

# Module 6: Mergers in a Dynamic World

Market Organization & Public Policy (Ec 731) · George Georgiadis

## Repeated Interaction:

- In simple static-pricing models, mergers may raise the price.
- This need not be true when firms interact repeatedly, and tacit collusion is a possibility.
- Mergers can be a double-edged sword:
  - They reduce the merging firms' incentives for cheating on tacit agreements;
  - *but* may raise profits when collusion breaks down, and thus indirectly increase the temptation to cheat (especially for non-merging firms).
- Compte, Jenny and Rey (EER, 2002): Effects of mergers on price in a repeated Bertrand model with capacity constraints and asymmetric firms.
  - Capacity constraints affect both the incentive to undercut the equilibrium price and the ability to punish deviators who undercut.
  - Mergers that consolidate the capacities of merging firms may or may not result in higher prices.
  - *Main results:*
    - \* If small firms have enough capacity such that strong punishment is possible regardless of the merger, then a merger that increases the size of the largest firm improves the ability to maintain the monopoly price.
    - \* If small firms have more limited capacity, then such a merger reduces this ability.

## Durable Goods

- Consumers' abilities to delay purchases in anticipation of future price reductions affect the ability to exercise market power; and may make tacit collusion easier by reducing the sales enjoyed by a deviating seller.

- Because consumers, anticipating the price war that is about to break out, will delay their purchases.
- Gul (RAND, 1987) and Ausubel and Deneckere (RAND, 1987): Oligopolists may be able to sustain a higher price than a monopolist.
- Used goods may constrain the pricing of even a monopolist; *e.g.*, if new goods depreciate in quantity but not in quality and the market is initially competitive, even a newly formed monopolist will not be able to raise the price above the competitive level until the current stock of used goods depreciates (Carlton and Gertner, JLawEcon, 1989).

## Entry

- Possibility of post-merger entry reduces the set of profitable mergers.
- Werden and Froeb (JIE, 1998): mergers that lead to entry are rarely profitable w/o efficiency improvements.
  - So the set of profitable mergers are more likely to be those that reduce costs.
- Easy entry conditions tend to make the DOJ / FTC more receptive to a merger.

## Endogenous Mergers

- Large literature that endogenizes the set of mergers that will occur absent any antitrust constraint.
  - Kamien and Zang (QJE, 1990); Gowisankaran and Holmes (RAND, 2004).
- *Main insight:* An unregulated merger process may stop far short of full monopolization.
- Intuition: *Hold-out problem*
  - If potential acquirees anticipate that the acquirer will purchase other firms, thereby raising the market price, they may insist on such a high price for their own firm as to make their acquisition unprofitable.
  - There may be no mergers occurring at all!

## Dynamic Merger Review (Nocke and Whinston, JPE, 2010)

- *Traditional approach:* tradeoff between market power and efficiency gains.
- Mergers are not one time events! Approval of a given merger will affect
  1. the welfare effects of potential future mergers; and
  2. the profitability of potential future mergers (and hence the likelihood of them being proposed).
- Optimal merger evaluation policy in a dynamic environment.
  - Objective is to maximize consumer surplus.
- *Main Result:* Under certain conditions, a myopic review policy is optimal.

### Model

- $n$  firms produce a homogeneous good and compete in quantities (Cournot competition).
- Each firm  $i$  has production cost  $c_i q_i$ .
- Inverse demand function  $P(Q)$ , where  $Q = \sum_i q_i$  is total output.
- *Assumptions:* For any  $Q > 0$  such that  $P(Q) > 0$ :
  1.  $P'(Q) < 0$  ;
  2.  $P'(Q) + QP''(Q) < 0$  ; and
  3.  $\lim_{Q \rightarrow \infty} P(Q) = 0$ .

