Handout 11

Topics

- First and third degree price discrimination
- Oligopoly: Collusion and Cournot Duopoly

Review: Price Discrimination

- **First degree PD:** monopolist knows the willingness to pay (WTP) of each consumer and charges consumers prices equal to their WTP; as a result, CS equals zero.
  - When $MC = AC$ is constant, monopolist sets prices such that the demand curve acts as the MR and produces Q_{PC} – which is the efficient outcome. Hence, there is no DWL.
  - In this case, assuming linear demand, the total profits by a monopolist is given by the area of the triangle that lies between the demand and the MC curves.
- **Third degree PD:** monopolist charges different groups of consumers different prices.
  - **Problem-solving steps:** separate demand equations are given for different groups of consumers. You follow the same profit maximization steps as for a monopolist, but separately for each consumer group, i.e. for each group, you first set $MR = MC$ to get Q_M, then use the corresponding demand to get P_M.

Review: Oligopoly

- **General Setting:** industry with few firms; firms have some market power i.e. can influence prices. Products can be homogenous or differentiated. Firms exhibit *strategic behavior* i.e. production decisions of a firm depends on behavior of other firms.
- **Collusion model:** firms collude to act as a monopolist – they jointly decide to produce monopolist quantities and charge monopolist prices because they want to maximize joint profits. They split the profits. Participating firms have incentive to cheat.
- **Cournot model :** a model of quantity competition
  - Setting: two firms; each takes the others' output as given; goal: maximize profits.
  - To get equilibrium quantity and prices, we build reaction functions.
  - Given linear demand and constant MC, reaction functions are *linear* and can be pinned down by *two* points: a) if the other firm produces Q_{PC}, you react by producing zero output; b) if the other firm produces zero output, you react by producing Q_M – acting like a monopolist. The resulting reaction function for firm 1 takes the form: $q_1 = Q_M - \frac{1}{2}q_2$ and for firm 2: $q_2 = Q_M - \frac{1}{2}q_1$.
  - Substitute one reaction function into another to get q_1^* and q_2^*.
  - Important Result: if both firms face the *same, constant* MC, then $q_1^* = q_2^* = \frac{2}{3}Q_M$.

Exercises

Exercise 1. First degree price discrimination

Suppose a monopoly is a first-degree price discriminator in the market for cell phones. Cell phone demand is given by $Q = 100 - P$. The monopoly's marginal cost is $MC = 20$.

1. What are the monopoly's profits if it practices first degree price discrimination? Are these higher or lower than when the monopoly cannot price discriminate?

2. What is consumer surplus in this market when the monopoly practices first degree price discrimination? Is this higher or lower compared to the situation where the monopoly cannot price discriminate?

3. What is dead weight loss in this market when the monopoly practices first degree price discrimination? Is this higher or lower than when the monopoly cannot price discriminate?

Exercise 2. Third degree price discrimination

Suppose there is only one airline to serve a certain local airport. The airline serves both students and the general public. The airline's marginal cost is given by $MC = 20$. Suppose the student demand is given by $P = 120 - Q$ and the general public demand is given by $P = 200 - Q/4$. What price should the airline charge each group for tickets?What is this monopolist's total profit?

Exercise 3. Collusion

Suppose there are 3 countries that are the only countries in the world to produce oil. The market demand for oil is $P = 260 - 2Q$. Marginal cost is \$20 on each unit sold.

a) Suppose they choose to collude. They first figure out how to maximize total profits and then divide the production and profits between them. How much do they each produce in this scenario? What profits does each earn?

b) Suppose one of the 3 countries cheats and produces an extra 20 barrels. What are the profits of the 3 countries in this scenario? Does it pay to be the cheater?

c) Now suppose all 3 countries cheat and produce the extra 20 barrels. What are the profits of each?

