Exclusionary Pricing When Scale Matters

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Outline

- **Motivation**: anticompetitive effects of price discrimination (PD), in particular rebates - hot debate
- **Model setup**: the general *m*-buyer case
- **Equilibria**: uniform vs. discriminatory pricing
- **A simple example**: 1 large + 2 small buyers (not presented here)
- **Policy Implications**

1.1 Policy debate on rebates

- **EU case law:** tough stance against rebates, **per se illegal** if used by a dominant firm (even if standardized quantity discounts)
- **US case law: competition on the merits**; burden to prove discounts are anticompetitive is on plaintiff (high standard)
- **Microsoft Licensing Case (1994-95)**: quantity discounts explicitly declared **lawful**.

1.2 Objectives of this paper

- Can PD be **anticompetitive**, i.e. exclude a more efficient entrant who can use the same price instruments?
- Which **price levels** will prevail in equilibrium for any **given market structure**?
- What are the **policy implications** regarding the use of PD by dominant firms?

1.3 Related Literature

- **Exclusive dealing** and entry deterrence:
  - Aghion/Bolton (AER, 1987), Rasmusen et al. (AER, 1991), Segal/Whinston (AER, 2000), Fumagalli/Motta (AER, 2006)
  - Miscoordination issues as well, but here different timing; also, network industry here.
- **Discrimination** and entry deterrence:
  - Innes/Sexton (AER, 1993): "Divide and Conquer"
  - Armstrong/Vickers (JIE, 1993): "Sheltered" vs. "Competitive Segment"

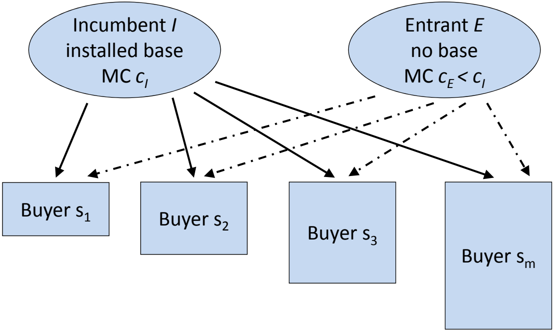
2. Model Setup

- 2 firms, I and E, with $c_I, c_E \in (0, 1)$ and $c_E < c_I$
- Neither firm has to pay costs of entry
- Simple **network externality** model: buyers receive positive utility from consuming only if network above a given **critical size** $\bar{s} \leq 1$ (i.e. **scale effects** on the demand side, not supply side)
- I has **installed base** exceeding $\bar{s}$ (old buyers); E has size 0 when game starts, and new buyers appear
- The two networks are **incompatible**.

2. Model Setup cont'd

- There are m different **new buyers** indexed $i = 1, \ldots, m$, with **inelastic demands** s_i, where $s_1 \leq s_2 \leq \ldots \leq s_m$ and $\sum_i s_i = 1$
- No reselling or side-payments among buyers
- Buyers' **willingness-to-pay** for k's good is 1 if k's network size exceeds $\bar{s}$, and zero otherwise. $(k = I, E)$
- **Key Assumption**: $s_m < \bar{s}$, so that winning only one buyer's orders (even if it is the largest buyer) will not be sufficient for E to reach the minimum network size

Figure 1: Market Structure



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2. Model Setup cont'd

Timing of the game:

- $t = 0$: I and E simultaneously make offers (prices must be non-negative, but not restricted otherwise)
- $t = 1$: Each buyer decides which firm to patronize

Note difference with **Segal and Whinston (2000)**: I and E set prices simultaneously - no first-mover advantage for I

2. Model Setup cont'd

Immediate implications of model setup:

- **Unique socially efficient allocation** is for E to serve all new buyers.
- A **monopolist** will never price discriminate; in our model, PD can only arise as a result of **strategic interaction**.

