Slide 1

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Economics *& Society*

Lecture 5

Strategic Competition

SMU

Slide 2

Previously in E&S

* Monopoly
* Supply curve in monopoly
* Market power
* Market efficiency ▶
  consumer surplus, producer surplus, DWL
* Taxation ▶
  PC & Monopoly
* Case: Market of human kidneys ▶

Slide 3

Modeling real markets
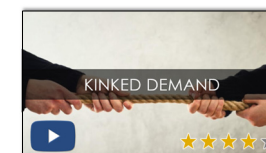
* There are *no perfectly competitive* markets out there
* There are *no pure monopolies*, either
* Then, *why* do we consider such models?

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Strategic Competition

MONOPOLISTIC COMPETITION

OLIGOPOLY

COURNOT OLIGOPOLY

BERTRAND OLIGOPOLY

COLLUSION

KINKED DEMAND

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OLIGOPOLY

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Assumptions

1. ***Small number*** of firms:
   - ▶ The number of firms is low enough, so that <u>interaction</u> is ***possible*** and ***meaningful***
   - ▶ Every firm needs to ***consider*** other firms' actions.

2. ***Homogeneous*** product:
   - ▶ ***Market power*** results from the <u>small number of firms</u>, NOT from <u>product differentiation</u>

3. ***Barriers*** to entry:
   - ▶ Firms are large and can ***create barriers*** to maintain their ***S-R profits*** in the ***L-R***
   - ▶ Threatening ***price wars***, excess ***capacity***, excessive ***advertisement***, ***proliferation***

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Strategic game

- ★ The ***key-***characteristic of oligopoly is ***interaction***
   we cannot think of firms' actions ***independently***, anymore
- ★ In <u>other market structures</u>, every firm is simply ***doing its best***
   no matter what ***other firms*** do
- ★ In <u>oligopoly</u>, any action will ***affect the rivals*** causing them to ***answer***
   every firm's ***outcome*** is ***affected*** by its actions but also its ***rivals' actions***
- ★ Therefore, actions in oligopoly are ***strategic***

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Examples of oligopolistic markets

- ★ Middle-high class ***sedans***
   BMW, Mercedes, Audi, Volvo
- ★ High-end ***smartphones***
   iPhone, Galaxy, Huawei
- ★ Web based ***email***
   Hotmail, Gmail, Yahoo

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Competition with respect to what?

* ★ Firms have to choose in **which field** they will compete:
  * ▶ <u>Apple</u> and <u>Samsung</u> are competing with respect to
  * ▶ <u>BMW</u> and <u>Benz</u> are competing with respect to
  * ▶ <u>Coke</u> and <u>Pepsi</u> are competing with respect to
  * ▶ <u>DKNY</u> and <u>Calvin Klein</u> compete with respect to
  * ▶ <u>Firefox</u> and <u>Chrome</u> compete with respect to
  * ▶ <u>SMU</u> and <u>NUS</u> compete with respect to
  * ▶ <u>Oil producing nations</u> are competing with respect to
  * ▶ <u>Supermarkets</u> compete with respect to

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Oligopoly models

* ★ ***Cournot:*** Competition with respect to <u>quantities</u>

  the choice variable of the firm is the ***quantity***

* ★ ***Bertrand:*** Competition with respect to <u>prices</u>

  the choice variable of the firm is the ***price***

* ★ ***Collusion:*** Firms cooperate and act as if they were a <u>monopoly</u>

* ★ ***Kinked demand model:*** Firms are <u>reluctant</u> to reduce prices

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COURNOT OLIGOPOLY

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The Cournot duopoly (1838)

* ★ Two ***identical*** and ***symmetric*** firms produce a ***homogeneous*** good

  firm 1 & firm 2

* ★ For both sellers, $FC = 0$ and $MC = \$10$

* ★ The ***market demand*** is

$$p = 130 - Q$$

  where $Q = q_1 + q_2$

* ★ Firms decide ***how much*** to produce:
  1. Separately
  2. Simultaneously
  3. Irrevocably

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MR for firm 1 ⚠️

★ The market demand **can be written** as
$$p = 130 - q_1 - q_2$$

★ In this demand function, firm 1 can **control** q_1
   but sees 130 and q_2 as **constant**

★ Thus, demand **as seen by firm 1** is
$$p = \underbrace{(130 - q_2)}_{\text{constant}} - \underbrace{q_1}_{\text{gradient}}$$

★ Thus, **marginal revenue** for firm 1 is
$$MR_1 = (130 - q_2) - 2q_1$$

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Optimal choice of output ⚠️

★ Profit maximization for firm 1 implies:
$$MR_1 = MC \quad \text{or} \quad (130 - q_2) - 2q_1 = 10 \quad \text{or} \quad \boxed{q_1 = \frac{120 - q_2}{2}} \quad (1)$$

★ **Equation** (1) is called firm's 1 "**best response**" or "**optimal reaction**" function
   because it yields the profit maximizing q_1 **for every** q_2 that firm 2 may choose

★ Firm 2 **responds symmetrically** to firm 1:
$$\boxed{q_2 = \frac{120 - q_1}{2}} \quad (2)$$

★ Since both firms are **identical**, in the end $q_1 = q_2$, so we can write (1) as:
$$q_1 = \frac{120 - q_1}{2} \quad \text{or} \quad 2q_1 = 120 - q_1 \quad \text{or} \quad \boxed{q_1 = q_2 = 40}$$