### Static Analysis

- Assumptions imply that firm  $i$ 's best-response output  $b_i(Q_{-i})$  satisfies  $\frac{db_i}{dQ_{-i}} \in (-1, 0)$ .
- *Comparative statics:*
  - A reduction in  $c_i$  increases  $q_i^*$ , reduces  $q_j^*$  for all  $j \neq i$ , and increases  $Q^*$ .
  - Following any change in incentives of a subset of firms,  $Q^*$  increases (decreases) iff the equilibrium output of that set of firms increases (decreases).
- Consumer Surplus (CS) effect of mergers:

- Consider a merger between a subset  $M \subseteq N$  of firms.
- Let  $c_M$  denote the post-merger marginal cost.
- Aggregate output before (after) the merger is  $Q^*$  ( $\bar{Q}^*$ ).
- Merger raises CS iff  $\bar{Q}^* > Q^*$ ,

○ *Lemma 1:* If a merger is CS-neutral (*i.e.*,  $\bar{Q}^* = Q^*$ ), then:

1. it causes no changes in the output of any non-merging firm or the total output of the merging firms ;
2. the merging firm's profit margin satisfies

$$P(Q^*) - c_M = \sum_{i \in M} [P(Q^*) - c_i] = -P'(Q^*) \sum_{i \in M} q_i^* ; \quad (1)$$

3. the post merger marginal cost  $c_M < \min_{i \in M} \{c_i\}$  ; and
4. the merger is profitable (*i.e.*, it raises the joint profit of the merging firms).

○ Sketch of Proof:

- #1 follows from  $\bar{Q}^* = Q^*$  and  $\frac{dq_i}{dQ^*} \in (-1, 0)$ .
- #2 and #3 follow from Farrell and Shapiro (AER, 1990).
- #4 follows from the fact that merging firms can feasibly set quantity  $\sum_{i \in M} q_i^*$ , so that their post-merger profit equals the sum of their pre-merger profits.

○ Can re-write (1) as

$$c_M = \hat{c}_M(Q^*) = P(Q^*) - \sum_{i \in M} [P(Q^*) - c_i]$$

- A merger is  $CS \uparrow$  if  $c_M < \hat{c}_M(Q^*)$  and  $CS \downarrow$  if  $c_M > \hat{c}_M(Q^*)$ .
- *Note:*  $\hat{c}_M(Q^*)$  increases in  $Q^*$ . Follows from  $\frac{d\hat{c}_M(Q^*)}{dQ^*} = -(|M| - 1) P'(Q^*) > 0$ .

○ *Definition:* Two mergers involving firms in  $M_1$  and  $M_2$  are disjoint if  $M_1 \cap M_2 = \emptyset$ .

○ *Proposition 1:* The sign of the CS-effect of two disjoint mergers is complementary:

1. If a merger is  $CS \uparrow$  in isolation, then it remains  $CS \uparrow$  if another merger that is  $CS \uparrow$  in isolation takes place.

2. If a merger is  $CS \downarrow$  in isolation, then it remains  $CS \downarrow$  if another merger that is  $CS \downarrow$  in isolation takes place.

○ *Sketch of Proof:* (Proof follows from the fact that  $\hat{c}_M(Q^*)$  increases in  $Q^*$ .)

– Because each merger  $M_i$  is  $CS \uparrow$  in isolation,  $\bar{Q}_i^* > Q^*$ , and so  $\hat{c}_M(\bar{Q}_i^*) > \hat{c}_M(Q^*)$ .

– Suppose merger  $M_1$  occurs first (and is  $CS \uparrow$ ), followed by merger  $M_2$ .

– Then  $c_{M,1} < \hat{c}_M(Q^*)$ , and  $\hat{c}_M(Q_1^*) > \hat{c}_M(Q^*)$ .

– Since merger  $M_2$  is  $CS \uparrow$  in isolation,  $c_{M,2} < \hat{c}_M(Q^*) < \hat{c}_M(\bar{Q}_1^*)$ , so it is also  $CS \uparrow$  after merger  $M_1$  has occurred.

