Part VI. Theory of competition policy

Chapter 14. Cartels and tacit collusion
Introduction to Part VI

So far
- Positive approach
- Describe, explain workings of imperfectly competitive markets

In this part
- Normative approach
- Guidance for competitive policy
  - Basic postulate: competition is desirable as it promotes economic efficiency
  - Problem: firms might be tempted to reduce competition
  - Consequence: set of rules aiming at maintaining competition → competition (antitrust) policy
Organization of Part VI

- **Chapter 14. Collusive practices**
  - Price-fixing, market-sharing → firms eliminate competition between them
  - How does collusion emerge? How is it sustained?

- **Chapter 15. Horizontal mergers**
  - Examine potential effects on welfare
    - Negative: fewer independent decision makers
    - Positive: increased efficiency (synergies)

- **Chapter 16. Strategic incumbent firms**
  - Incumbent may try to make entry more difficult on their market.
  - How? To what effect?
Chapter 14. Learning objectives

• Identify the incentives for a firm to collude.
  • Cartel formation

• Understand how cartels and other forms of collusion can be sustained.
  • Sustainability of tacit collusion
  • Repeated competition

• Understand how authorities can fight against collusion.
  • Detecting and fighting collusion
Case. The vitamin cartels

- Worldwide market for bulk vitamins
- In Europe, sales of bulk vitamins were 800m € in 1998
- Production of vitamins is highly concentrated
  - Largest firm is Hoffmann-La Roche: market share of 40-50%
  - BASF: 20-30%
  - Aventis: 5-15%
- Concentration on the production side
  - Slow and costly plant construction
  - Economies of scale in the production technology
- Buyer side is more fragmented.
- November 2001: European Commission imposes a fine of 855.22 m € to 8 companies for participating to secret market-sharing and price-fixing cartels.
Formation and stability of cartels

• Simple market structure
  • $n$ symmetric firms produce a homogeneous good
  • Constant marginal cost $c$
  • Competition à la Cournot
  • Firms face an inverse demand given by $P(q) = a - q$, where $q$ is the total quantity produced

• 3 procedures
  • Firms decide simultaneously whether or not to participate in a single industry-wide cartel.
  • Endogenous formation of cartels in a sequential way
  • Bilateral market-sharing agreements (“I stay out of your market if you stay out of mine”)
Simultaneous cartel formation

- A cartel of $k$ firms is formed, with $1 < k \leq n$.
- The Cournot game is thus played among the other $(n - k)$ independent firms and the cartel.
- All $(n - k + 1)$ players are symmetric.
  - Assumption: inside the cartel the division of profits is equitable.
- For a given cartel size, profits for firms inside and outside the cartel are

\[
\pi^{in}(k) = \frac{(a - c)^2}{k(n - k + 2)^2} \quad \text{and} \quad \pi^{out}(k) = \frac{(a - c)^2}{(n - k + 2)^2}
\]
• **Cartel stability:** No cartel member has an incentive to unilaterally leave the cartel,

\[
\pi^\text{in}(k) \geq \pi^\text{out}(k - 1) \iff \frac{(a - c)^2}{k(n - k + 2)^2} \geq \frac{(a - c)^2}{(n - k + 3)^2}
\]

• **Lesson:** Consider the formation of a single cartel on a Cournot market with homogeneous goods and constant marginal costs. If there are at least three firms in the industry, all firms remain independent. If there are just 2 firms in the industry, the 2 firms form a cartel.
• **Intuition** for this result:
  • Formation of the cartel induces positive externalities on the firms outside the cartel (higher market price).
  • All firms prefer to free-ride on the public good provided by cartel members.

• **Result changes if firms produce horizontally differentiated goods**
  • Competition and free-riding incentive are relaxed.
  • It is possible to find stable cartels comprising not all firms but a strict subset of them (if goods are sufficiently differentiated).

• See example in math slides.
Sequential cartel formation

- Game where multiple cartels can be formed
  - Exogenous specification of the ordering of the firms; 1\textsuperscript{st} firm proposes a cartel; if all prospective members accept, cartel is formed; otherwise, 1\textsuperscript{st} firm in the ordering that refuses proposes another cartel; etc.

Source: Bloch, 1995
Sequential cartel formation (cont’d)

• Sequentiality entails important differences
  • Firms can commit to stay out of the cartel.
  • At equilibrium, first firms remain independent and free-ride on cartel that last firms will eventually form.
  • Firms prefer to form a cartel of size $k$ than to remain independent if

\[
\pi^\text{in}(k) \geq \pi^\text{out}(1) \iff \frac{(a - c)^2}{k(n - k + 2)^2} \geq \frac{(a - c)^2}{(n + 1)^2}
\]

\[
\iff (k - 1)(-k^2 + (2n - 3)k - (n + 1)^2) \geq 0
\]

\[
\iff k > \frac{1}{2} \left(2n + 3 - \sqrt{4n + 5}\right) > 0.8n
\]
Sequential cartel formation (cont’d)

- **Lesson**: Consider a Cournot market with homogenous goods. The first \((n - k^*)\) firms remain independent while the last \(k^*\) firms form a cartel, with \(k^*\) being larger than 80% of the firms in the industry.

