Microeconomics

Monika Köppl-Turyna

Department of Economics | ISCTE-IUL

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Market Structure: Imperfect Competition

Introduction to Game Theory I

- Why does OPEC limit extraction of crude oil?
- Under perfect competition it is virtually impossible to make firms cooperate.
- If there are only a few competitors in the market the incentive for either strategic behavior or collusion arises.
- With only few competitors actions (e.g. increase in quantity produced) affects the whole market.
- **The characteristic feature of oligopolistic markets is interdependence among firms.**

Introduction to Game Theory II

Strategic Behavior as the Prisoner's Dilemma

		Prisoner Y	
		Confess	**Remain silent**
Prisoner X	**Confess**	5 years for each	0 years for X 20 years for Y
	Remain silent	20 years for X 0 years for Y	1 year for each

Introduction to Game Theory III

Brand Switching as the Prisoner's Dilemma

		Firm 1	
		Don't advertise	**Advertise**
Firm 2	**Don't advertise**	$\Pi_1 = 500$ $\Pi_2 = 500$	$\Pi_1 = 750$ $\Pi_2 = 0$
	Advertise	$\Pi_1 = 0$ $\Pi_2 = 750$	$\Pi_1 = 250$ $\Pi_2 = 250$

Introduction to Game Theory IV

Nash Equilibrium

Nash equilibrium the combination of strategies in a game such that neither player has any incentive to change strategies given the strategy of his opponent.

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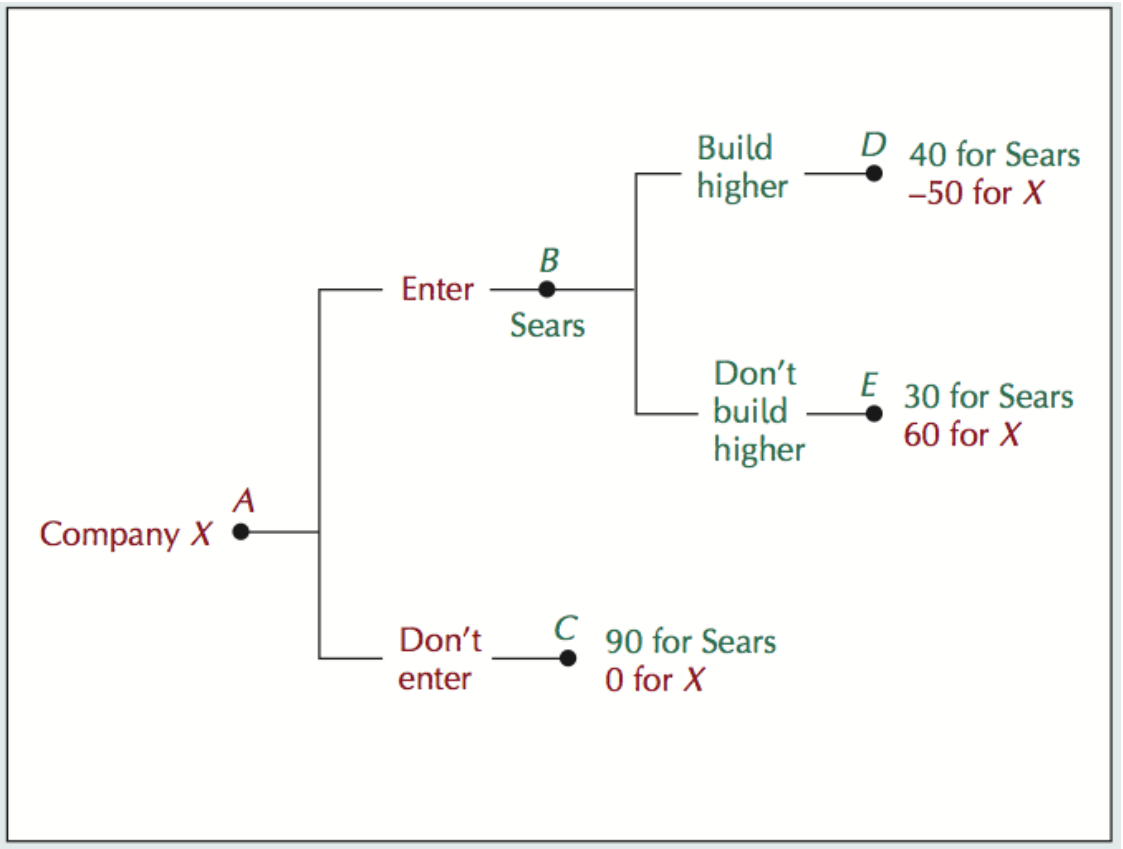
		Firm 1	
		Don't advertise	**Advertise**
Firm 2	**Don't advertise**	$\Pi_1 = 500$ $\Pi_2 = 400$	$\Pi_1 = 750$ $\Pi_2 = 100$
	Advertise	$\Pi_1 = 200$ $\Pi_2 = 0$	$\Pi_1 = 300$ $\Pi_2 = 200$

