obtained.

The solvent consumers buy a safer product with a higher price, which the insolvent would not buy. Also, the solvent consumers would not buy the product supplied to the insolvent. Although it’s cheaper, it’s more dangerous and the solvent may pay twice for liability.

But if the proportion of insolvent consumers is too small, a manufacturer may deviate from the separating equilibrium and get positive profits by providing a product with socially optimal safety and a relatively low price.
Conclusion

- If the consumers are homogeneous and insolvent, residual-manufacture liability is preferred.
- If the consumers are heterogeneous, residual-manufacturer liability can lead to distortions in the market quantities and product safety features, sometimes too big to be dominated by consumer-only liability.
- Taxes, which reflect the marginal social harm, may be a viable alternative. But the planner may lack necessary experience and time. And a tax would provide inadequate incentive for manufacturers to design safer products.
- Insurance policies have the similar problems as the residual-manufacturer.
- This paper doesn’t aim to define the contents liability, how much and how broad.