- **Intuition**
  - **Simultaneous** cartel formation: each firm has an incentive to leave the cartel.
  - **Sequential** cartel formation: first firms can commit to stay out and cartel can then form
Network of market-sharing agreements

• **Bilateral** collusive agreements

• Market-sharing agreements
  - 2 firms are active on different geographical markets or serve distinct consumer segments
  - Refraining from competing on the other firm’s territory
  - Constitute a collusive structure, a collusive network

• Network stability if
  - No pair of firms has an incentive to form a new link.
  - No firm has an incentive to unilaterally destroy an existing link.

• **Lesson**: If collusive network are negotiated bilaterally, they may lead to full collusion, with every firm a monopoly on its own market.
Tacit collusion

- ‘Meeting of the minds’ between colluding firms
- Analysis of ‘tacit agreements’ is also highly relevant for explicit agreements
  - Sustainability necessary for cartels as long as punishments cannot be legally binding
- Considering 2 firms
  - Offer perfect substitutes at constant marginal costs $c$
  - Compete over time (each period $t = 1,2, \ldots T$, firms repeat the ‘static’ game)

**Lesson**: If competition is repeated over a finite number of periods, firms play according to the (unique) Nash equilibrium of the static game in each period. Tacit collusion cannot emerge.
Tacit collusion: Infinite horizon

- Infinite time horizon \((T=\infty)\): no known end to the game
- Tacit collusion may emerge.
- Consider the so-called **grim trigger strategy**
  - Firm \(i\) starts by choosing the action that maximizes total profits.
  - Firm \(i\) keeps on choosing this action as long as both firms have done so in all previous periods. → *cooperation phase*
  - If one firm deviates, deviation ‘triggers’ the start of the *punishment phase*.
    - Firms choose the action that corresponds to the Nash equilibrium of the static game.
Grim trigger Strategy

- Cooperative action: both obtain $\pi^c = \pi^m/2$
- If one plays the cooperative action and the other optimally deviates, the deviating firm obtains $\pi^d$
- At the Nash equilibrium of the static game, both firms obtain $\pi^n$, with $\pi^d > \pi^c > \pi^n$.

- Trade-off between
  - immediate gain from deviation
  - future losses resulting from the other firm’s punishment

depends on
  - magnitude of the deviation and the punishment profits with respect to the collusive profits
  - the firms’ discount factor
Grim trigger Strategy (cont’d)

• Cooperative phase: present discounted value

\[ V^C = \pi^c + \delta \pi^c + \delta^2 \pi^c + \ldots = \frac{1}{1-\delta} \pi^c \]

• If firm 1 deviates, it will obtain \( \pi^d \) in the current period and \( \pi^n \) in all subsequent periods

\[ V^D = \pi^d + \delta \pi^n + \delta^2 \pi^n + \ldots = \pi^d + \frac{\delta}{1-\delta} \pi^n \]

• Follow the grim trigger strategy if and if only

\[ V^C \geq V^D \iff \frac{1}{1-\delta} \pi^c \geq \pi^d + \frac{\delta}{1-\delta} \pi^n \]

\[ \iff \frac{\delta}{1-\delta} (\pi^c - \pi^n) \geq \pi^d - \pi^c \]

\[ \iff \delta \geq \frac{\pi^d - \pi^c}{\pi^d - \pi^n} \equiv \delta_{\text{min}} \]
Application to price competition

- Bertrand competition model with constant and identical marginal costs
  - If both firms collude, they make a profit of $\pi^c = \pi^m / 2$
  - Undercutting the rival’s price leads to deviation profits of $\pi^d = \pi^m - \varepsilon$
  - After deviation has occurred, $\pi^n = 0$
  - Minimum discount factor $\delta_{min}^{Bert}$

$$\delta_{min}^{Bert} \geq \frac{\pi^d - \pi^c}{\pi^d - \pi^n} = \frac{\pi^m - (\pi^m / 2)}{\pi^m - 0} = \frac{1}{2}$$

- **Lesson**: In the infinitely repeated Bertrand duopoly game, any profit level between zero and the monopoly profit can be supported in a subgame perfect equilibrium if the discount factor is sufficiently large, $\delta \geq 1/2$. 
Application to price competition (cont’d)

• Suppose \( n \) firms operate in the market

• Total collusive profits have to be shared among \( n \) firms: \( \pi^c = \pi^m/n \)

\[
V^C \geq V^D \iff \frac{1}{1 - \delta} \frac{\pi^m}{n} \geq \pi^m \iff \delta \geq 1 - \frac{1}{n} \equiv \delta_{\text{min}}^{\text{Bert}}(n)
\]

• Critical discount factor \( \delta_{\text{min}}^{\text{Bert}}(n) \) is increasing in \( n \)

• Lesson: In the infinitely repeated Bertrand price-setting game, the set of discount factors that can support collusion is larger the smaller the number of firms in the market.
• **Lesson**: Firms find it harder to sustain collusion when they interact less frequently or when price adjustments are less frequent.

• **Lesson**: Under demand uncertainty, the critical discount factor above which the fully collusive outcome can be sustained is larger than under demand certainty.

