Vertical Contracting with Endogenous Market Structure

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$\Rightarrow$ Analyze endogenous retail market structures with asymmetric information between manufacturer and retailers

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3. Which factors determine the number of retailers?
4. What are the effects on welfare?

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- Lower number of retailers or vertical merger may increase welfare

Related Literature

- Opportunism problem with multiple retailers:
  - Hart and Tirole 1990, O'Brien and Shaffer 1992, Rey and Tirole 2007
  - Effect of off-equilibrium beliefs: McAfee and Schwartz 1994, Rey and Vergé 2004
  - Segal and Whinston 2003: menus of two-part tariffs reduce opportunism problem
- Dequiedt and Martimort 2015: informational opportunism with asymmetric information and public contracting
- Contracting with externalities: Segal 1999

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... we focus on **asymmetric information**

Outline

- Model
- Two Types
- Optimal Market Structure
- Example
- Welfare

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$\Rightarrow$ Opportunism problem and no full rent extraction

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$$\pi = \sum_{i=1}^{N} T_i\left(m_i\right) - c\left(\sum_{i=1}^{N} x_i\left(m_i\right)\right)$$

R_i's profit is

$$u_i = \left[P\left(\sum_{j=1}^{N} x_j\left(m_j\right)\right) - \theta\right] x_i\left(m_i\right) - T_i\left(m_i\right)$$

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- Perfect Bayesian Equilibrium with **passive** (and **wary**) beliefs

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- M chooses between 1 and 2 retailers

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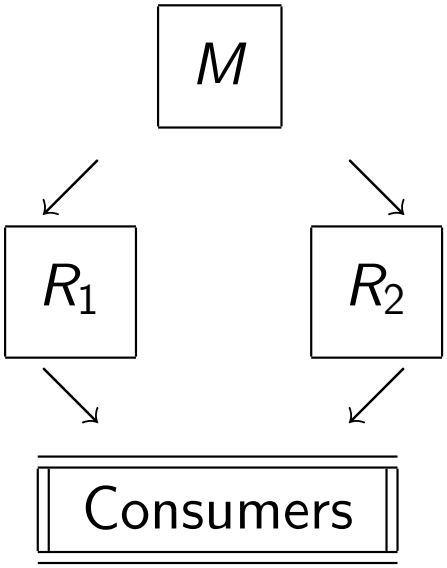
$\Rightarrow$ High-cost type's quantity is downward distorted

Opportunism Problem with Complete Information

- $N = 2$: competing retailers



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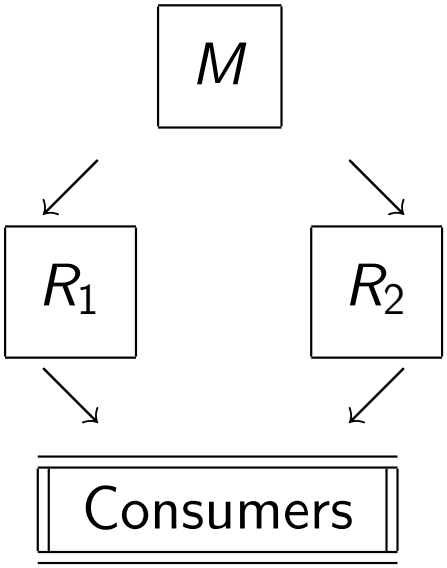

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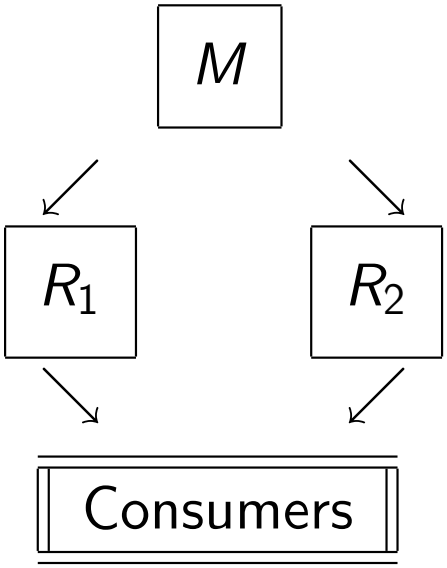

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$\Rightarrow$ M cannot obtain monopoly profit

Competing Retailers with Private Information

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$\Rightarrow$ R_i has lower incentive to misreport θ (than without R_j)

