Exclusionary Pricing When Scale Matters

Liliane Giardino-Karlinger\textsuperscript{1}  Massimo Motta\textsuperscript{2}

\textsuperscript{1}University of Vienna
\textsuperscript{2}ICREA-UPF

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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"
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**.
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

Incumbent / installed base
MC $c_I$

Entrant $E$
no base
MC $c_E < c_I$

Buyer $s_1$
Buyer $s_2$
Buyer $s_3$
Buyer $s_m$
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 $I$
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 $\tilde{p}_i \in [0, 1]$ for all $i = 1, \ldots, m$, where $\sum_i s_i \tilde{p}_i \geq c_I$, E sets some $\tilde{p}_E \in [0, 1]$ such that $\tilde{p}_E \leq \tilde{p}_i \forall i$, and in all continuation equilibria where $p^E_i \leq \tilde{p}_i$, 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
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 $p^1_I = c_I - \epsilon$, stealing buyer 1 from $E$ and locking in buyer 2, who then has to pay $p^2_I = 1$

- For small enough $\epsilon$, $I$ 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:

   \[
   s_1 p^1_I + s_2 \cdot 1 = c_I \Rightarrow p^1_I \ll c_I
   \]

2. $E$’s offer to buyer 2 matches $I$’s best offer to this buyer:

   \[
   s_1 \cdot 1 + s_2 p^2_I = c_I \Rightarrow p^2_I \ll c_I
   \]

3. $E$ still breaks even at these prices:

   \[
   s_1 p^1_I + s_2 p^2_I \geq c_E \\
   = \bar{c}_I \ll c_I
   \]
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.
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.