Introduction to Game Theory V

Sequential Game – Strategic Entry Deterrence



Oligopoly

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- Some forms of oligopolistic competition:
  - Competition in Quantities – **Cournot Model**
  - Competition in Prices – **Bertrand Model**
  - Dominant Firm – **Stackelberg Model**
  - Competition in Differentiation – **Salop and Hotelling Models**
  - Monopolistic Competition – **Chamberlin Model**

Cournot Model I

Cournot Model

An oligopoly model in which each firm assumes that its rivals will continue producing at their current levels of output.

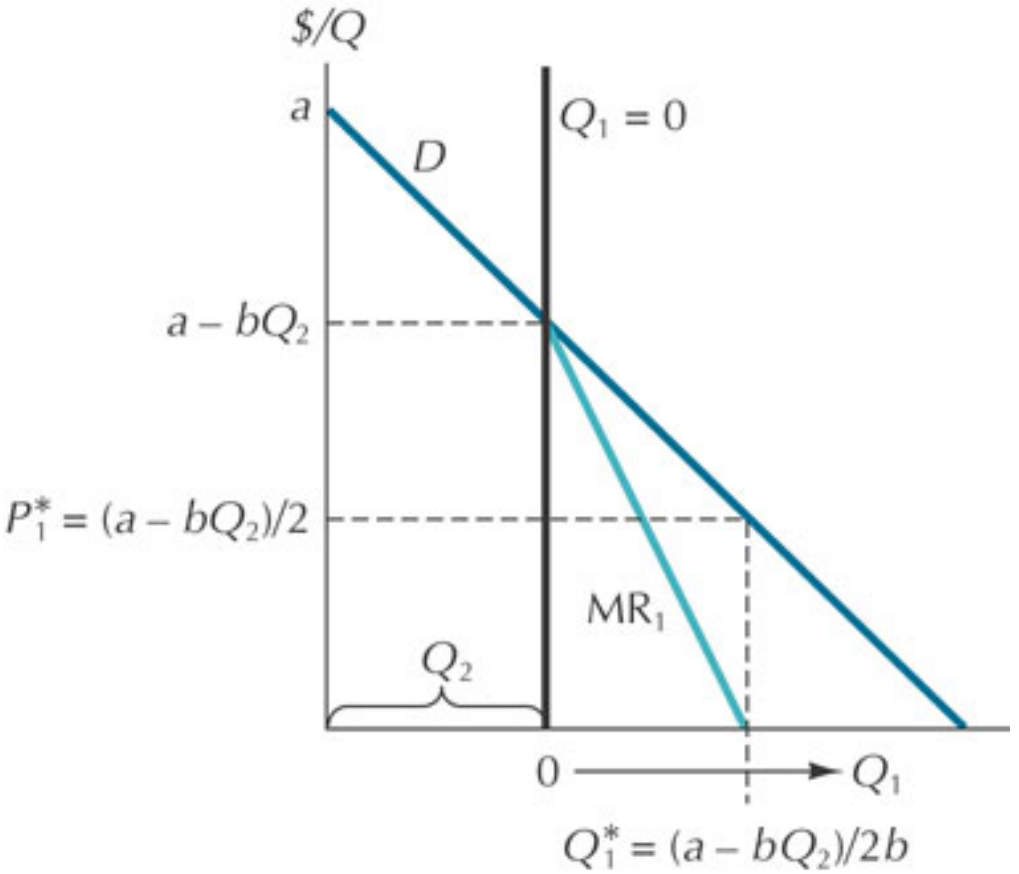
- Each duopolist treats the other's quantity as a fixed number.
- Total market demand given by

