Merger Policy with Merger Choice

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Preliminary and incomplete
Introduction

- Traditional approach to review of horizontal mergers:
  
  Market power vs. efficiency gains

- Seminal papers:
  - Williamson (AER, 1968)
  - Farrell-Shapiro (AER, 1990)
• Literature typically considers a single merger in isolation:

1. No possibility of future mergers.

2. No possibility of alternative mergers today.

• Our first paper, *Dynamic Merger Review* (JPE, forthcoming), has addressed the first point.

• This paper, *Merger Policy with Merger Choice*, addresses the second point.
Merger Policy with Merger Choice

- Optimal policy when firms can choose *which* merger to propose.

- **Simplest possible setting:** Single target (firm 0), several potential acquirers. At most one merger can be proposed to the antitrust authority. No dynamics.

- **Main result:** Antitrust authority adopts a minimum CS-standard that is increasing in the size of the merging firms.

- Provides a justification for discriminating between mergers based on naive computation of post-merger Herfindahl index (over and above apparent effect on CS).
• Related papers:
  

  – Armstrong and Vickers (*Econometrica*, 2010). Abstract model that considers same issue. All projects (mergers) ex ante identical. Industry treated as an “agent.” (Literature on delegated agency without transfers.)
The Model

- Homogeneous-goods Cournot model with constant returns to scale.

Assumption 1 *For any $Q > 0$ such that $P(Q) > 0$:*

(i) $P'(Q) < 0$;
(ii) $P'(Q) + QP''(Q) < 0$;
(iii) $\lim_{Q \to \infty} P(Q) = 0$.

- Assumption implies that there exists a unique equilibrium. Unique equilibrium is stable.

- $K$ potential mergers, $M_1$ to $M_K$, each between firm 0 and merger partner $k \in \{1, \ldots, K\}$. 
• Firms 1 to $K$ ordered by pre-merger marginal costs: $c_1 > c_2 > \cdots > c_K$.

• There may be other firms in the industry.

• Merger: $M_k = (k, \bar{c}_k)$, where $\bar{c}_k \in [l, h_k]$ is post-merger marginal cost.

  – Feasibility and cost is stochastic, and independent across mergers. Set of realized feasible mergers is $\mathcal{F}$ (the “null merger” $M_0$ is always in this set).

  – Assume no mass points and full support of post-merger marginal costs.
• Pre-merger equilibrium:

\[
\{q_i^0\}_{i=0}^N, Q^0, CS^0, \{\pi_i^0\}_{i=0}^N.
\]

• Equilibrium after merger \( M_k \):

\[
\{q_i(M_k)\}_{i=1}^N, Q(M_k), CS(M_k), \{\pi_i(M_k)\}_{i=1}^N.
\]

• Induced change in CS:

\[
\Delta CS(M_k) \equiv CS(M_k) - CS^0.
\]

• Change in bilateral profit of merger partners:

\[
\Delta \Pi(M_k) \equiv \pi_k(M_k) - [\pi_0^0 + \pi_0^k].
\]
Antitrust policy: Commitment to approval set \( \mathcal{A} \equiv \{M_k : \bar{c}_k \in \mathcal{A}_k\} \cup M_0 \).

- At most one merger can be evaluated.
- No randomization.
- Null merger \( M_0 \) is always in this set.
- Restrict attention to unions of closed intervals.

For most of talk, antitrust authority’s objective is to maximize expected consumer surplus.

Key issue: Given antitrust policy, which merger \( M_k \) (if any) will be proposed?
• **For now:** Bargaining process given by Segal’s offer game (QJE, 1999).

  – Making take-it-or-leave-it offer, firm 0 sells itself to firm of its choosing. If offer is rejected, there is no merger.