• **Lesson**: Even if firms cannot observe deviations of other firms from equilibrium play, collusion can still be supported to some extent. However, the conditions for collusion to be sustainable are stricter than in a world in which deviations can be immediately observed and punished. In addition, profits are lower.
Case. Multimarket contact in the U.S. airline industry

- Markets: different city-pair routes
- Multimarket contact may facilitate collusion when
  - Firms differ in their production costs across markets
  - Markets themselves differ
- Both conditions are relevant in this industry.
- Hub and spoke model
  - Significant cost advantage to the carrier operating the hub
- Significant cross-route differences
- Experts claimed: airlines refrain from pricing aggressively in a given route for fear of retaliation in another jointly contested route.
- Fares are (on average) higher on routes where the competing carriers have extensive interroute contacts.
Answer (Lesson): Without the information sharing within a cartel, collusion is more likely to be infeasible. Even if it is feasible, collusion may not be supported over the whole time-horizon but firms may alternate between collusive and punishment phases (over varying length) in which they switch between a high and a low price.
Detecting and fighting collusion

• Communication is central to collusion; thus it can be used to detect collusion.
  • Collusion might leave significant pieces of evidence.
    • Permanent records of meetings or agreements
    • Telephone conversations may have been tapped.

• Competition authorities have designed policies to encourage cartel members to bring evidence to the authorities by themselves.

• Simply looking at possible high price-cost margins is not sensible.
  • as we have seen in Chapter 3 about market power
The difficulty in detecting collusion

- Four methods to detect collusion
  1. Is the firm’s behaviour consistent or not with properties or behaviour that are supposed to hold under a wide class of competitive models?
  2. Are there structural breaks in the firm’s behaviour?
  3. Does the behaviour of suspected colluding firms differ from competitive firm’s behaviour?
     - If only a subset of firms in the industry colludes and they can be identified a comparison can be directly carried out.
     - Otherwise one can resort to comparison across markets and across periods.
  4. Which model (competitive or collusive) better fits the data?
The difficulty in detecting collusion (cont’d)

• All 4 methods suffer from 2 general problems:
  1. Necessary data to identify firm’s behaviour are not available (cost is often unobservable).
  2. Firms have incentive to misreport private information.
     • Authorities are likely to suffer from the so-called indistinguishability theorem
     • → firms misreport cost information to make prices appear as resulting from competitive—and not collusive—behaviour

• Even if needed data are available, estimation of firm’s behaviour may be extremely sensitive to model specifications.
Leniency and whistleblowing programmes

• To obtain evidence for the existence of cartels and collusion, competition authorities introduced
  • Corporate leniency programmes
    • Reduced sentences for firms that cooperate with the authorities and provide evidence for the existence of a cartel
  • Whistleblowing programmes
    • Shielding individual informants from criminal sanctions

• Results of law enforcement
  • Make cartels less stable
  • Break-up existing cartels
  • Prevent the formation of cartels
Case. The vitamin cartels (cont’d)

• For violation of article 81 of the Community Treaty and article 53 of the European Economic Area Agreement, 8 companies were fined for forming a cartel.

• Hoffmann-La Roche (462m €) and BASF (296,16m €) were considered the joint leaders and instigators of the cartels.

• Aventis received significantly lower fines as the first company to cooperate both with the US Department of Justice and the European Commission.
Case. The beer cartel in the Netherlands

- 4 Dutch beer brewers formed a cartel on the beer market (a branded consumer good market) in the Netherlands.
  - Coordinated prices and price changes (at the wholesale level)
  - Operated in 2 market segments
    - Consumption on the premises (bars, restaurants, hotels) → Coordinated rebate policies, market-sharing agreements
    - Retail (mostly supermarkets) → Market-sharing agreements
- In 2007 the European Commission fined the 3 leading Dutch brewers Heineken, Grolsch and Bavaria a total amount of 274m EUR for operating this cartel between at least 1996 and 1999.
- InBev (also part of the cartel) provided essential information that led to surprise inspections and hard evidence (handwritten notes, proof of secret meeting dates)
- Under the Commissions leniency programme, InBev did not have to pay fines.
Leniency programme

• Considering a corporate leniency programme whereby a cooperating firm is granted a reward (or, at least, a reduced fine).

• The condition for the sustainability of collusion becomes more stringent.

• Lesson: Reducing fines for firms which report incriminating evidence may deter collusion. However, for some cartels, competition authorities have to grant sufficiently large positive rewards to deter collusion.
Whistleblowing programme

• Complementation of the corporate leniency programme by granting a positive reward to employees reporting incriminating evidence.
• Firms will have to bribe informed employees to prevent them from disclosing information.
• Collusion becomes less profitable and thus harder to sustain.

• **Lesson**: Corporate leniency and individual whistleblowing programmes are complementary in the fight against collusion.
Chapter 14 - Review questions

Review questions

• Contrast the conditions for cartels to be stable when they form in a simultaneous versus sequential way.

• Explain how a collusive outcome may emerge noncooperatively as the equilibrium of a repeated game. Discuss how the horizon of the game, the number of firms, the frequency of interaction and multimarket contact affect the sustainability of collusion.

• Explain why tacit collusion is harder to sustain when demand fluctuates and the rival’s actions cannot be observed.