One vs. Two Retailers

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- Monopolistic retailer eliminates opportunism problem

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- R_i's **information rent** is

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- Stronger competition among retailers reduces their information rents

Optimal Bilateral Contract

- M solves

$$\max_{x_i(\cdot)} \int_{\underline{\theta}}^{\overline{\theta}} \left[\left(P(\cdot) - \theta - h(\cdot) \right) x_i(\cdot) - c(\cdot) \right] dF(\theta) + \\ + \int_{\underline{\theta}}^{\overline{\theta}} h(\cdot)(N-1) P'(\cdot) \dot{x}^*(\cdot) x_i(\cdot) \, dF(\theta)$$

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- **Lemma.** $x^*(\theta) < x^C(\theta)$ *for every* $\theta > \underline{\theta}$ and $\dot{x}^*(\theta) < 0$

Optimal Retail Network

- $\pi^*(N) = M$'s profit with N (continuous number of) retailers

Theorem

M never uses a single retailer because

$$\lim_{N \to 1^+} \frac{\partial \pi^*(N)}{\partial N} > 0.$$

Optimal N is finite because $\pi^*(1) > \lim_{N \to \infty} \pi^*(N)$.

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- At $N = 1$, opportunism problem vanishes and negative effect of increasing N is second order

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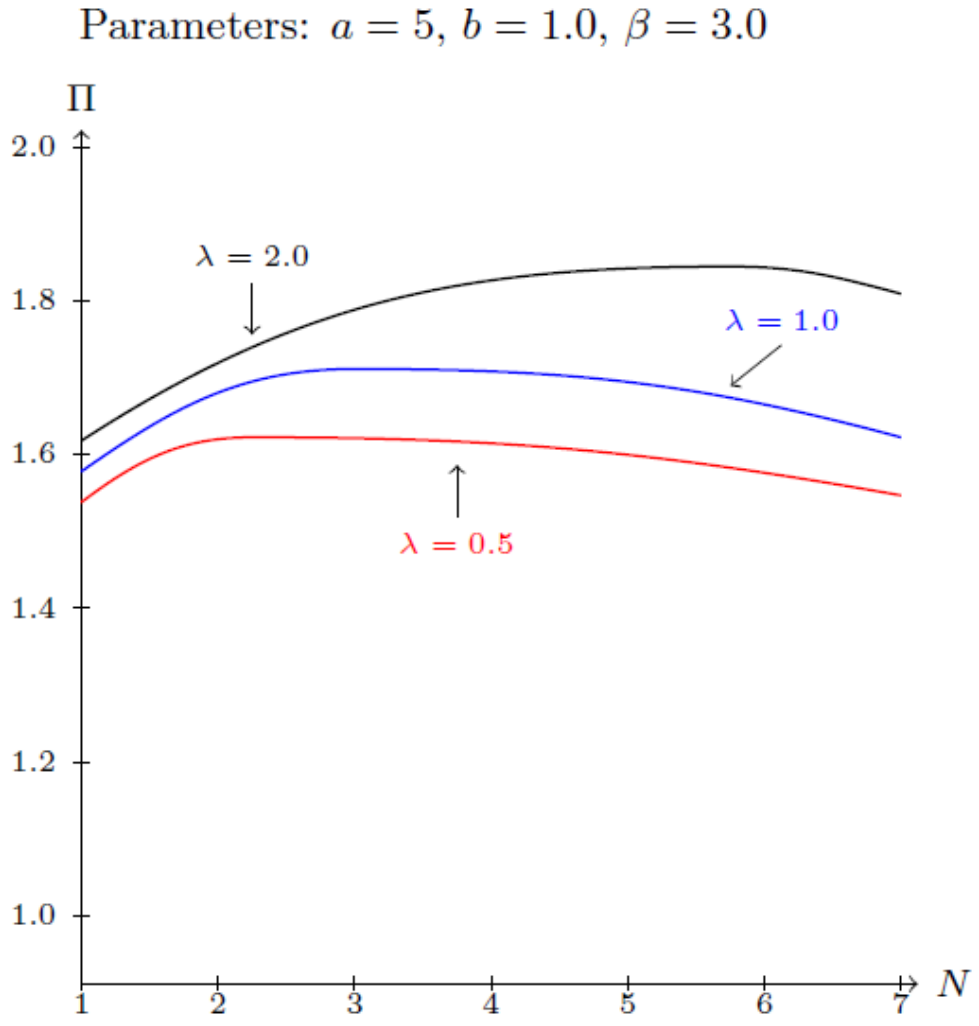
$\Rightarrow$ weaker opportunism problem and higher information rents

