Strategic Delegation, Bargaining, and Location Choice

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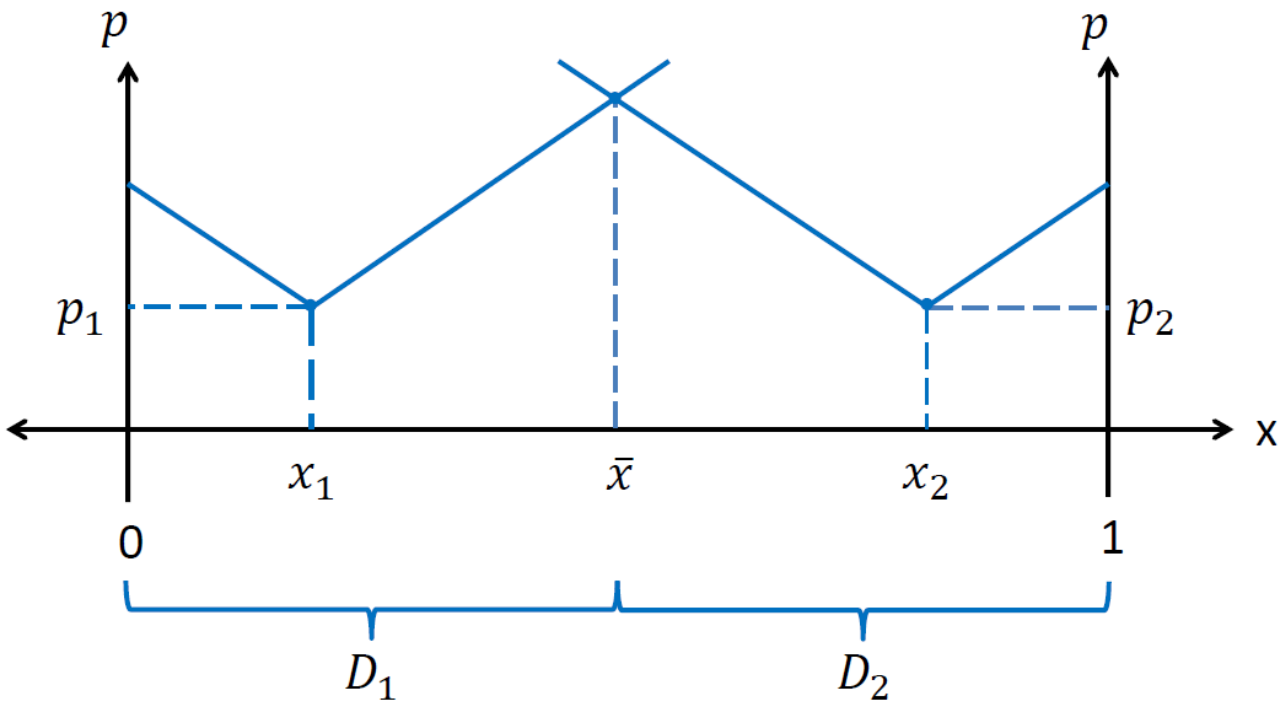
Introduction

Location choice

- Location choice (e.g. Hotelling, 1929; d'Aspremont et al.,1979; Tabuchi and Thisse, 1995)



Introduction

Location choice

- Location choice
  - Basic Hotelling model with uniformly distributed consumers and quadratic transportation costs
  - Consumers' utility

$$u_x = \begin{cases} v - t(x_1 - x)^2 - p_1 & \text{if bought from firm 1,} \\ v - t(x_2 - x)^2 - p_2 & \text{if bought from firm 2,} \end{cases} \tag{1}$$

  - Firm demand

$$D_1 = \overline{x} = \frac{x_1 + x_2}{2} + \frac{p_2 - p_1}{2t(x_2 - x_1)}, \quad D_2 = 1 - D_1. \tag{2}$$

  - Restricting the location increases consumer welfare

- Main purpose of our paper
  - Model closer to reality
  - Enrich the microstructure of the models

Introduction

Strategic delegation

- Owner-managed firms are very rare

  $\Rightarrow$ Strategic delegation (e.g. Fershtman and Judd, 1987; Sklivas, 1987; Matsumura and Matsushima, 2012)
  - Managers' compensation $M_i = A_i + B_i * U_i$
    - fixed component A_i, bonus rate B_i,
    - $U_i = \lambda_i \pi_i + (1 - \lambda_i) D_i$,
    - profits π_i, weight put on sales/profits λ_i, sales D_i
  - Managers determine quantity or price that maximize compensation M_i
  - Owners set contract parameters that maximize profits net of compensation $\pi_i - M_i$
- Matsumura and Matsushima (2012)
  - Restricting the location reduces consumer welfare