• Explain why competition authorities encourage colluding firms and their employees to report incriminating evidence through leniency and whistleblowing programmes.
Part IV. Theory of competition policy

Chapter 15. Horizontal mergers
Chapter 15. Learning objectives

• Understand what influences the profitability of Cournot mergers.
• Assess how a merger affects welfare.
• Examine how modifications of the model change the results of our analyses.
  • Successive mergers
  • Entry-inducing mergers
  • Price competition
  • Impact on tacit collusion
• Understand how merger analyses are conducted empirically.
Horizontal mergers

- Merger control in the US
  - Long tradition: Clayton Act from 1914
    - Mergers are forbidden if substantial lessening of competition

- Merger control in the European Union
  - Introduced in 1990
    - Before: individual member states were in charge
  - Revised in the 2004 Horizontal Merger Guidelines

- 2 main effects of mergers on competition
  - **Negative**: fewer decision makers
  - **Positive**: efficiency gains

- What if profitable but welfare-reducing merger?
Mergers between 2 firms

- Market for a homogeneous product
  - Monopoly profit $\pi^m = \pi(1)$ is greater than industry profits in duopoly $2\pi(2)$
  - Merger to monopoly is always profitable.
- For mergers which fall short of a merger to monopoly, the issue is less clear-cut.
- Compare profits at the post-merger and the pre-merger equilibria.
  - Suppose constant marginal cost and no synergy effects $\rightarrow$ no cost advantage for the merged firm (merger equivalent to buying a firm and closing it down)
Mergers between 2 firms (cont’d)

• Consider a single merger between 2 firms
  • The other firms in the industry will always gain from the merger.
  • Why? The merging firms internalize their previous rivalry once they are placed under common control.
    • → Benefits the firms outside the merger
  • Cournot competition → as a response to the merger,
    • the other firms increase output
    • detrimental to merging firm’s profit.

• **Lesson**: Under Cournot competition, mergers of two firms are unlikely to be profitable if the market is fragmented but they are more likely to be profitable if the market is concentrated.
Mergers between 2 firms (cont’d)

• Previous result hinges on 6 assumptions
  • Only 2 firms merge.
  • No increasing marginal cost of production (no capacity constraints)
  • Merger doesn’t affect efficiency of production.
  • Only a single merger is possible.
  • No additional firm can enter.
  • Firms are Cournot competitors.

• We now relax these assumptions 1 by 1.
Mergers between several firms

- Merger is profitable if it involves a sufficiently large number of firms.

**Lesson:** Mergers between multiple firms are only profitable for Cournot competition if a highly concentrated market results.

- Intuition: profitability depends on 2 opposite forces
  - By internalizing previous rivalry, the merged entity reduces its quantity and thereby increases its profit.
  - But, outside firms react by increasing their quantity, which reduces the profitability of the merger.
  - For the 1st effect to dominate, the number of outside firms must be small enough.
Mergers between several firms (cont’d)

• Analytically:

• $P(q) = a - q$, marginal cost $= c$, no synergies
• $n$ firms, $k$ of which merge
• Merger is profitable if post-merger profit of the merged entity is larger than $k$ times the pre-merger profit:

\[
\pi_I \geq k\pi_{ea} \iff \frac{(a - c)^2}{(n - k + 2)^2} \geq k \frac{(a - c)^2}{(n + 1)^2}
\]
\[
\iff (k - 1)(-k^2 + (2n - 3)k - (n + 1)^2) \geq 0
\]
\[
\iff k > \frac{1}{2} \left(2n + 3 - \sqrt{4n + 5}\right) > 0.8n
\]

• So-called “80% rule”.

Efficiency-increasing mergers

• If merger confers an advantage to merged entity with respect to the outside firms:
  • Merged firm doesn’t ↓ its production so much
  • → Outside firms don’t ↑ their production so much

• More mergers should become profitable in the presence of efficiency gains.

• 2 different types of efficiency gains
  • Scale economies
  • Synergies
Scale economies

- Merged entity has now access to the combined productive capacity of the merging partners.

Assumptions

- Each firm owns a certain amount of capital.
- When some firms merge, the merged entity owns the combined capital stock.
- Each firm’s marginal cost increases linearly with that firm’s output.
- The larger the firm’s capital stock, the lower the slope of the marginal cost curve.

- The merged entity has a lower marginal cost curve than either of the constituent firms.
Scale economies (cont’d)

- Model
  - \( P(q) = a - q \), \( n \) firms, \( k \) of which merge
  - \( K \): capital stock; \( c, h \): positive parameters
  - Total cost:
    \[
    C(q_i, K) = cq_i + \frac{h}{2 \ K} q_i^2
    \]
  - Marginal cost: \( c + (h/K)q_i \) \( \rightarrow \) rotates about the intercept as the capital stock changes.
  - Redo the previous analysis under these assumptions.

- **Lesson**: Fixed asset combinations and increasing marginal costs enlarge the scope for profitable mergers in Cournot industries.
Synergies

• Assumptions
  • \( P(q) = a - q \), \( n \) firms, \( k \) of which merge
  • Pre-merger constant marginal cost \( c \)
  • Merger ↓ marginal cost of the merged firm from \( c \) to \( c - x \) (\( x \) positive).
  • Redo the previous analysis under these assumptions.

