

Chapter 12

Oligopoly

Oligopoly – Characteristics

- () of firms
- Product differentiation may or may not exist
- () to entry

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Oligopoly – Equilibrium

- () Equilibrium
 - Firms are doing the best they can and **have no incentive to change their output or price**
- () Equilibrium
 - Each firm is doing the best it can **given what its competitors are doing**.

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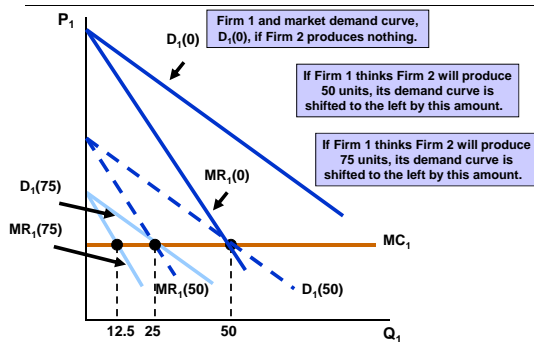
Duopoly

- The () Model
 - Oligopoly model in which firms produce a homogeneous good, each firm treats the output of its competitors as fixed, and all firms decide simultaneously how much to produce
 - Firm will adjust its output **based on what it thinks the other firm will produce**

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Firm 1's Output Decision



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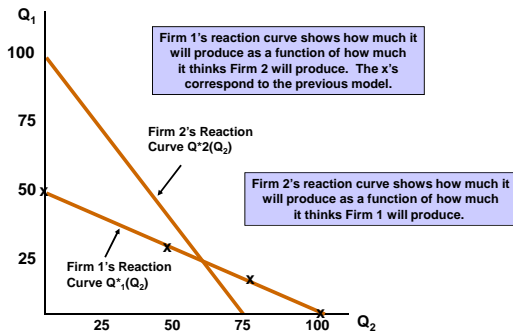
Oligopoly

- The () Curve
 - The relationship between a firm's profit-maximizing output and the amount it thinks its competitor will produce.
 - A firm's profit-maximizing output is a decreasing schedule of the expected output of Firm 2.

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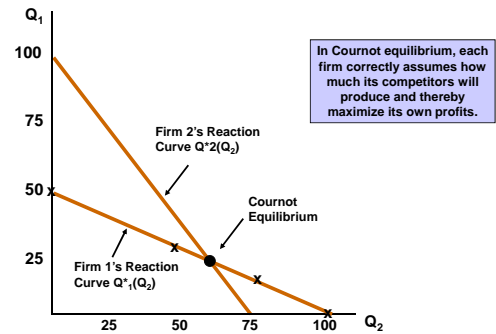
Reaction Curves and Cournot Equilibrium



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Reaction Curves and Cournot Equilibrium



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Cournot Equilibrium

- Each firm's reaction curve tells it **how much to produce given the output of its competitor.**
- Equilibrium in the Cournot model, in which each firm correctly assumes how much its competitor will produce and sets its own production level accordingly.

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Oligopoly

- Cournot equilibrium is an example of a Nash equilibrium (Cournot-Nash Equilibrium)
- The Cournot equilibrium says nothing about the dynamics of the adjustment process

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Oligopoly: Example

- An Example of the Cournot Equilibrium
 - Two firms face linear market demand curve
 - Market demand is $P = 30 - Q$
 - Q is total production of both firms:
 $Q = Q_1 + Q_2$
 - Both firms have $MC_1 = MC_2 = 0$

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Oligopoly Example

- Firm 1's Reaction Curve $\rightarrow MR=MC$

$$\begin{aligned} \text{Total Revenue: } R_1 &= PQ_1 = (30 - Q)Q_1 \\ &= 30Q_1 - (Q_1 + Q_2)Q_1 \\ &= 30Q_1 - Q_1^2 - Q_2Q_1 \end{aligned}$$