Introduction

Bargaining

- Take-it-or-leave-it contracts in manager-owner relationships nonexistent

  $\Rightarrow$ Bargaining (e.g. Fershtman, 1985; van Witteloostuijn, 2007; Nakamura, 2008)
  - Base salary A_i and bonus rate B_i outcome of a bargaining process
  - Bargaining process represented by generalized Nash bargaining solution
  - Nash-product

$$N_i = M_i^{\beta}(\pi_i - M_i)^{1-\beta}, \tag{3}$$

    - β represents bargaining power of managers
    - disagreement points are 0

Model

Starting Point: Matsumura and Matsushima (2012)

- Basic Hotelling model with 2 firms
- Owners delegate location and price decision authority to managers
- All decision makers are risk-neutral
- Firms are allowed or are not allowed to locate outside the linear city
- Firm gross profits

$$\pi_i = (p_i - c)\ D_i. \tag{4}$$

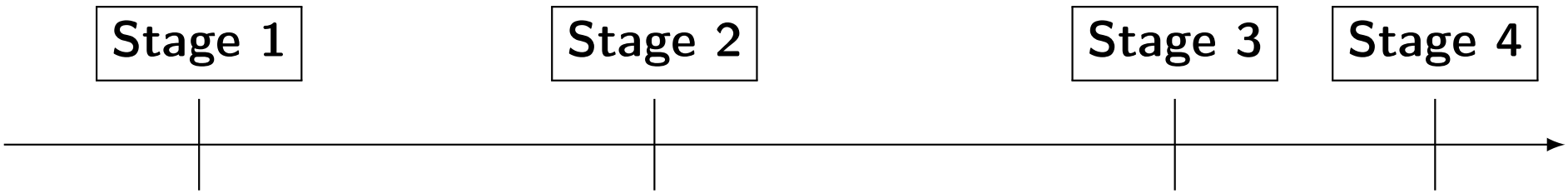
- Consumer surplus

$$CS = \int_0^{D_1} (v - p_1 - t(x - x_1)^2)dx + \int_{D_1}^1 (v - p_2 - t(x_2 - x)^2)dx. \tag{5}$$

- Managers' compensation $M_i = A_i + B_i * U_i$
  - $U_i = \pi_i + \lambda_i D_i$,
  - weight put on sales $\lambda_i \geq 0$
  - Sales delegation equal to market share delegation

Model

Starting Point: Matsumura and Matsushima (2012)



Owners set incentive parameter λ_i.

Owners and managers bargain over the base salary A_i and the bonus rate B_i.

Managers choose location x_i.

Managers choose prices p_i.

Figure : Timeline 1

Modification 1: Results

Lemma (1)

When the firms' locations are restricted and owners and managers bargain over the contract parameters A_i and B_i, the equilibrium outcome is:

$$x_1^{UR} = 0, \quad x_2^{UR} = 1, \quad \lambda_i^{UR} = 0, \quad p_i^{UR} = c + t, \quad A_i = \frac{t}{2}(\beta - B_i),$$

$$(\pi_i - M_i)^{UR} = \frac{t}{2}(1-\beta), \; M_i = \frac{t}{2}\beta, \; CS^{UR} = v - \frac{12c + 13t}{12}, \; i = 1, 2.$$

When the firms' locations are not restricted and owners and managers bargain over the contract parameters A_i and B_i, the equilibrium outcome is:

$$x_1^{UR} = -\frac{1}{4}, \quad x_2^{UR} = \frac{5}{4}, \quad \lambda_i^{UR} = \frac{3t}{4}, \quad p_i^{UR} = c + \frac{3t}{4}, \; A_i = \frac{3t}{8}(\beta - 2B_i),$$

$$(\pi_i - M_i)^{UR} = \frac{3t}{8}(1-\beta), \; M_i = \frac{3t}{8}\beta, \; CS^{UR} = v - \frac{48c + 85t}{48}, \; i = 1, 2.$$

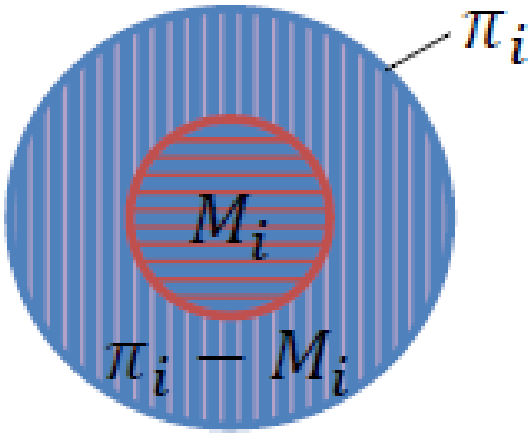
Modification 1: Results

- The results in Matsumura and Matsushima (2012) are robust against bargaining
  - The bargaining power β only influences the base salary and thus the distribution of profits
  - Managers have an incentive to locate far away from each other
  - Only if location is unrestricted, firms would want to set a $\lambda_i \geq 0$