$$P = a - b(Q_1 + Q_2)$$

- Assume production at 0 marginal cost.
- We get the demand curve for firm 1 by subtracting bQ_2 from the vertical intercept of the market demand curve
- We can rewrite the demand as

$$P = (a - bQ_2) - bQ_1$$

Cournot Model II



- **The residual demand** of a Cournot duopolist.

Cournot Model III

- Marginal revenue of firm 1:

$$MR_1 = (a - bQ_2) - 2bQ_1$$

- Firms are symmetric so it must be that $Q_1 = Q_2$
- Optimization problem: set the marginal revenue equal marginal cost and solve for output of firm 1 in terms of Q_2:

$$Q_1 = \frac{a - bQ_2}{2b}$$

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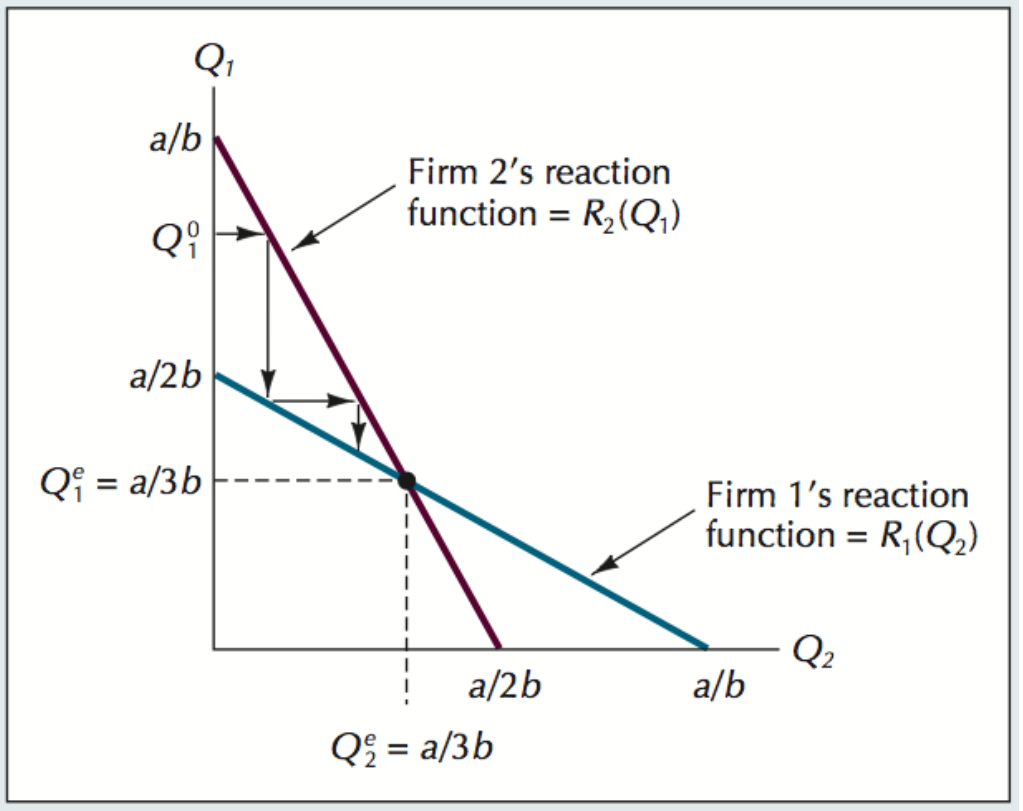
Definition

Reaction function is a curve that tells the profit-maximizing level of output for one oligopolist for each amount supplied by another.