– Hence  $\bar{Q}_{12}^* > \bar{Q}_1^* \Rightarrow \hat{c}_M(\bar{Q}_{12}^*) > \hat{c}_M(\bar{Q}_1^*)$ , and so merger  $M_1$  remains  $CS \uparrow$ .

– Statement #2 is proved similarly.

○ *Proposition 2:* Suppose that merger  $M_1$  is  $CS \uparrow$  in isolation. Merger  $M_2$  is  $CS \downarrow$  in isolation, but  $CS \uparrow$  once merger  $M_1$  has taken place. Then:

1. Merger  $M_1$  is  $CS \uparrow$  (and hence profitable) conditional on merger  $M_2$  taking place.

2. The joint profits of the firms in  $M_1$  are higher if both mergers take place than if neither merger takes place.

○ *Sketch of Proof:* (Part 1)

– Consider implementing  $M_1$  first, followed by  $M_2$ .

\* CS increases after each step, and so the combined effect of the two mergers is positive.

– Now consider implementing  $M_2$  first, followed by  $M_1$ .

\* Combined effect is positive, while the effect of  $M_2$  in isolation is negative.

\* Therefore, CS must increase after  $M_1$  is implemented, which proves part 1.

## Dynamic Analysis

### Setup:

○ Set of possible (disjoint) mergers:  $\{M_1, \dots, M_K\}$ , where  $M_j \cap M_k = \emptyset$  for all  $j \neq k$ .

○ Time  $t \in \{1, \dots, T\}$

- Merger  $M_k$  becomes feasible at the start of period  $t$  with probability  $p_{k,t}$ , where  $\sum_t p_{k,t} \leq 1$ .
  - If a merger becomes feasible, it remains feasible thereafter.
  - Conditional on merger becoming feasible, firms in  $M_k$  observe a random draw of their post-merger marginal cost  $c_{M_k} \sim G_{k,t}$ .
  - Each firm observes the feasibility and efficiency of their own and rivals’ merger possibilities.
- At the start of each period  $t$ , all firms with feasible but not yet approved mergers decide whether to propose them or not.
  - Previously proposed but rejected mergers can be proposed again.
- In each period  $t$ , antitrust authority observes that a merger is proposed (and its marginal cost), and decides whether to approve it or not.
- All parties discount time at rate  $\delta \leq 1$ .

## Analysis

- Interested in the performance of “myopic” merger review policies, which in each period maximize consumer surplus given the set of proposed mergers and current market structure, ignoring the possibility of future mergers.
- Focus on the most *lenient* myopic CS-based merger policy.
  - Antitrust authority selects in each period the largest possible set of mergers amongst those sets that maximize consumer surplus.
- *Lemma 4*: If all feasible but not-yet-approved mergers are proposed in each period (so that the antitrust authority need not worry about firms’ incentives to propose mergers), then the most lenient, myopically CS-maximizing merger policy maximizes discounted consumer surplus for every realization of feasible mergers.
- *Note*: Assumption that “all feasible but not-yet-approved mergers are proposed in each period” is wolog, because if a merger is  $CS \uparrow$ , then it is also profitable.
- Proof follows from two features:

1. Complementarity of  $CS \uparrow$  mergers - implies that antitrust authority will never later regret approval of a  $CS \uparrow$  merger due to the appearance of a new  $CS \uparrow$  merger.
  2. Since the antitrust authority can always approve a merger at a later date, it will never later regret rejection of a merger that is  $CS \downarrow$  given the current market structure.
- *Proposition 3:* Suppose the antitrust authority follows the most lenient myopically CS-maximizing merger policy. Then:
    1. All feasible mergers being proposed in each period after any history is a SPE for the firms. In this eq'm, the outcome maximizes discounted consumer surplus for any realized sequence of feasible mergers.
    2. For each sequence of feasible mergers, every SPE results in the same optimal sequence of period-by-period consumer surpluses.
  - Result follows from Lemma 4 and observation that firms' proposal incentives are aligned with those of antitrust authority: any  $CS \uparrow$  merger is profitable regardless of whether it causes additional mergers to be approved.

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