  – Firm 0’s program:

  \[
  \max_{M_k} \Delta \Pi(M_k) = \pi_k(M_k) - [\pi_0^0 + \pi_k^0].
  \]

  – That is, firm 0 chooses the merger \( M_k \) that maximizes induced change in bilateral profit of merging parties.
• Define:

\[ M^* (\mathcal{F}, \mathcal{A}) \equiv \arg \max_{M_k \in \mathcal{F} \cap \mathcal{A}} \Delta \pi(M_k). \]

• Antitrust authority solves:

\[ \max_{\mathcal{A}} E_{\mathcal{F}} [\Delta CS(M^* (\mathcal{F}, \mathcal{A}))]. \]
• **Sequence of moves:**

1. Antitrust authority commits to approval set $\mathcal{A}$.

2. Firms learn realization of merger possibilities.

3. Bargaining between firms as to what merger to propose. (Offer game.)

4. Antitrust authority approves/rejects proposed merger (if any).

5. Cournot competition.
Analysis: Preliminaries

Lemma 1  Suppose merger $M_k$ is CS-neutral. Then

1. the merger causes no changes in the output of any nonmerging firm $i \notin \{0, k\}$ nor in the joint output of the merging firms 0 and $k$;

2. the merged firm’s margin at the pre- and post-merger price $P(Q^o)$ equals the sum of the merging firms’ pre-merger margins:
   \[ P(Q^o) - c_k = [P(Q^o) - c_0] + [P(Q^o) - c_k]; \]  
   \[ (1) \]

3. the merger is profitable for the merging firms;

4. the merger increases aggregate profit.
Lemma 2 A reduction in post-merger marginal cost $\bar{c}_k$ causes:

1. aggregate output $Q(M_k)$ and consumer surplus surplus $CS(M_k)$ to increase;

2. the induced change in the merging firms’ bilateral profit, $\Delta \Pi(M_k)$, to rise.
There is systematic bias in firms' proposal incentives relative to interests of consumers:

Lemma 3 Suppose two mergers, $M_j$ and $M_k$, with $k > j \geq 1$, induce the same non-negative change in consumer surplus, $\Delta CS(M_j) = \Delta CS(M_k) \geq 0$. Then the larger merger $M_k$ induces a greater increase in the merging firms' bilateral profit: $\Delta \Pi(M_k) > \Delta \Pi(M_j) \geq 0$.

Idea:

– For any CS-neutral merger $M_i$,

$$\Delta \Pi(M_i) = (P(Q^0) - c_0)q_i^0 + (P(Q^0) - c_i)q_0^0.$$  

– Extends to any CS-nondecreasing merger.
Can now draw a useful figure:

\[ \Delta \Pi \]

\[ \Delta CS \]

\[ 0 \]

\[ M_1 \]
\[ M_2 \]
\[ M_3 \]
\[ M_4 \]

**Note:** \( c_j < c_k \iff s_j^0 > s_k^0 \iff \Delta H_{M_j}^{\text{naive}} > \Delta H_{M_k}^{\text{naive}} \)

(Assumption 2: Each merger may or may not increase CS.)
Other Bargaining Processes

Efficient Bargaining

- “Efficient” bargaining: For any realized set of feasible and approvable mergers, the firms propose the one that maximizes aggregate profit.

- Bargaining processes leading to joint profit maximization:
  1. Multilateral Coasian bargaining under complete information.
To obtain that reduction in post-merger marginal cost increases aggregate profit (analog of Lemma 2, part (2)), one needs to impose additional structure. Holds, for instance, if pre-merger marginal cost differences are not too large.

Analog of Lemma 3:

Lemma 3 Suppose two mergers, $M_j$ and $M_k$, with $k > j \geq 1$, induce the same non-negative change in consumer surplus, $\Delta CS(M_j) = \Delta CS(M_k) \geq 0$. Then the larger merger $M_k$ induces a greater increase in aggregate profit.