• Lesson: Mergers between Cournot competitors that do not result in a highly concentrated market are only profitable if they entail sufficiently large synergies.
Welfare analysis of Cournot mergers

- We use the total surplus criterion
  - Sum of consumer surplus, CS, and total profits ("insiders" and "outsiders" profits).
  - Allow merger if $\Delta W = \Delta CS + \Delta \Pi_I + \Delta \Pi_O > 0$

- Interplay between
  - Competition-reducing effect of mergers
  - Potential efficiency gains

- Merger can increase total surplus if efficiency gains are large enough.
  - ‘Efficiency defence’

- But, there also exist levels of synergies that make mergers profitable but, at the same time, detrimental to consumers (or to society as a whole).
The ‘efficiency defence’

1998: Superior Propane and ICG Propane are the 2 largest propane distributors in Canada.

- Plan of merger
- 2 effects
  - Reduction of competition
    - Substantial in 66 of 74 local markets
    - Near monopoly in 16 local markets.
    - Estimated deadweight loss of C$ 6 MIO per year
  - Cost efficiencies
    - Estimated C$ 29 MIO per year
- Merger permitted using the total surplus criterion.
Welfare analysis of Cournot mergers (cont’d)

- Linear Cournot model with synergies
  - \( P(q) = a - q, \) \( n \) firms, \( k \) of which merge; pre-merger constant marginal cost \( c; \) merger ↓ marginal cost of the merged firm from \( c \) to \( c - x \) (\( x \) positive).
  - Define \( \phi = \frac{x}{a-c} < 1 \) → measures synergies

If merger profitable, then desirable

- Level of synergies necessary for a Cournot merger
  - to enhance consumer surplus
  - to enhance welfare
  - to be profitable

Profitable but not desirable mergers

\[ n = 9 \]
Welfare analysis of Cournot mergers (cont’d)

• **Lesson**: Suppose that mergers among Cournot competitors induce synergies. When a merger does not make the market too concentrated, profitability of the merger is a sufficient condition for welfare improvement. However, if the merger results in a highly concentrated market, it could be profitable and welfare-detrimental at the same time.
General welfare analysis

• A profitable merger among the insiders ($\Delta \Pi_I > 0$) is necessarily welfare-increasing if its ‘external effect’ on consumers and outsiders is positive ($\Delta CS + \Delta \Pi_O > 0$).

• The estimation of the external effect requires much less information than the estimation of the overall welfare effect.
  • Estimation of impact on insiders’ profits requires estimation of synergies (hard to get).

• What matters for consumers and outsiders is the change in the equilibrium output of the insiders.
General welfare analysis (cont’d)

• Merger within a subset of firms
  • Positive external effect if
    \[ s_I < \sum_{i \in O} \lambda_i s_i, \text{ with } \lambda_i \equiv -\frac{dq_i}{dq} \]
  • Upper bound on the combined share of the merging firms (at pre-merger equilibrium) for their merger to generate positive external effects

• Intuition
  • If combined share of merging firms is small, they will not find it profitable to restrict output much.
  • Outsiders react by expanding their output → output is shifted towards larger firms with lower pre-merger marginal costs → beneficial from welfare point of view
• **Lesson**: In a Cournot industry, a merger within a subset of firms (the ‘insiders’) has a positive external effect on the other firms (the ‘outsiders’) and on consumers if the combined share of the insiders is below some threshold, which depends on the way outsiders react at equilibrium to the change in total output generated by the merger. If there exists a positive external effect, a profitable merger is welfare-increasing.
Successive mergers

• If 2 mergers ↑ consumer surplus in isolation, they also ↑ consumer surplus when they take place together.
  • Conditional on one merger being proposed and approved, because (i) it is profitable, and (ii) it increases consumer surplus,
  • 2nd merger remains profitable and beneficial to consumers

• → Competition authority can use a myopic policy (i.e., look at one merger at a time).

• Lesson: In environments where multiple disjoint mergers can be proposed over time, an antitrust authority that is concerned with the maximization of (discounted) consumer surplus can use a myopic policy that approves mergers if they do not decrease consumer surplus at the time of approval.
**Case. Consolidation in the US airline industry?**

- **February 2008:**
  - Delta Airlines and Northwest Airlines announce their plan to merge.
  - Other rumours of mergers
    - United Airlines and Continental
    - Continental and American Airlines

- **Airlines executives declared:**
  - Mergers were conditional on one another.
  - 2 major airlines needed to merge for the other airlines to follow suit.
  - OK with status quo if 1st merger did not take place.
Mergers and entry

• The profitability of a merger should be questioned if entry can occur.
  • If the entry threat is immediate, there does not exist any rationale for a merger.
• Shows that entry barriers are at the heart of the competitive effects of mergers.

• Lesson: If a merger only temporarily leads to a smaller number of firms because there is subsequent entry, a merger in a Cournot model is not profitable when firms are sufficiently patient.
Mergers under price competition

• Suppose firms set prices in a differentiated product market.
  • → Stronger incentives to merge

• Why? With price competition, firms compete less aggressively after a merger.
  • Outsiders set a higher price.
  • Merged firm then benefits from these higher prices.

• With price competition, there is a rationale for mergers even in a non-concentrated industry.
Mergers under price competition (cont’d)

• **Lesson**: If firms have differentiated products and compete in prices, a merger between two firms leads to higher prices for all firms.

• In contrast to quantity competition there are strong private incentives to merge absent any efficiency gains.

