Insurance Monopoly and Imperfect Competition when Insurers Affect Risk

By Ronen Avraham and David Gilo

December, 2021

Overview

Sometimes, insurance companies can affect the distribution of damages.

Question: how does competition in the insurance market affect the risk from accidents?

- Background question: when is it better to allow collusion or 'joint lobbying' in the determination of risk?

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Model of insurance

Risk averse individuals: $U(A)$, where A is the final wealth

$$A = W - \text{ transfers } - \text{ uninsured damage}$$

Binary damage distributions. Characterized by:

p : probability of accident.

L : damage conditional on accident.

Authors are interested in two type of contracts:

- Fixed loading factor.
- Proportional loading factor.

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0. Insurance company/companies affect distribution of damage.
   - Affect L or p.
1. Insurance company/companies choose their quantities.
   - Monopoly or Cournot competition.
2. Consumers choose whether to buy insurance or not.
   - FLF: $\alpha \in \{0, 1\}$ pays premium $\alpha \cdot m$.
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Working backwards:

- Given U and W, what is the individual risk premium $r(p, L)$.
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- Interpretation of results for individual risk premium.
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Individual Choice

Lemma 1 and 3: if U is concave,

- $r(p, \cdot)$ is increasing in L for all p.
- $r(\cdot, L)$ is concave in p with $r(0, L) = r(1, L) = 0$ for all L.

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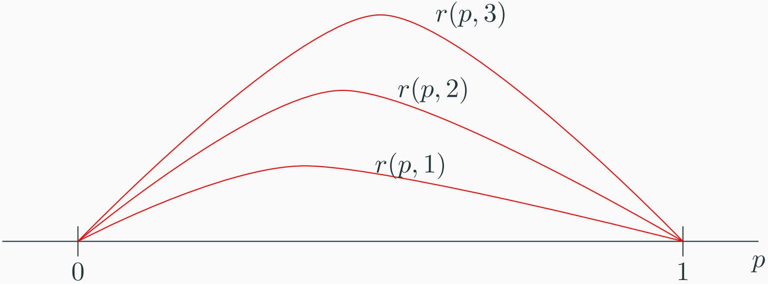

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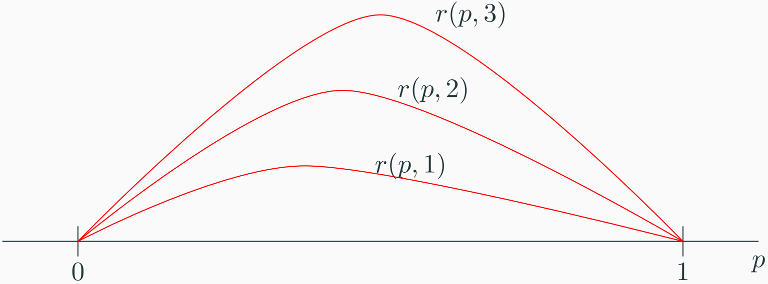

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Equation that characterizes r:

$$p \cdot U(W - L) + (1-p) \cdot U(W) = U(W - p \cdot L - r)$$

Changing variables:

$$p \cdot U\left(W - \frac{D}{p}\right) + (1-p) \cdot U(W) = U(W - D - \hat{r})$$

Totally differentiating w.r.t p we get:

$$\frac{\partial \hat{r}}{\partial p} = \frac{U(W) - U(W - D/p) - \frac{D}{p} U'(W - D/p)}{U'(W - D - \hat{r})} < 0$$

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- The insurer only likes higher probability of accident because it increases the expected damage.
- Fixing the expected damage D, the insurer prefers lower probability of accident.
- Non-monotonicity:
  - For small p, the effect of having a higher expected damage dominates the relatively higher probability of accident.
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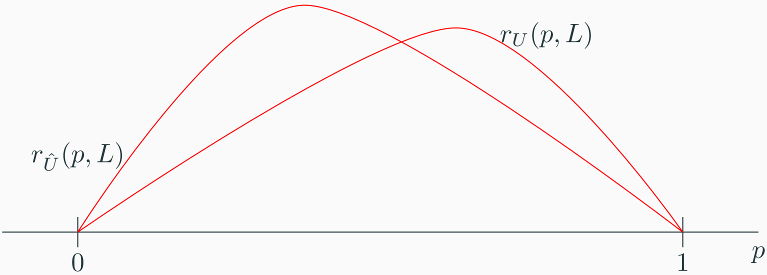