Get same graph with $\Delta \Pi$ now denoting change in aggregate profit.
Main Result

• Let:

\[ \Delta CS_k \equiv \min\{\Delta CS(M_k) : M_k \in \mathcal{A}\} \]
\[ \Delta \Pi_k \equiv \min\{\Delta \Pi(M_k) : M_k \in \mathcal{A}\} \]

Proposition 1 Any optimal approval policy \( \mathcal{A} \) approves the smallest merger \( M_1 \) if and only if it is CS-nondecreasing, approves only mergers \( \{1, \ldots, \hat{K}\} \) with positive probability (\( \hat{K} \) may equal \( K \)) and satisfies:

\[ 0 = \Delta CS_1 < \Delta CS_2 < \ldots < \Delta CS_{\hat{K}}. \]
Proposition 1: The lowest allowable CS-level is increasing with merger size.
Note: Disapproval matters only when a merger is most profitable among feasible and allowable mergers.
Should approve any CS–nondecreasing smallest merger ($M_1$).
The lowest allowable CS-level for $M_k$, $\Delta \Pi_k$, equals the expected CS-level of the next most profitable allowable merger.
The lowest allowable CS-levels must be increasing in merger size.
Now instead reject $M_3$ if the change in CS less than (or equal to) $\Delta CS_2$. 

$\Delta CS_2 = \Delta CS$

Expected value

$\Delta \Pi < \Delta \Pi_2 \quad \Delta \Pi > \Delta \Pi_2$
Cut-off Rules?

ΔCS

Prob = 0.9

Prob = 0.1

ΔΠ
Extensions

- Price competition with differentiated products.
- Alternative welfare standard.
- Fixed cost synergies.
- More general set of potential mergers.
Price Competition with Differentiated Products

- Do our results hinge on specifics of Cournot model?

- Consider two models of price competition with differentiated products:
  - CES.
  - Multinomial logit.

- Like Cournot model, both models can be written as *aggregative games*.

- Common mathematical structure of equilibrium profit function used to show that merger curves can be ordered as before.
Alternative Welfare Standard?

\[ W = \lambda CS + (1-\lambda)\Pi \]

Suff Cdn: Any \( W \)-nondecreasing merger is cost-reducing.

\[ \Delta W = 0; \text{Slope} = -(1-\lambda)/\lambda \]
Fixed Cost Synergies? Result extends if $\Delta f_i = f + \varepsilon_i$, where $\varepsilon_i$ is iid and "small enough."
More General Set of Potential Mergers

• So far:

1. all potential mergers involve two firms;

2. firm 0 is part of each potential merger.

• What can we say in general (but continuing to assume that at most one merger can be proposed)?
• Key observation:

  – Conditional on being CS-neutral, induced change in aggregate profit (and, hence, in bilateral profit of merger partners) is proportional to induced change in Herfindahl index $H$.

  – Hence, in general, at $\Delta CS = 0$, the merger curves can be ranked on the basis of their induced change in the $H$.

  – But for CS-neutral mergers, this induced change in $H$ can be naively computed (by pretending that post-merger market share of the merged firm is equal to sum of pre-merger market shares of the merger partners).

• Hence, provided these curves do not intersect when $\Delta CS > 0$, our main result continues to hold.
Sufficient condition? For any $\Delta CS \geq 0$, curve of $M_k$ is to right of that of $M_j$ if:

1. $\Delta H_{M_k}^{naive} > \Delta H_{M_j}^{naive}$;
2. $\sum_{i \in M_k} s_i > \sum_{i \in M_j} s_i$;
3. $\#M_k \leq \#M_j$.
Conclusion

- Have analyzed simple model where pivotal firm, firm 0, can choose *which* merger to propose to antitrust authority.

- Antitrust authority’s optimal policy involves a higher minimum CS-standard the larger is the proposed merger.

- Analysis makes clear why discriminating between mergers on basis of naively computed post-merger Herfindahl indexes may be optimal.
• Open questions:
  – Other bargaining processes.
  – Full distribution of fixed cost synergies.
  – Correlation in synergies.
The End