Further Conclusions & Further Research

- Bargaining over the contract terms implements the same results as if owners offer a take-it-or-leave-it contract.
- Intuition
  - A_i and B_i do not influence location and pricing decision of manager
  - A_i and B_i just influence the distribution of the generated pie
  - λ_i influences the size of the pie
  - Independent of the distribution, both parties want to make the pie as big as possible

- What we also did
  - Modification 2: λ_i not restricted
  - Modification 3: different decision authority and timing



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Introduction

Strategic delegation

- Strategic delegation (e.g. Fershtman and Judd, 1987; Sklivas, 1987; Matsumura and Matsushima, 2012)
  - Managers' compensation $M_i = A_i + B_i * U_i$
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    - $U_i = \lambda \pi_i + (1 - \lambda_i) D_i$,
    - incentive parameter λ_i, sales D_i
  - managers determine quantity or price that maximizes compensation M_i
  - owners set contract parameters that maximize profits net of compensation $\pi_i - M_i$
  - must take incentive compatibility constraint and participation constraint into account
  - if both are risk neutral original maximization problem reduces to

$$\begin{array}{lll} \max\limits_{A_i, B_i, \lambda_i} & \Pi_i - M_i & \\ s.t. & M_i \geq \underline{U} & (PC) \\ & \max\limits_{p_i / q_i} \; M_i & (ICC) \end{array} \quad \Rightarrow \quad \begin{array}{lll} \max\limits_{\lambda_i} & \Pi_i \; (-\underline{U}) & \\ s.t. & M_i = \underline{U} & (PC) \\ & \max\limits_{p_i / q_i} \; U_i & (ICC) \end{array}$$

Introduction

Three aspects of firm decisions

- bargaining (e.g. Fershtman, 1985; van Witteloostuijn, 2007; Wang et al., 2008)
  - use the reduced maximization problem
    - correct the wrong approach
  - consider bargaining over incentive parameter λ_i
    - bargain over base salary A_i and bonus rate B_i
    - owners set λ_i

$$\begin{array}{ll} \max\limits_{A_i,B_i,\lambda_i} & \Pi_i - M_i \\ s.t. & M_i \geq \underline{U} \quad (PC) \\ & \max\limits_{p_i/q_i} \; M_i \quad (ICC) \end{array} \quad \Rightarrow \quad \begin{array}{ll} \max\limits_{\lambda_i} & \Pi_i \; (-\underline{U}) \\ s.t. & M_i = \underline{U} \quad (PC) \\ & \max\limits_{p_i/q_i} \; U_i \quad (ICC) \end{array}$$

Modification 2

- λ is not restricted ,
  - owners can actually punish managers for pursuing greater market share
  - only relevant if location is restricted
- Results

Lemma (2)

When the firms' locations are restricted and owners and managers bargain over the contract parameters A_i and B_i, the equilibrium outcome is:

$$x_1^{UR} = 0, \quad x_2^{UR} = 1, \quad \lambda_i^{UR} = -t, \quad p_i^{UR} = c + 2t, \quad A_i = t(\beta - \frac{B_i}{2}),$$

$$(\pi_i - M_i)^{UR} = t(1-\beta), \quad M_i = t\beta, \quad CS^{UR} = v - \frac{12c + 25t}{12}, \quad i = 1, 2.$$

- The negative λ serves as a collusion device
- Restricting the location beneficial for consumers

Modification 3

- Decision authority and timeline
  - owners instead of managers determine optimal location
  - location choice before bargaining
  - λ_i still unrestricted

Stage 1	Stage 2	Stage 3	Stage 4
Owners choose location.	Owners set incentive parameter λ_i.	Owners and managers bargain over the base salary A_i and the bonus rate B_i.	Managers choose prices.

Figure : Timeline 2

Modification 3: Results

- Location is restricted $\Rightarrow$ results unchanged

Lemma (3)

When the firms' locations are not restricted and owners and managers bargain over the contract parameters A_i and B_i, the equilibrium outcome is:

$$x_1^{UR} = -\frac{3}{4},\ x_2^{UR} = \frac{7}{4},\ \lambda_i^{UR} = -\frac{5t}{2},\ p_i^{UR} = c + 5t,\ A_i = \frac{5t}{4}(2\beta - B_i),$$

$$(\pi_i - M_i)^{UR} = \frac{5t}{2}(1-\beta),\ M_i = \frac{5t}{2}\beta,\ CS^{UR} = v - \frac{48c + 289t}{48},\ i = 1, 2.$$

- Owners will locate farther away from each other
- λ_i will be very small
- Prices will be very high
- Not restricting the location is beneficial for consumers