Competition with Capacity Constraints and Non-Linear Pricing, with an Application to Mergers

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Motivation

- Several industries are characterized by firms facing **capacity constraints**.
- Canonical model is **Bertrand-Edgeworth model** in which capacity-constrained firms set **linear prices** to consumers.
  - The resulting equilibrium is in mixed strategies.
  - The model is intractable for many applied purposes.
- How competition with capacity-constrained firms works if firms charge **non-linear prices**?
- Are there **practical implications for merger control**?

Main elements

- A general number of firms, offering a homogeneous good.
- Firms can have different capacities but the authors consider **symmetric and constant marginal costs**.
- **Full non-linear pricing**: a firm can set a different price for each unit it sells (within its capacity limit).
- **Two possible rationing rules** (leading to the same equilibrium):
  - adaptation of the efficient rationing-rule;
  - Walrasian auctioneer.
- Benchmark with **rectangular demand**, then general demand

Main (theoretical) results

- **An equilibrium in pure strategies occurs**, in sharp contract to most results on Bertrand-Edgeworth model.
- In this equilibrium, a firm sets a price equal to:
  - **WTP of lowest-valuation** consumer for **pivotal units**;
  - **marginal cost** for **non-pivotal units**.
- To implement this equilibrium, firms' price schedules follow quantity discounts.
- The degree of market power in the industry is directly related to the degree of pivotality.

It seems simple, but...

$$p_i(u_i) = \begin{cases} v & \text{for} \quad u_i \in \left[0, \tilde{k}_i\right], \\ c & \text{for} \quad u_i \in \left(\tilde{k}_i, k_i\right], \end{cases} \qquad \bar{p} = \mu v + (1-\mu)\, c.$$

capacity share

$$s_i = k_i / k$$

$$e = (k - \theta)\,/k > 0$$

Excess capacity

$$\gamma_i = \max\{s_i - e, 0\}$$

$$\mu_i = \max\left\{\frac{s_i - e}{1 - e}, 0\right\}.$$

- **Pivotality measures (weakly) decreasing in excess supply and (weakly) increasing in market concentration.**

Main (applied) results

1. Merger effects are driven by the change in pivotality caused by a merger.
   - A set of specific results on how mergers change pivotality:

$$\frac{\Delta \bar{p}}{\bar{p}} = \frac{\Delta \mu}{\mu} m$$

2. Merger-induced change in pivotality depends on how many of the merging firms are pivotal.
3. It is possible to obtain simple closed-form solutions for merger effects that depend on parameters that are observable by competition authorities.

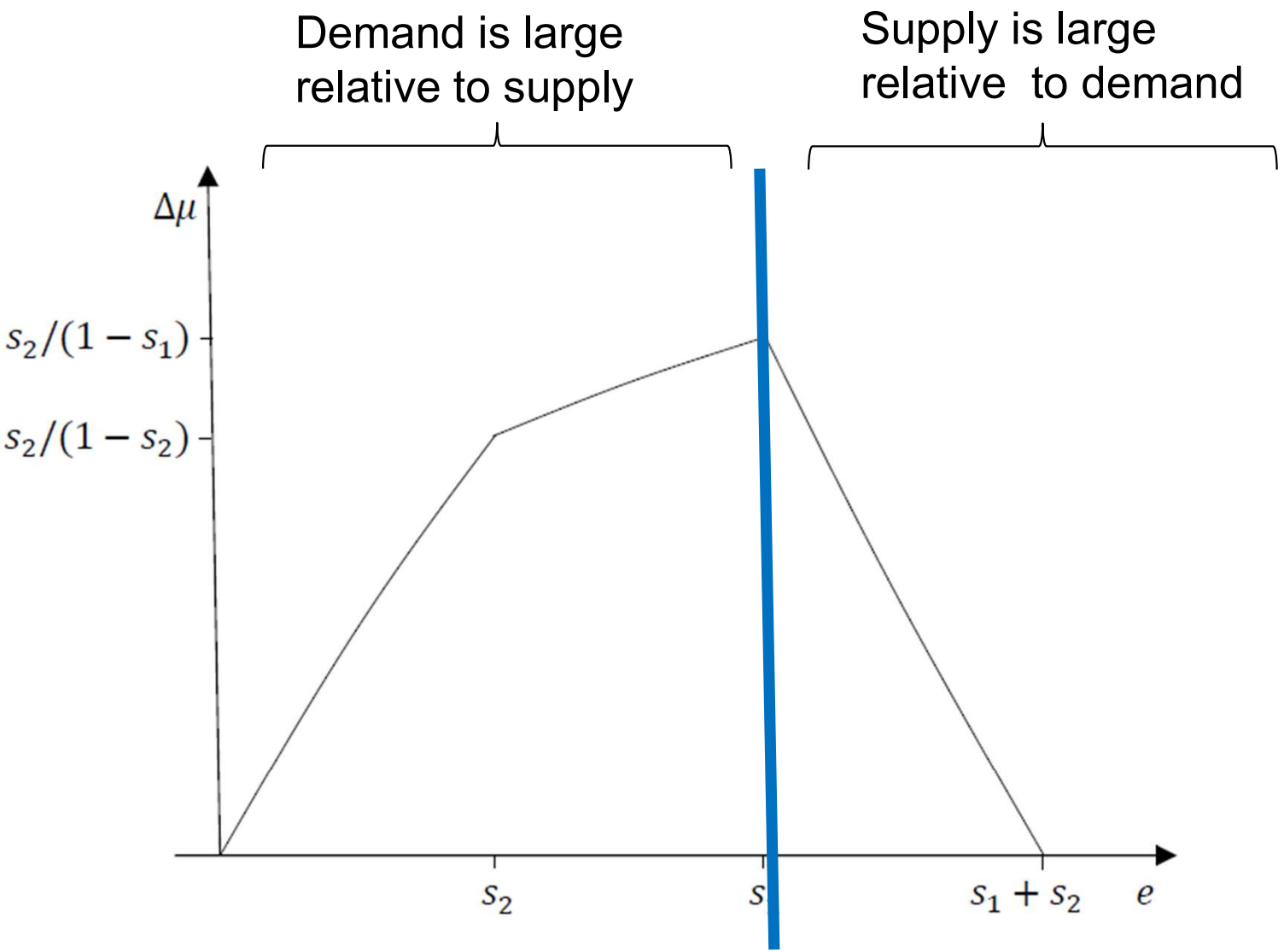

Figure 1: The impact of capacity utilization on merger effects

Main comments:

- Very interesting paper, motivated by the need to study industries with **capacity-constrained firms**.
- The model provides a micro-foundation for the use of pivotality analysis in antitrust and regulation.
  - It can useful for other models of competition that prominently feature capacity constraints (and hence pivotality).
- The paper is **still in progress** but it already contains many interesting results.
- It is **easy to follow**, with a simple benchmark (rectangular demand), a relevant extension (general demand), and main calculations in the Appendix.

Possible improvements:

- I was wondering if you can provide **specific cases** to which your methodology can apply.
  - How would your pivotality approach provide results that differ from standard merger analysis?
- What if the merger affects **total aggregate capacity**?
- The case of rectangular demand provides easy-to-use formulas for competition authorities…

  … but the general demand case also accounts for **how pivotality is distributed** between firms.
- Which one should we follow?
- What are the main policy implications of your analysis (back to my initial points…).