Outline

1. Consumer Surplus

2. Profit Maximization: Monopoly

3. Price Discrimination

4. Oligopoly?
1 Welfare: Consumer Surplus

- Nicholson, Ch. 5, pp. 145–149 [OLD: Ch. 5, pp. 139–143]

- Evaluate welfare effects of price change from $p_0$ to $p_1$

- Proposed measure:

\[ e(p_0, u) - e(p_1, u) \]

- Can rewrite expression above as

\[
e(p_0, u) - e(p_1, u) = \left( e(0, u) + \int_0^{p_0} \frac{\partial e(p, u)}{\partial p} dp \right) - \left( e(0, u) + \int_0^{p_1} \frac{\partial e(p, u)}{\partial p} dp \right) = \int_{p_1}^{p_0} \frac{\partial e(p, u)}{\partial p} dp
\]
• What is \( \frac{\partial e(p,u)}{\partial p} \)?

• Remember envelope theorem...

• Result:

\[
\frac{\partial e(p,u)}{\partial p} = h(p,u)
\]

• Welfare measure is integral of area to the side of Hicksian compensated demand

• Graphically,
• Example of welfare effects: Imposition of Tax

• Welfare before tax

• Welfare after tax
2 Profit Maximization: Monopoly

- Nicholson, Ch. 13, pp. 385–393 [OLD: Ch. 18, pp. 496–504]

- Nicholson, Ch. 9, pp. 248–255 [OLD: Ch. 13, pp. 335–342]

- **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
3 Price Discrimination

- Nicholson, Ch. 13, pp. 397–404 [OLD: Ch. 18, pp. 508–515].

- 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).
3.1 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
3.2 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 $ \varepsilon$ small):

  – 100 photocopies for $100-\varepsilon$

  – 1,000 photocopies for $500-\varepsilon$

● Problem if resale!
3.3 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.
4 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:

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

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

• First order condition with respect to $y_i$:

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

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

  – simultaneous determination?

  – can firms $-i$ observe $y_i$?

• Need to study strategic interaction
5 Next Lecture

• Game theory

• Back to oligopoly:
  – Cournot
  – Bertrand