• **Merger is necessarily welfare-reducing if there are no efficiency gains.**
Coordinated effects

- Possibility that a merger could increase the incentives of the remaining firms to engage in tacit collusion (coordinated effects)

- Contrasting impacts on sustainability of collusion
  - Merger ↓ number of firms in the market → makes tacit collusion easier to sustain.
  - Merger may affect degree of symmetry among remaining firms.
    - In the presence of synergies, merged entity may become a more efficient producer than outside firms.
    - In differentiated good industries, merged entity may own a larger set of brands.
Coordinated effects  (cont’d)

• Contrasting impacts  (cont’d)
  • More asymmetries among firms make tacit collusion harder to sustain.
    • More difficult to define the common collusive price (more efficient firms prefer lower prices than less efficient ones).
    • Allocation of production quotas is also harder to agree upon (equal sharing would typically be inefficient when some firms are more efficient than others).

• **Lesson**: A merger may exert 2 conflicting effects on the sustainability of collusion: a positive effect through the reduction in the number of firms and a negative effect if it increases the asymmetry among firms.
### Case. Nestlé-Perrier merger

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<td>Perrier</td>
<td>Nestlé + Perrier</td>
<td>Nestlé + Perrier – Volvic</td>
<td>Nestlé + Perrier – other brands</td>
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<tr>
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<td>BSN</td>
<td>BSN + Volvic</td>
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Refused because dominant position
Refused because coordinated effects
Event studies

• Analysis of stock market performance of merging firms and outsiders following
  • a merger announcement,
  • the eventual investigation and subsequent decision of the competition authority.
• Learn the potential effects of a merger from the reaction of the stock market.
  • Increase in the equity value of the merging firms and of the outsiders indicates that the merger is likely to result in
    • higher prices
    • thus higher profits,
    • at the expense of consumers.
Event studies (cont’d)

• Not clear
  • when stock market participants learn about a merger announcement
  • what they learn from it
    • the announcement may simply inform about the good health of the industry.
Direct price comparisons

- Direct comparisons of prices before and after the merger
- Can help competition authorities to identify the characteristics that are likely to make a merger anticompetitive or efficiency-enhancing.
- Ex post analysis may be used to assess the performance of ex ante analyses.
Merger simulations

• 2 steps
  • Collect pre-merger market information
    • To estimate direct and cross elasticities
    • To calibrate a one-shot-non-cooperative oligopoly model that matches the critical features of the industry under review.
  • Use calibrated model to calculate post-merger equilibrium

• *Almost Ideal Demand System (AIDS)* nested logit models to analyse markets with differentiated consumer products

• Quantify and disentangle the impacts a merger is likely to have on concentration and efficiencies
Merger simulations (cont’d)

• Serious limitations
  • Price predictions subject to modelling error
  • In their current form, focus on the immediate price and output effects of mergers
    • Leave aside longer-term potential impacts of the merger
  • Usually assume that the firms’ behaviour does not change as a result of the merger.
Review questions

• Explain why mergers that do not involve efficiency gains are rarely profitable in Cournot industries.

• What is the main advantage of assessing the welfare impact of a merger by looking at its ‘external effect’? Explain in words the condition under which this external effect is positive.

• Taking successive mergers and entry into account, discuss whether and, if yes, how merger analysis has to be reconsidered.

• Explain the fundamental differences between mergers in Cournot and in Bertrand industries.

• What is meant by ‘coordinated effects’ of a merger. Discuss.
Chapter 16. Learning objectives

• Understand how the incumbent’s investment decision depends on the strategic effects of this investment and on the type of product market competition.

• Examine the rationale behind several entry-related strategies.
  • How do investments in capacity, in R&D and strategies designed to raise the entrant’s cost affect cost variables?
  • Under which conditions can brand proliferation, bundling decisions and manipulation of the installed base of customers be used as entry deterrence tools?

• Understand how imperfect information and the presence of multiple incumbents influence our results.
Taxonomy of entry-related strategies

- Incumbent’s investment decision anticipating the possibility of entry depends on
  - Strategic effect of this investment
  - Type of product market competition

- Two-stage game
  - First stage
    - Incumbent (firm 1) chooses some irreversible investment $K_1$
  - Second stage
    - Observing $K_1$, entrant (firm 2) decides to enter or not
    - Product market decisions
      ✓ If the entrant enters: duopoly
      ✓ If not: incumbent remains in monopoly position
Taxonomy of entry-related strategies (cont’d)

- If potential entrant decides to enter
  - Second-stage decisions: \( \sigma_1 \) and \( \sigma_2 \), typically either a price (\( \sigma_i = p_i \)) or a quantity (\( \sigma_i = q_i \))
  - Profits: \( \pi_1(K_1, \sigma_1, \sigma_2) \) and \( \pi_2(K_1, \sigma_1, \sigma_2) \)
  - Equilibrium: \( \{ \sigma_1^*(K_1), \sigma_2^*(K_1) \} \)

- If potential entrant does not enter
  - Entrant makes zero profit
  - Incumbent obtains \( \pi_1^m(K_1, \sigma_1^m(K_1)) \)
    - \( \sigma_1^m(K_1) \): monopoly choice in stage 2

- 2 possibilities for the incumbent
  - **Entry deterrence**: choose \( K_1 \) such that \( \pi_2(K_1, \sigma_1^*(K_1), \sigma_2^*(K_1)) \leq 0 \)
  - **Entry accommodation**: choose \( K_1 \) to maximize \( \pi_1(K_1, \sigma_1^*(K_1), \sigma_2^*(K_1)) \)
Taxonomy of entry-related strategies (cont’d)