- As λ increases, retailers' are more likely to have low cost and information rents increase



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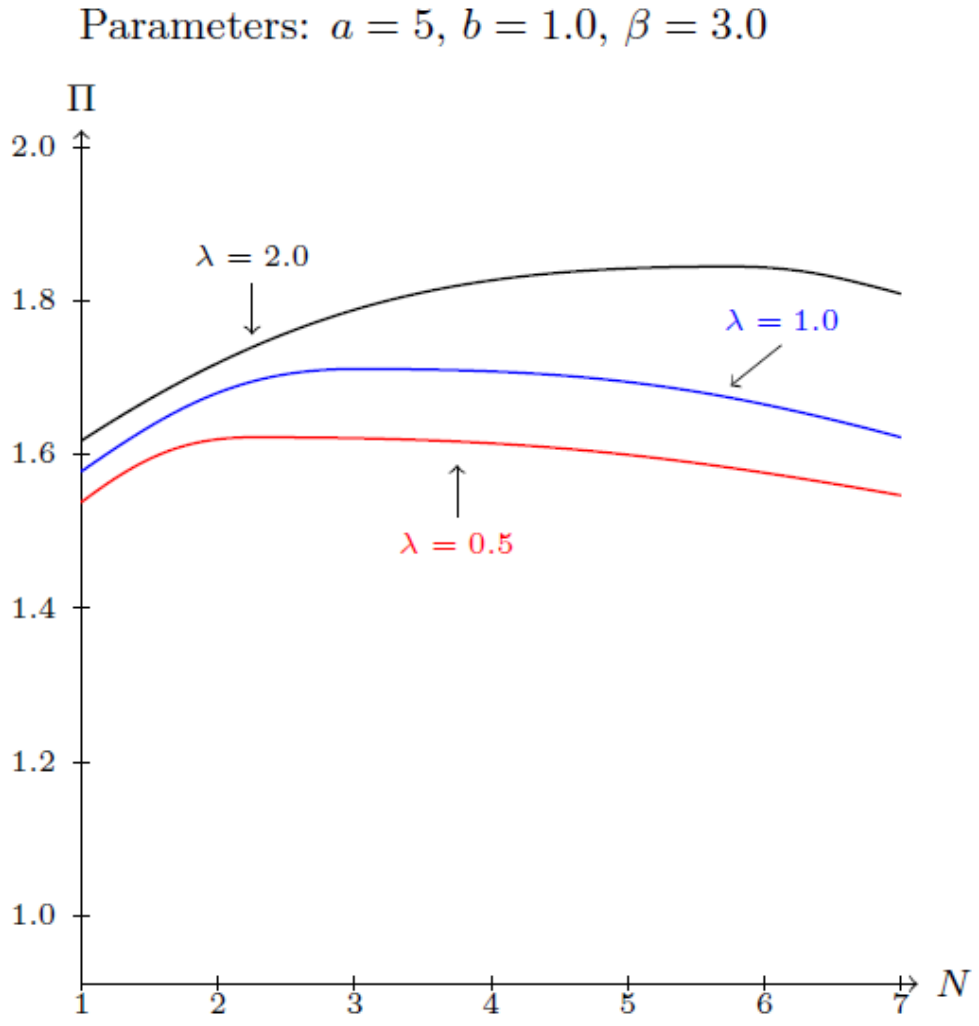

$\Rightarrow$ Optimal N is increasing in λ: 3 for $\lambda = 1$, 6 for $\lambda = 2$

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- Linear-quadratic framework, $\lambda = 1$

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- Large $\beta/b \Rightarrow$ large distortion to reduce information rent (because profit of a retailer who overeports cost is large)

Extensions

- Wary beliefs
- Price competition
- Imperfect cost correlation
- Alternative mechanisms:
  - Sequential contracting
  - Auction among retailers

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  - When M offers larger quantity to R_i, R_i assumes that M sells less to R_j and R_i is willing to pay higher tariff

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- With asymmetric retailers, higher N increases output variance and profit (function convex in price)

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- With sequential entry, only 1 retailer participates and the auction price is 0

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- Welfare may increase with fewer retailers or vertical merger