



# **Industrial Organization**

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# Exercise Lesson 2

(Chapter 10-16)

- *Bertrand Model*
- *Repeated Games*
- *Vertical Mergers*

# Chapter 10: Oligopolistic Price Competition

## Bertrand Model

- Competitive and efficient market outcomes even when the number of firms is quite small (*Duopoly Model*).
- Firms compete in prices (*price competition model*), instead of production level.
- *Simultaneous price strategy*.
- Firms produce *identical products* (only relative prices matters), at the *same marginal cost  $c$* .
- Prices are pushed to *marginal cost* (in Cournot competition are above).
- High-cost firms are forced out of business.
- Firms have extensive capacity (is possible to serve all rival's costumers after undercutting rival's price)
- The price chosen by competitors are strategic complements (a rise in one firm's price permits its rival price to raise too).

# Exercise 1: Bertrand Model

Let the market demand for carbonated water be given by  $Q^D = 100 - 5P$ . Let there be two firms producing carbonated water, each with a constant marginal cost of 2.

- *What is the market equilibrium price and quantity when each firm behaves as a Bertrand duopolist choosing price? What firm profit does each firm earn?*

# Solution

There is only one Nash Equilibrium in Bertrand duopoly model: it is the *price pair*  $p_1 = p_2 = c$ .

If firm 1 set this price in the expectation that firm 2 will do so, and if firm 2 act in precisely the same manner, neither will have an incentive to change. In this way their profit is equal to zero.

The Bertrand duopoly game is that the market price equals marginal cost.

$$P = P_1 = P_2 = 2$$

$$\pi_1 = \pi_2 = 0$$

# Chapter 11: Dynamic Games

- *Sequential games* (different from simultaneous games).
- *Stackelberg Model*: duopoly model (similar to Cournot).
- Large advantage to the firm that chooses its output level first (monopoly output): *Leader Firm*.
- The firm that moves second is the *Follower Firm*.
- “*Once-and-for-all*”: firms trade their goods only *once*.
- A sequential price game with differentiated products yields *higher profit* for both firms (than in simultaneous).
- Issue of *commitment* and *credibility*.

# Chapter 12: Entry Deterrence and Predation

- Ability of firms to *maintain a dominant market position* for a long period of time.
- ***Entry Deterrence***: preventing the entry of new firms and driving existing ones out of business (*limit price* or *limit output*).
- ***Predatory Conduct***: the firm want to *influence the behavior of its rivals* (those who are in the market and those who thinking to enter).
- *Credibility* is essential for predatory conduct to be successful.



# Chapter 13: Predatory Conduct

- Can we construct models in which predatory actions are rational?
- *Predatory Pricing* is not a perfect subgame.
- *Asymmetric Information*: uncertainty, one firm knows something and the other firm does not.
- *Antitrust Policy*: to preserve the benefit of *competition*.

# Chapter 14: Collusion, Price Fixing, Antitrust Policy

- *Collusion* is a real problem (concentrated market, small number of firms, entry barriers, regular order, market growth, technological or cost symmetry, product homogeneity).
- In the last years a large number of *collusive cartel* have been caught and successfully prosecuted.
- *Extra-profit* are earned if each firms cooperate.
- *Price Fixing Agreement*.

# Chapter 14: Repeated Games

- *Repeated Game*: the firms interact with each other over and over again.
- Repetition of strategic interaction makes *cartels* possible.
- Importance of *cooperation* when a game is repeated.
- *Finitely (potentially colluding firms)* or *Indefinitely* Repeated Games.
- A repeated game must have an *indefinite end point* (there is always a positive probability that the game will be played one more time).

## Exercise 3: Repeated Games

- Firm 1 and firm 2 are movie producers. Each has the option of producing a blockbuster romance or a blockbuster suspense film. The payoff matrix displaying the payoff of each of the four possible strategy combinations (in thousand) is shown below, with firm 1's payoff listed first. Each firm chooses without knowing it's rival choice.
  - a. Find the Nash Equilibrium
  - b. Find the Nash Equilibrium if the game is repeated.