**Question**: does the incumbent over- or under-invest when acting strategically?

- Is investment level at subgame perfect equilibrium higher or lower than what would be chosen by an incumbent acting ‘non strategically’?
- We answer the question for
  - Entry deterrence
  - Entry accommodation
Entry deterrence

- Incumbent chooses investment to make entry unprofitable
  - Assume: monopoly choice of $K_1$ is not sufficient to deter entry (entry cannot be ‘blockaded’)
  - Incumbent must distort its investment choice
  - Distortion is costly → incumbent chooses investment such that
    \[
    \pi_2 = (K_1, \sigma_1^*(K_1), \sigma_2^*(K_1)) = 0
    \]

- Impact of a change in $K_1$ on the entrant’s profit?
  - Totally differentiate $\pi_2$ with respect to $K_1$
    \[
    \frac{d\pi_2}{dK_1} = \frac{\partial \pi_2}{\partial K_1} + \frac{\partial \pi_2}{\partial \sigma_1} \frac{\partial \sigma_1^*(K_1)}{\partial K_1} + \frac{\partial \pi_2}{\partial \sigma_2} \frac{\partial \sigma_2^*(K_1)}{\partial K_1}
    \]
    \[
    \text{Total effect} = \text{Direct effect} + \text{Strategic effect (SED)} = 0 \quad \text{(envelope theorem)}
    \]
Entry deterrence (cont’d)

• **Direct effect** can be of any sign
  - Negative (e.g., persuasive advertising)
  - Positive (e.g., informative advertising)
  - Nul (e.g., investment in capacity)

• **Strategic effect**: by changing its ex ante decision, incumbent modifies its ex post behaviour → which affects firm 2’s profit

• Investment makes the incumbent tough (soft) if total effect \( d\pi_2/dK_1 \) is negative (positive)

• To deter entry → need to look aggressive

• So, if investment makes incumbent...
  - **Tough** → incentive to overinvest: ‘**top dog strategy**’
  - **Soft** → incentive to underinvest: ‘**lean and hungry look**’
Entry deterrence (cont’d)

• **Lesson**

  • If investment makes incumbent **tough** (i.e., if investment entrant’s profit), then incumbent must behave as a **top dog** to deter entry: he must overinvest (be strong or big) to look aggressive.

  • If investment makes incumbent **soft** (i.e., if investment ↑ entrant’s profit), then incumbent must adopt a **lean and hungry look** to deter entry: he must underinvest (be weak or small) to look aggressive.
Entry accommodation

• Firm 1 takes entry as given → no longer chooses $K_1$ to make $\pi_2$ negative but to maximize $\pi_1$
  • → Differentiate $\pi_1 = (K_1, \sigma_1^*(K_1), \sigma_2^*(K_1))$ with respect to $K_1$

\[
\frac{d\pi_1}{dK_1} = \frac{\partial \pi_1}{\partial K_1} + \frac{\partial \pi_1}{\partial \sigma_1} \frac{d\sigma_1^*(K_1)}{dK_1} + \frac{\partial \pi_1}{\partial \sigma_2} \frac{d\sigma_2^*(K_1)}{dK_1}
\]

Total effect  Direct effect  Strategic effect (SEA) = 0 (envelope theorem)

• Direct effect exists anyway and can be neglected
• Strategic effect: influence of firm 1’s investment on firm 2’s second-stage behaviour
• Incumbent should
  • Overinvest if strategic effect is positive
  • Underinvest otherwise
Entry accommodation (cont’d)

- Sign of the strategic effect (SEA)? Depends on
  - Sign of strategic effect under entry deterrence (SED)
  - Whether 2nd-stage strategies are substitutes or complements

\[
\text{SED} = \frac{\partial \pi_1}{\partial \sigma_2} \frac{d \sigma_2^*(K_1)}{dK_1} \\
\text{SEA} = \frac{\partial \pi_2}{\partial \sigma_1} \frac{d \sigma_2^*(K_1)}{dK_1}
\]

Same sign if firms’ choices have same nature

Chain rule

Slope of firm 2’s reaction curve
Entry accommodation (cont’d)

- If 2\textsuperscript{nd}-stage choices are strategic substitutes
  - Reaction curves are downward sloping
  - SEA has reverse sign of SED

\begin{itemize}
  \item Investment makes firm 1 tough $\rightarrow$ SED $< 0$ $\rightarrow$ SEA $> 0$ $\rightarrow$ overinvestment
  \item Investment makes firm 1 soft $\rightarrow$ SED $> 0$ $\rightarrow$ SEA $< 0$ $\rightarrow$ underinvestment
\end{itemize}

- $\rightarrow$ Same conduct for accommodation and deterrence
  - If investment makes incumbent tough, incumbent overinvests
    $\rightarrow$ top dog strategy $\rightarrow$ Commitment to be aggressive
    $\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\q
Entry accommodation (cont’d)