3. Equilibrium Solutions

As in Segal and Whinston (2000), **two types of pure-strategy Nash equilibria** emerge in our game:

- All buyers buy from I **("exclusionary equilibria")** - exist for any price regime, but not coalition-proof
- All buyers buy from E **("entry equilibria")** - coalition-proof, but existence depends on price regime

3.1 Exclusionary Equilibria

Proposition 1: *(Exclusionary equilibria) There always exist pure-strategy Nash equilibria where I serves all buyers. In such an equilibrium, I sets* $\tilde{p}_I^i \in [0,1]$ *for all* $i = 1, \ldots, m$*, where* $\sum_i s_i \tilde{p}_I^i \geq c_I$*, E sets some* $\tilde{p}_E^i \in [0,1]$ *such that* $\tilde{p}_E^i \leq \tilde{p}_I^i \forall i$*, and in all continuation equilibria where* $p_E^i \leq \tilde{p}_I^i$*, all buyers buy from I.*

- Even **monopoly price** can be sustained in equilibrium!
- No incentive for individual buyer to deviate, given that all others buy from *I*
- Equilibria **not robust to coalition formation** among buyers

3.2 Entry Equilibria

Proposition 3: *(i) Under* **uniform pricing**, *an entry equilibrium in pure and undominated strategies exists for any* $c_E < c_I$; *it is characterized by:* $\tilde{p}_E^i = \tilde{p}_I^i = c_I$ *for all* i, *and all buyers buy from* E.
(ii) Under **first-degree PD**, *a pure strategy entry equilibrium only exists for* $c_E \leq \tilde{c}_I$ *where* $\tilde{c}_I \ll c_I$; *when it exists, all buyers buy from* E, *and* $\tilde{p}_E^i = \tilde{p}_I^i \leq c_I$ *for all* i, *with strict inequality for at least one* i.

3.2 Entry Equilibria cont'd

Intuition for Results

- **Discrimination** allows I to **break entry equilibria** when c_I is small.
- Suppose $m = 2$, and both buyers are offered $p_E = p_I = c_I$ (candidate equilibrium à la Bertrand)
- I could deviate by setting $p_I^1 = c_I - \epsilon$, stealing buyer 1 from E and locking in buyer 2, who then has to pay $p_I^2 = 1$
- For small enough ϵ, I can still make profits: $s_1(c_I - \epsilon) + s_2 \cdot 1 > c_I$

3.2 Entry Equilibria cont'd

Thus, for an entry equilibrium to exist, we must have:

- 1. *E*'s offer to buyer 1 matches I's best offer to this buyer:

$$s_1 p_I^1 + s_2 \cdot 1 = c_I \Rightarrow p_I^1 \ll c_I$$

- 2. *E*'s offer to buyer 2 matches I's best offer to this buyer:

$$s_1 \cdot 1 + s_2 p_I^2 = c_I \Rightarrow p_I^2 \ll c_I$$

- 3. *E* still breaks even at these prices:

$$\underbrace{s_1 p_I^1 + s_2 p_I^2}_{=\tilde{c}_I \ll c_I} \geq c_E$$

3.3 Other forms of price discrimination

- Suppose first-degree PD not possible, but buyers differ sufficiently in size to **implicitly discriminate by quantity**: $p_I^i = p_I(q_i)$.
- I's deviation offers essentially the same, but have to satisfy **"self-sorting constraints"** in addition.

$$CS(s_i) \geq CS(q_i \neq s_i) \forall i = 1, \ldots, m$$

- Thus, quantity discounts are a **weaker instrument of discrimination**, hence less exclusionary.

3.4 Summary Equilibrium Solutions

Effects of PD on market structure:

- Under uniform pricing, **both** exclusionary and entry **equilibria exist** for entire parameter space.
- Under PD,
  - for $c_E \leq \tilde{c}_I$, **both** exclusionary and entry **equilibria exist**.
  - for $c_E \in (\tilde{c}_I, c_I)$, **only exclusionary equilibria exist**.

3.4 Summary Equilibrium Solutions cont'd

Welfare effects:

- For consumers:
  - **PD makes no difference** for exclusionary equilibria (artefact of the model)
  - **Lower prices** ($p_E < c_I$) under entry equilibria
- For total welfare:
  - PD reduces parameter space for which the **unique socially efficient equilibria** (namely entry equilibria) exist.
  - **Possible underinvestment** because E can no longer appropriate the full efficiency rent $c_I - c_E$

4. Policy Implications

- **Prohibiting PD by a dominant firm:** in particular the most "targeted" forms of PD; but PD potentially good when buyers have different valuations
- **Prohibiting below-cost pricing by a dominant firm:** effective in preventing exclusion in our model; likely no pro-competitive reason for below-cost pricing, at least in mature network markets.
- **Interoperability:** eliminates incumbency advantage, but possible conflict with IPRs and investment incentives
- **Buyer Power:** exclusionary equilibria eliminated by buyer coalitions; but not sufficient to avoid "divide-and-conquer" type strategies