		Firm 2	
		Romance	Suspense
Firm 1	Romance	(\$900; \$900)	(\$400; \$1000)
	Suspense	(\$1000; \$400)	(\$750; \$750)

- Data: *Simultaneous Game*

## Solution

*a.*

- *Romance - Romance: if Firm 1 would choose suspense, it would obtain an higher payoff (\$1000).*
- *Romance -Suspense: if Firm 1 would choose suspense, it would obtain an higher payoff (\$750).*
- *Suspense – Romance: if Firm 2 would choose suspense, it would obtain an higher payoff (\$750).*
- *Suspense - Suspense: none of the firms have incentive to switch strategy, the payoff would be lower (\$400) → **Nash Equilibrium***

*b.*

		Firm 2	
		Romance	Suspense
Firm 1	Romance	(\$1800; \$1800)	(\$800; \$2000)
	Suspense	(\$2000; \$800)	(\$1500; \$1500)

- *The repeated game can be consider a **subgame**.*
- *The conclusions are the same as before.*
- *It is always a simultaneous game.*
- ***Suspense-Suspense** is always the **Nash Equilibrium**.*
- *Firms move knowing the first time period payoff.*

# Chapter 15: Horizontal Mergers

- *Combination of firms* that are *rival* within the same industry.
- Joining of firms that were *competitors*: two or more competitors became a single firm.
- Reduction of fixed and variable costs.
- May create a *legal cartel* and may raise *antitrust concerns*.
- *Merger Paradox*: a merger is not profitable for the merging firms, the true beneficiaries are the non merging firms.
- It does not raise in case of *differentiated products* and *compete in price* for costumers.

# Chapter 16: Vertical and Conglomerate Mergers

- ***Vertical Merger***: different firms operating at *different stage of production* in the same product line (film production companies and movie theatre).
- They raise complicated issue:
  - Benefit firms and consumers by eliminating double marginalization.
  - Facilitate *price discriminations*.
- ***Conglomerate Merger***: two firms that have *little or no common markets or products*.
- Their product are neither substitutes nor complements.
- Difficult identification of the reasons behind this merger: *scope economies, saving on transaction cost, minimizing risk for stockholders and managers*.



## Exercise 4: Vertical Mergers

Suppose that the downstream market for widgets is perfectly competitive and characterized by the inverse demand curve  $P = 100 - Q$ . Retailers have zero production costs, but do incur a fee  $r$  for every unit sold. This fee is the payment that retailers must pay to the only manufacturer of widgets, the monopolist Widget International (WI). WI bears no fixed cost. It does, however, have a constant marginal cost of \$10.

- a. *What is the equilibrium price to consumers,  $P$ , and fee to retailers  $r$ ? What is the profit earned by retailers and WI at these prices?*
- b. *Show that vertical integration by which WI becomes the single producer and retailer of widgets does not raise WI's profit and does not lower the price to consumers.*
- c. *What is the price to consumers if both widget manufacturing and retailing are competitive?*

## Solution

a. *Competitive Price = marginal cost = r*

*WI Demand:  $r = 100 - Q$*

$$WI MR = 100 - 2Q = 10 \rightarrow Q = \frac{100 - 10}{2} = 45 \rightarrow r = 100 - 45 = 55$$

b. WI is already earning the maximum profit possible (no price discrimination, so vertical merger with one or many retailers cannot rise WI's profit or price P for consumers. Even if all WI bought all downstream retailers it would maximize profit by setting  $P=55$ , selling 45 units and earning 2025 in profit.

$$\pi = (100 - Q)Q - cQ = (100 - 45) * 45 - 10 * 45 = 2025$$

c. *Competitive manufacturing price = Competitive retail price = marginal cost = 10*