Exercise 4. Cournot Duopoly

Consider the market for central processing units (CPUs), a key component in modern computers. This market consists of two firms: Intel and AMD. For simplicity, assume that both Intel and AMD have identical cost structures, where $MC = AC = 30$ (we would change this later) for each firm. On any given day, the market demand for CPUs is given by $P = 120 - Q$.

a) Suppose the market for CPUs was controlled by a monopoly with the same cost structure as Intel and AMD. How many CPUs would this monopoly produce (call this Q_M), and what price would it charge P_M ?

b) Suppose instead the market for CPUs was perfectly competitive, with every firm having the same cost structure as Intel and AMD. What would be the market equilibrium quantity Q_{PC} and price P_{PC}?

c) Now return to reality, where Intel and AMD compete as Cournot duopolist. What is the reaction function of Intel? What is the reaction function of AMD?

d) Find the quantity produced by each firm in a Cournot equilibrium, q^*_{Intel} and q^*_{AMD}. Then find the market quantity Q_C and market price P_C under this Cournot duopoly.

e) Compare the three industrial structures: monopoly, Cournot duopoly, and perfect competition. Rank these in terms of firms profits and the welfare of consumers (Hint:there is no need to calculate anything here. Use your intuition to rank these by comparing prices and quantities only.)

f) Suppose Intel's marginal cost is $MC = 20$. What's Intel's reaction function?

g) Find the new quantity produced by each firm in a Cournot equilibrium, q^*_{Intel} and q^*_{AMD}. Can you use the $\frac{2}{3}$ rule?

Exercise 5. Additional Exercise on Monopoly

Verisson is a monopoly in the provision of broadband plans in Madison. Verisson's variable cost and marginal cost are given by $VC = 4q$ and $MC = 4$, respectively. Verisson's fixed cost is equal to \$1,500 (it requires a huge investment in infrastructure to be able to provide broadband plans). The demand for broadband plans in Madison is given by $Q = 84 - P$.

a) Derive the TC for Verisson. Does Verisson's technology exhibit economies of scale?

b) Derive the Marginal Revenue (MR) of Verisson. Find the number of plans that Verisson provides and the price at which they sell them. Is Verisson making profits?

c) Compute the CS and PS in the market. What is the DWL of this monopoly?

A rival firm Chartel, that has the same cost functions as Verisson, is considering whether to enter the market or not. If Chartel enters the market, demand is equally split between both firms. Thus, the demand for broadband plans that Chartel would face in Madison is given by $Q = 42 - 0.5P$.

a) Derive the MR for Chartel. Find the number of broadband plans that Chartel would offer and the price at which it would offer those plans if it decides to enter.

b) Would Chartel enter the market of broadband plans in Madison?

Multiple choice questions

1. Firms A and B are two firms in Cournot Duopoly. Market demand is $P = 50 - Q$ and $MC = 4$. How many units should firm B produce if firm A produces 20 units?

   a. 23
   b. 20
   c. 13
   d. 4

2. A monopolistic firm faces a downward-sloping demand curve because:

   a. There are a large number of firms in the industry, all selling the same product.
   b. The demand for its product is always inelastic.
   c. Unlike a competitive firm, the amount a monopolistic firm sells affects the price of the good.
   d. Marginal revenue is negative throughout the feasible range of output.

3. Which of the following would not be classified for a barrier to entry for a monopoly?

   a. patent laws
   b. economies of scale
   c. declining marginal revenue curve
   d. Franchises or charters

4. If a monopolist can perfectly price discriminate, then

   a. It will charge just two different prices in two different markets.
   b. There will be no consumer surplus.
   c. The efficient quantity will not be produced.
   d. The deadweight loss is larger than if it cannot price discriminate.

5. Which of the following is true with third degree price discrimination?

   a. The monopolist earns higher profits than with first degree price discrimination.
   b. Consumer surplus is higher than with first degree price discrimination.
   c. The monopolist is able to charge a different price to each consumer.
   d. This is a profit maximizing strategy if resale is possible.

6. Which of the following is not true when firms collude?

   a. Firms have an incentive to cheat.
   b. Firms choose price to maximize total profit.
   c. The quantity produced is the same as if there was a monopoly.
   d. Consumers surplus is higher than if there was a monopoly.