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Price & profits

★ Price in **Cournot**: $p = 130 - q_1 - q_2 = 130 - 40 - 40$ or $p = \$50$

★ Profit per firm: $\Pi_1 = (p - c)q_1 = (\$50 - \$10)40$ or $\boxed{\Pi_1 = \Pi_2 = \$1{,}600}$

★ If both firms **acted as PC competitors**:
   $D = S$ or $130 - Q = 10$ or $Q = 120$ or $q_1 = q_2 = 60$.
   Price: $p = 130 - q_1 - q_2 = 130 - 60 - 60$ or $p = \$10$
   Profit per firm: $\Pi_1 = (p - c)q_1 = (\$10 - \$10)60$ or $\boxed{\Pi_1 = \Pi_2 = \$0}$

★ If firms **collude** and behave as a **monopoly**:
   $MR = MC$ or $130 - 2Q = 10$ or $Q = 60$ or $q_1 = q_2 = 30$.
   Price: $p = 130 - q_1 - q_2 = 130 - 30 - 30$ or $p = \$70$.
   Profit per firm: $\Pi_1 = (p - c)q_1 = (\$70 - \$10)30$ or $\boxed{\Pi_1 = \Pi_2 = \$1{,}800}$

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Comparing models

	Price	Quantity per firm	Profit per firm
PC	$10	60	$0
Cournot	$50	40	$1,600
Collusion	$70	30	$1,800

★ <u>Price</u>, <u>quantity</u> and <u>profit</u> of Cournot are **between** PC and Monopoly

★ The **most profitable outcome** for firms is to **collude** by setting $q = 30$

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Incentive for cheating ⚠️

	Price	Quantity per firm	Profit per firm
PC	$10	60	$0
Cournot	$50	40	$1,600
Collusion	$70	30	$1,800

★ Assume that <u>firm 1</u> sets $q_1 = 30$ and **expects** <u>firm 2</u> to also produce $q_2 = 30$:
  ▸ Firm 2 can produce $q_2 = 30$ and each firm earn **profit** $1,800
  ▸ OR firm 2 can produce $q_2 = (120 - q_1)/2 = (120 - 30)/2 = 45$.
★ If $q_2 = 45$, **price** will be: $p = 130 - q_1 - q_2 = 130 - 30 - 45 = \$55$:
  ▸ Profit for firm 2: $\Pi_2 = (p - c)q_2 = (\$55 - \$10)45$ or $\Pi_2 = \$$
  ▸ Profit for firm 1: $\Pi_1 = (p - c)q_1 = (\$55 - \$10)30$ or $\Pi_1 = \$$
★ Each firm has a strong **incentive to cheat** hurting the other firm
  without **commitment mechanism**, collusion is **not sustainable**

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BERTRAND OLIGOPOLY

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Bertrand competition (1883)

★ Two **identical** and **symmetric** firms produce a **homogeneous** good
  firm 1 & firm 2
★ For both sellers, $FC = 0$ and $MC = \$10$
★ The **market demand** is
$$p = 130 - Q$$
  where $Q = q_1 + q_2$
★ Firms separately, simultaneously, and irrevocably choose **prices**
★ Since the good is **homogeneous**, consumers buy from **cheapest** seller:
  ▸ The **cheapest** seller serves the **entire** demand
  ▸ If $p_1 = p_2$, firms **share** the demand as in Cournot $(p = 130 - q_1 - q_2)$.

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Bertrand equilibrium

★ If firm 1 charges any $p_1 > \$10$
  firm 2 would want to
★ If firm 1 charges any $p_1 < \$10$
  firm 2 would
★ If firm 1 charges $p_1 = \$10$
  firm 2 would
★ The Bertrand **equilibrium** is $p_1^* = p_2^* = MC$
  firms end up producing the **PC output** and earning **PC profit**

The Bertrand paradox

* The Bertrand equilibrium is **paradoxical**

  firms are supposed to have **market power** but **behave as if they do not have**

* This happens **because** even a <u>minuscule price-cut</u> will change the firms' <u>market shares dramatically</u>

* There are 3 **major ways** to **resolve** this paradox:

  1. **Capacity constraints**: if the cheaper firm does not have the **capacity** to serve the entire market alone, its rival can profit from exploiting the **residual** customers

  2. **Repeated interaction**: the <u>benefit from cheating</u> is **high** but **for only one** period – the <u>benefit from collusion</u> is **lower** but for **more periods**

  3. **Differentiation**: when a firm's product is perceived as **better** by its customers, they **will not abandon** it if a rival undercuts the price

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External video ▶

In this Al Jazeera Video, watch how Russia and Saudi Arabia found themselves amid a harsh price war during one of the worst economic downturns of the last century. Try to figure out what kind of game petroleum is: Cournot or Bertrand?

You Tube

Oil price war: Analysts expect prices to drop further
Al Jazeera English ✔ 92K views • 2 months ago
Top energy officials in the US and Russia will meet to tackle an historic collapse in global oil markets. The meeting comes after a ...

SAUDI-RUSSIAN OIL PRICE FEUD   5:17

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Thank you!

(you are welcomed to stay for *consultation* or *discussion*)

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⊘ WARNING! ⊘

The slides in this handout are created with the intention to serve a visual aid for the audience during the live presentation of the material in the lecture. As such, **they are not designed to be standalone reading material** and should be used strictly as **reference**, side by side with notes taken in the lecture. Studying solely from the slides **is not recommended** and might in some cases **mislead** those who have not attended the relevant lecture. **Less than 20% of tasks in test and exam can be answered solely from the slides**.

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