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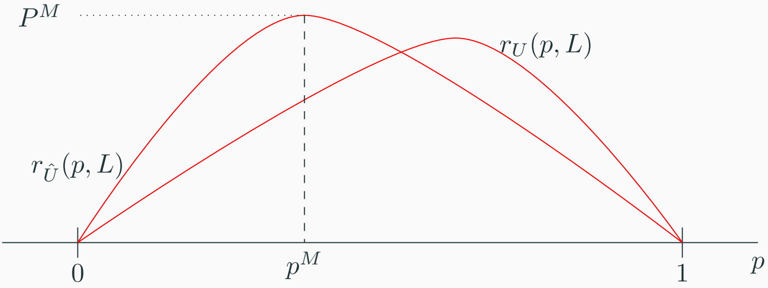

Suppose that there type $\hat{U}$ is much more prevalent in the population.

A monopolist might find optimal to only serve type $\hat{U}$.

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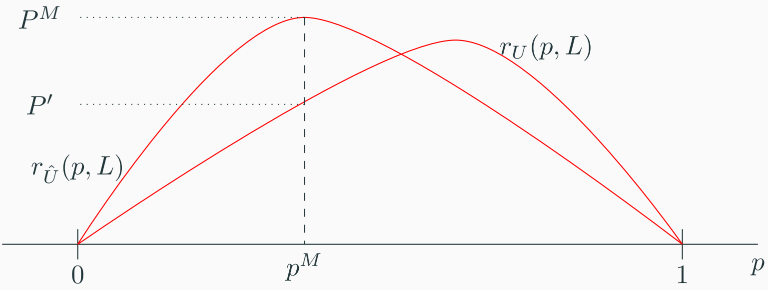

If a duopolist was choosing quantities given p^M they might supply more than the total amount of type $\hat{U}$ agents.

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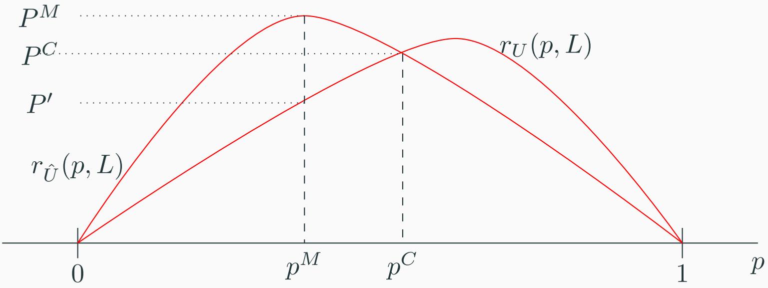

Market would clear at a lower price P'.

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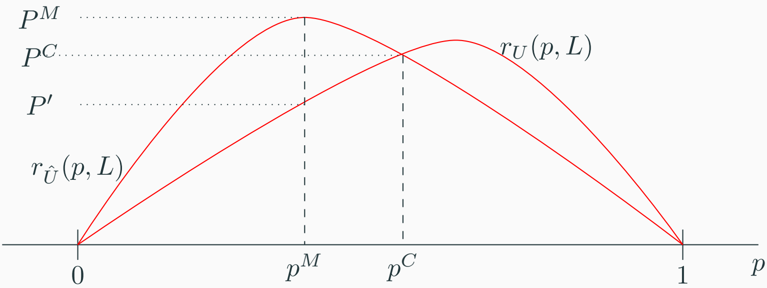

Duopolists would do better at p^C, where price is less sensitive to quantities produced.

Aggregation

Only restriction: U is concave.

This makes aggregation complicated. For given m, L, p some (U, W) are going to buy insurance and some are not.

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$$p \geqslant \frac{e^{\alpha m} - 1}{e^{\alpha L} - 1}$$

Under some conditions, threshold $\alpha(p, L, m)$.

Let G be the distribution of α. Aggregate demand takes the form

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