- Solving simultaneously yields $Q_1 = Q_2 = \frac{a}{3b}$

Cournot Model IV

Graphical Solution



Bertrand Model

Bertrand Model

An oligopoly model in which each firm assumes that rivals will continue charging their current prices.

- Each firm decides on the price it charges..
- If firm 1 charges p_1, firm 2 has three choices:
  - it can charge more than p_1, in which case it sells nothing.
  - it can charge $p_2 = p_1$, in which case they split the market evenly.
  - it can charge a marginally lower price, in which case it will capture the entire market demand.
- The third option is the most profitable – The price will be driven down to the marginal cost.

Stackelberg Model

- "What would a firm do if it knew its only rival were a naive Cournot duopolist?"
- Suppose firm 1 knows that firm 2 will treat firm 1s output level as given and use this knowledge.
- Reaction function of firm 2:

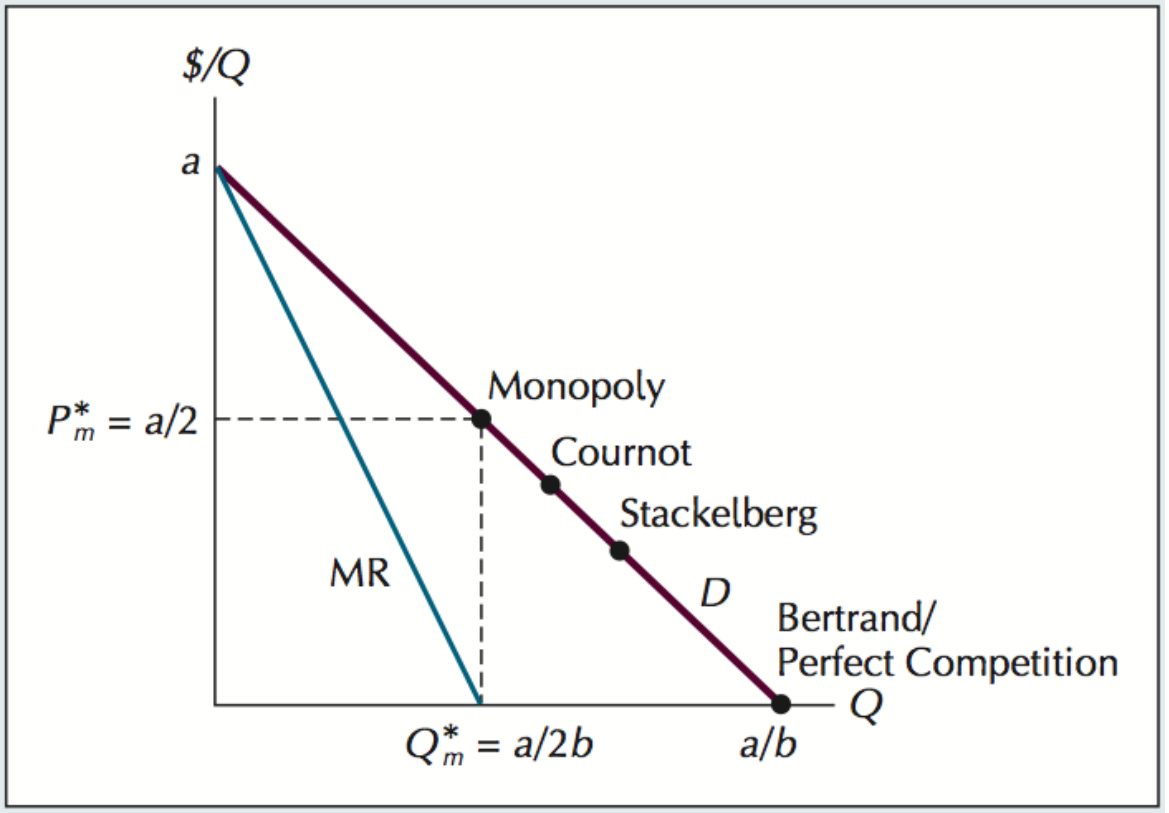
$$Q_2^* = \frac{a - bQ_1}{2b}$$

- Demand is then:

$$P = a - b[Q_1 + R_2(Q_1)] = \frac{a - bQ_1}{2}$$

- $Q_1^* = \frac{a}{2b}$ and $Q_2^* = \frac{a}{4b}$
- Firm 1 is referred to as **Stackelberg Leader**

Comparison of Outcomes I



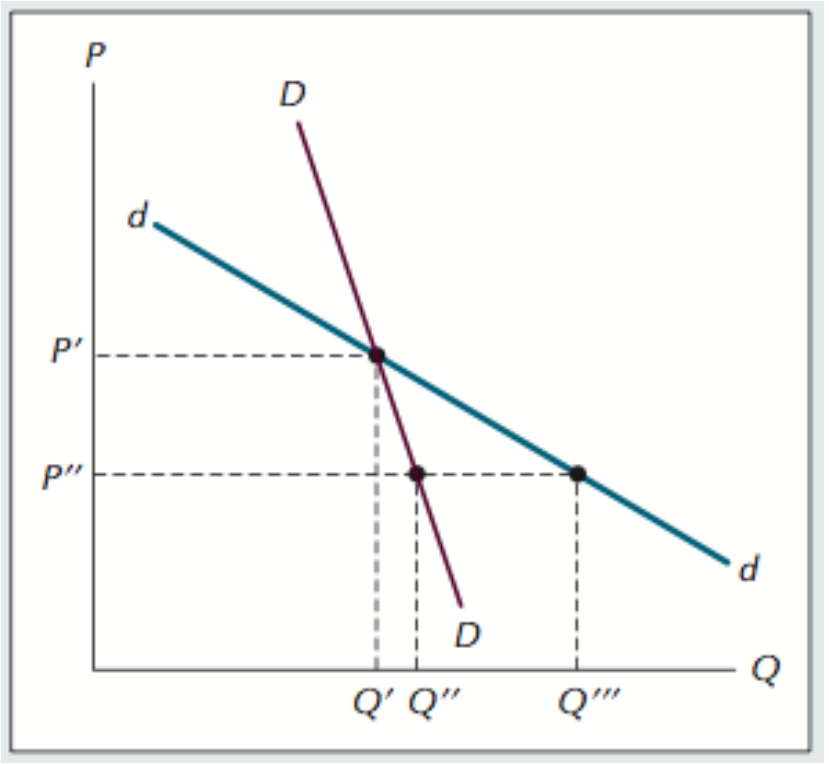
Comparison of Outcomes II

Model	Industry output Q	Market price P	Industry profit Π
Shared monopoly	$Q_m = a/(2b)$	$P_m = a/(2)$	$\Pi_m = a^2/(4b)$
Cournot	$(4/3)Q_m$	$(2/3)P_m$	$(8/9)\Pi_m$
Stackelberg	$(3/2)Q_m$	$(1/2)P_m$	$(3/4)\Pi_m$
Bertrand	$2Q_m$	0	0
Perfect competition	$2Q_m$	0	0

Monopolistic Competition I

- Monopolistic competition is a market structure that is close to perfect competition,
- Occurs if many firms serve a market with free entry and exit, but in which one firms products are not perfect substitutes for the products of other firms.
- Because the products are viewed as close but not perfect substitutes, each firm will confront a downward-sloping demand schedule.
- Because the products are close substitutes, this in turn means that each firm perceives its demand schedule as being highly elastic.
- In contemplating the demand for its own product, the firm assumes that its competitors do not respond in any way to its price and quantity decisions.
- As a result a firm confronts two different demand curves - one that describes what will happen when it alone changes its price and a second that describes what will happen when all prices change.

Monopolistic Competition II



Monopolistic Competition III