- If 2\textsuperscript{nd}-stage choices are strategic complements
  - Reaction curves are upward sloping
  - SEA and SED have the same sign

\begin{itemize}
  \item Investment makes firm 1 tough \(\Rightarrow\) SED < 0 \(\Rightarrow\) SEA < 0 \(\Rightarrow\) underinvestment
  \item Investment makes firm 1 soft \(\Rightarrow\) SED > 0 \(\Rightarrow\) SEA > 0 \(\Rightarrow\) overinvestment
\end{itemize}

- Different conducts for accommodation and deterrence
  - When deterrence calls for overinvestment (top dog), accommodation calls for underinvestment \(\Rightarrow\) puppy dog
  - When deterrence calls for underinvestment (lean and hungry look), accommodation calls for overinvestment \(\Rightarrow\) fat cat
  - Intuition: incumbent wants to look inoffensive so as to trigger a favourable response from the entrant
Entry accommodation (cont’d)

- **Lesson**: The optimal business strategies for entry deterrence (D) and for entry accommodation (A) are as follows.

<table>
<thead>
<tr>
<th>Strategic substitutes</th>
<th>Tough</th>
<th>Soft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top dog</td>
<td><em>(D and A)</em></td>
<td><em>(D and A)</em></td>
</tr>
<tr>
<td>Lean and Hungry</td>
<td><em>(D and A)</em></td>
<td>Lean and Hungry</td>
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</tbody>
</table>

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<thead>
<tr>
<th>Strategic complements</th>
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<th>Soft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top dog</td>
<td><em>(D)</em></td>
<td><em>(D)</em></td>
</tr>
<tr>
<td>Puppy Dog</td>
<td><em>(A)</em></td>
<td><em>(A)</em></td>
</tr>
<tr>
<td>Fat Cat</td>
<td><em>(A)</em></td>
<td><em>(A)</em></td>
</tr>
</tbody>
</table>
Case. Kodak vs. Fuji

- US market for photographic film
  - Up to 1970s: dominated by Kodak
  - Fuji managed to enter in 1980: 5% market share
- Fuji’s entry was first deterred and then accommodated by Kodak.
  - Deterrence → see below
  - Accommodation
    - Strategic variables: price and advertising → complements
    - → Incumbent is better off not acting in an aggressive way
    - Kodak was in a position to cut its price but did not do so; also, Kodak’s advertising aimed at expanding the market not at stealing business from Fuji → puppy dog strategy
Strategies affecting cost variables

• Specific examples for investment $K_1$
  
  • Investment in capacity as an entry deterrent
  • Investment as an entry deterrent reconsidered
    • Model of R&D competition
  • Rising rival’s costs
Case. The ready-to-eat (RTE) cereal industry

- US, 1940s to 1970s: high concentration
  - 4 major manufacturers (Kellogg, General Foods, General Mills and Quaker Oats) → 85% of sales
  - No entry in this period, although profitable industry
- Barriers to entry
  - No real barrier coming from economies of scale, capital requirements, product differentiation, patents...
  - Main cause: brand proliferation
    - No new firm entered but 80 new brands were introduced by 6 major incumbent firms between 1950 and 1972!
    - Federal Trade Commission (1972): ‘these practices of proliferating brands, differentiating similar products and promoting trademarks through intensive advertising result in high barriers to entry into the RTE cereal market’.
The European Microsoft case

- 2004: European Commission found that Microsoft had leveraged its market power from its primary market for PC operating systems (OS) into the secondary, complementary market for work group server OS.
  - **Primary market:** Microsoft has 90% market share.
  - **Secondary market:** Microsoft’s market share rose from 20% (late 1990s) to 60% (2001).
  - The Commission argued that at least part of this spectacular increase was due to Microsoft’s deliberate restriction of the interoperability between Windows PCs and non-Microsoft work group servers (= virtual bundling).
Case. Kodak vs. Fuji (Act II)

- US market for photographic film
  - Up to 1970s: dominated by Kodak
  - Fuji managed to enter in 1980: 5% market share
- Fuji’s entry was first deterred. How?
  - Kodak was limit pricing and limit advertising.
  - If Fuji had imperfect information on either market demand or Kodak’s costs, Kodak could choose low prices and high advertising budgets to indicate low costs of production
  - \( \rightarrow \) low price and advertising elasticities
  - Estimates made by Kadiyali (1996) indeed show such low elasticities.
Case. Kodak vs. Fuji (Act III)

• After Fuji’s entry (1980), limit pricing and advertising persisted. (Kadiyali, 1996)
  • Post-entry: very low own-price & own-advertising elasticities.
  • Prices were lower and advertising levels higher post-rather than pre-entry.
  • No entry occurred despite high price-cost margins ($1.28 per roll for Kodak, $1.35 per roll for Fuji).
• The 2 firms seem to have joined forces to deter entry.
  • Observed prices correspond to estimations of a tacit collusion model (prices low enough to deter entry but higher than in a more competitive equilibrium).
Review questions

• Explain why entry deterrence and entry accommodation call for the same strategy when product decisions are strategic substitutes, and for opposing strategies when product decisions are strategic complements. Illustrate with some examples.

• Why, and in what circumstances, would an incumbent firm facing potential entry find it profitable to expand its production capacity above the level that a monopolist ignoring entry would choose.

• Explain under which conditions an incumbent firm is able to use brand proliferation to deter entry.

• Why is incomplete information crucial for limit pricing to serve as an entry deterrent? Explain.

• Is there a free-riding problem when several incumbents try to deter entry? Discuss.