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Oligopoly Example

- An Example of the Cournot Equilibrium

$$MR_1 = \Delta R_1 / \Delta Q_1 = 30 - 2Q_1 - Q_2$$

$$MR_1 = 0 = MC_1$$

Firm 1's Reaction Curve

$$Q_1 = 15 - 1/2 Q_2$$

Firm 2's Reaction Curve

$$Q_2 = 15 - 1/2 Q_1$$

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Oligopoly Example

- An Example of the Cournot Equilibrium

$$\text{Cournot Equilibrium: } Q_1 = Q_2$$

$$15 - 1/2(15 - 1/2 Q_1) = 10$$

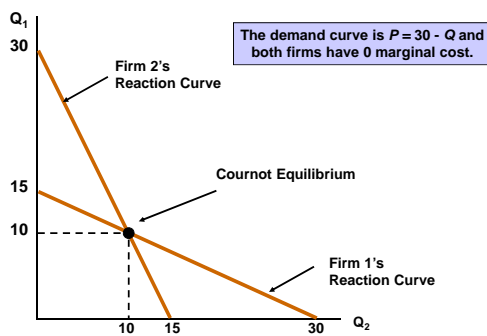
$$Q = Q_1 + Q_2 = 20$$

$$P = 30 - Q = 10$$

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Duopoly Example



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Oligopoly Example

- Profit Maximization with Collusion

$$R = PQ = (30 - Q)Q = 30Q - Q^2$$

$$MR = \Delta R / \Delta Q = 30 - 2Q$$

$$MR = 0 \text{ when } Q = 15 \text{ and } MR = MC$$

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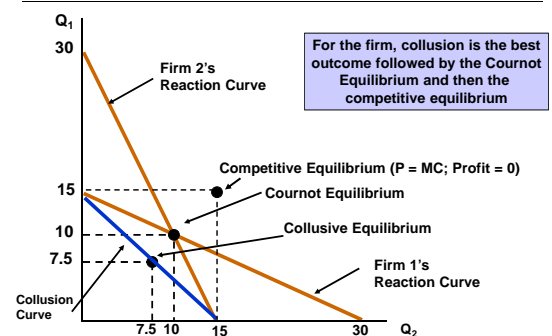
Profit Max with Collusion

- ()
 - $Q_1 + Q_2 = 15$
 - Shows all pairs of output Q_1 and Q_2 that maximizes total profits
 - $Q_1 = Q_2 = 7.5$
 - Less output and higher profits than the Cournot equilibrium

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Duopoly Example



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First Mover Advantage – The Stackelberg Model

- Oligopoly model in which one firm sets its output before other firms do.
- Assumptions
 - One firm can set output first
 - $MC = 0$
 - Market demand is $P = 30 - Q$ where Q is total output
 - Firm 1 sets output first and Firm 2 then makes an output decision seeing Firm 1 output

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First Mover Advantage – The Stackelberg Model

- Firm 1
 - Must consider the reaction of Firm 2
- Firm 2
 - Takes Firm 1's output as fixed and therefore determines output with the Cournot reaction curve: $Q_2 = 15 - \frac{1}{2}(Q_1)$

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First Mover Advantage – The Stackelberg Model

- Firm 1
 - Choose Q_1 so that:

$$MR = MC = 0$$

$$R_1 = PQ_1 = 30Q_1 - Q_1^2 - Q_2Q_1$$
 - Firm 1 knows that firm 2 will choose output based on its reaction curve. We can use firm 2's reaction curve as Q_2

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First Mover Advantage – The Stackelberg Model

- Using Firm 2's Reaction Curve for Q_2 :

$$R_1 = 30Q_1 - Q_1^2 - Q_1(15 - \frac{1}{2}Q_1)$$

$$= 15Q_1 - \frac{1}{2}Q_1^2$$

$$MR_1 = \Delta R_1 / \Delta Q_1 = 15 - Q_1$$

$$MR = 0 : Q_1 = 15 \text{ and } Q_2 = 7.5$$

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First Mover Advantage – The Stackelberg Model

- Conclusion
 - Going first gives firm 1 the advantage
 - Firm 1's output is twice as large as firm 2's
 - Firm 1's profit is twice as large as firm 2's
- Going first allows firm 1 to produce a large quantity. Firm 2 must take that into account and produce less unless it wants to reduce profits for everyone

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Competition Versus Collusion: The Prisoners' Dilemma

- Nash equilibrium is a *noncooperative* equilibrium: each firm makes decision that gives greatest profit, given actions of competitors

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Competition Versus Collusion: The Prisoners' Dilemma

- The () Dilemma illustrates the problem that oligopolistic firms face.
 - Two prisoners have been accused of collaborating in a crime.
 - They are in separate jail cells and cannot communicate.
 - Each has been asked to confess to the crime.

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Payoff Matrix for Prisoners' Dilemma

		Prisoner B	
		Confess	Don't confess
Prisoner A	Confess	-6, -6	0, -10
	Don't confess	-10, 0	-2, -2

Would you choose to confess?

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Oligopolistic Markets

- Conclusions
 1. () will lead to greater profits
 2. Explicit and implicit collusion is possible
 3. Once collusion exists, the profit motive to break and lower price is significant

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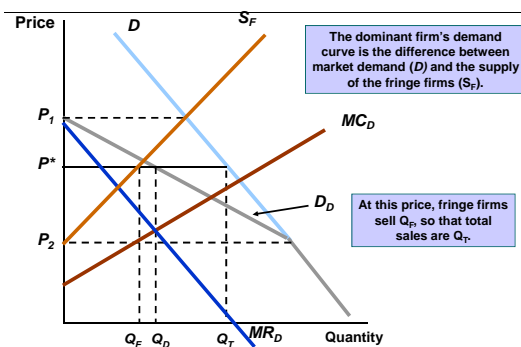
Price Leadership

- The () Firm Model
 - In some oligopolistic markets, one large firm has a major share of total sales, and a group of smaller firms supplies the remainder of the market.
 - The large firm might then act as the dominant firm, setting a price that maximizes its own profits.

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Price Setting by a Dominant Firm



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