Outline

1. Profit Maximization: Monopoly

2. Price Discrimination

3. Oligopoly?
1 Profit Maximization: Monopoly

- Nicholson, Ch. 11, pp. 371-380
- Nicholson, Ch. 14, pp. 501-510

- **Perfect competition.** Firms small

- **Monopoly.** One, large firm. Firm sets price $p$ to maximize profits.

- What does it mean to set prices?

- Firm chooses $p$, demand given by $y = D(p)$

- (OR: firm sets quantity $y$. Price $p(y) = D^{-1}(y)$)
• Write maximization with respect to $y$

• Firm maximizes profits, that is, revenue minus costs:

$$\max_{y} p(y) y - c(y)$$

• Notice $p(y) = D^{-1}(y)$

• First order condition:

$$p'(y) y + p(y) - c_y'(y) = 0$$

or

$$\frac{p(y) - c_y'(y)}{p} = -p'(y) \frac{y}{p} = -\frac{1}{\varepsilon_{y,p}}$$

• Compare with f.o.c. in perfect competition

• Check s.o.c.
• Elasticity of demand determines markup:
  - very elastic demand $\rightarrow$ low mark-up
  - relatively inelastic demand $\rightarrow$ higher mark-up

• Graphically, $y^*$ is where marginal revenue $(p' (y) y + p (y))$ equals marginal cost $(c'_y (y))$

• Find $p$ on demand function
• Example.

• Linear inverse demand function \( p = a - by \)

• Linear costs: \( C(y) = cy \), with \( c > 0 \)

• Maximization:

\[
\max_y (a - by) y - cy
\]

• Solution:

\[
y^* (a, b, c) = \frac{a - c}{2b}
\]

and

\[
p^* (a, b, c) = a - b \frac{a - c}{2b} = \frac{a + c}{2}
\]
• s.o.c.

• Figure

• Comparative statics:
  
  – Change in marginal cost \( c \)

  – Shift in demand curve \( a \)
• Monopoly profits

• Case 1. High profits

• Case 2. No profits
• Welfare consequences of monopoly
  – Too little production
  – Too high prices

• Graphical analysis
2 Price Discrimination

- Nicholson, Ch. 14, pp. 513-519

- Restriction of contract space:
  - So far, one price for all consumers. But:
  - Can sell at different prices to differing consumers (first degree or perfect price discrimination).

- Self-selection: Prices as function of quantity purchased, equal across people (second degree price discrimination).

- Segmented markets: equal per-unit prices across units (third degree price discrimination).
2.1 Perfect price discrimination

- Monopolist decides price and quantity consumer-by-consumer

- What does it charge? Graphically,

- Welfare:
  - gain in efficiency;
  - all the surplus goes to firm
2.2 **Self-selection**

- Perfect price discrimination not legal

- Cannot charge different prices for same quantity to A and B

- Partial Solution:
  - offer different quantities of goods at different prices;
  - allow consumers to choose quantity desired
Examples (very important!):

- bundling of goods (xeroxing machines and toner);

- quantity discounts

- two-part tariffs (cell phones)
• Example:

• Consumer A has value $1 for up to 100 photocopies per month

• Consumer B has value $.50 for up to 1,000 photocopies per month

• Firm maximizes profits by selling (for $ small):
  - 100 photocopies for $100-$
  - 1,000 photocopies for $500-$

• Problem if resale!
2.3 Segmented markets

- Firm now separates markets

- Within market, charges constant per-unit price

- Example:
  - cost function $TC(y) = cy$.
  - Market A: inverse demand function $p_A(y)$ or
  - Market B: inverse function $p_B(y)$
• Profit maximization problem:

$$\max_{y_A, y_B} p_A(y_A) y_A + p_B(y_B) y_B - c(y_A + y_B)$$

• First order conditions:

• Elasticity interpretation

• Firm charges more to markets with lower elasticity
• Examples:
  - student discounts

  - prices of goods across countries:
    * airlines (US and Europe)
    * books (US and UK)
    * cars (Europe)
    * drugs (US vs. Canada vs. Africa)

• As markets integrate (Internet), less possible to do the latter.
3 Oligopoly?

• Extremes:
  – Perfect competition
  – Monopoly

• Oligopoly if there are \( n \) (two, five...) firms

• Examples:
  – soft drinks: Coke, Pepsi;
  – cellular phones: Sprint, AT&T, Cingular,...
  – car dealers
• Firm $i$ maximizes:

$$\max_{y_i} p (y_i + y_{-i}) y_i - c(y_i)$$

where $y_{-i} = \sum_{j \neq i} y_j$.

• First order condition with respect to $y_i$:

$$p'_y (y_i + y_{-i}) y_i + p - c'_y (y_i) = 0.$$  

• Problem: what is the value of $y_{-i}$?

  – simultaneous determination?

  – can firms $-i$ observe $y_i$?

• Need to study strategic interaction
4 Next Lecture

- Game theory

- Back to oligopoly:
  - Cournot
  - Bertrand