Lecture 8: Price Discrimination

Mauricio Romero

Lecture 8: Price Discrimination

Lecture 8: Price Discrimination

- In real life, firms often have different prices for different consumers/units
- We will explore some of these now
- In a competitive market such exotic pricing schemes could never arise since $p =$ marginal cost

Lecture 8: Price Discrimination

Lecture 8: Price Discrimination

- Suppose the firm can observe all characteristics of the consumer
- What should the firm do?

- Suppose the firm can observe all characteristics of the consumer
- What should the firm do?
- Demand curve illustrates the willingness to pay for the q-th unit of the product

- Suppose the firm can observe all characteristics of the consumer
- What should the firm do?
- Demand curve illustrates the willingness to pay for the q-th unit of the product
- Firm can extract all of the surplus of the consumer. How?

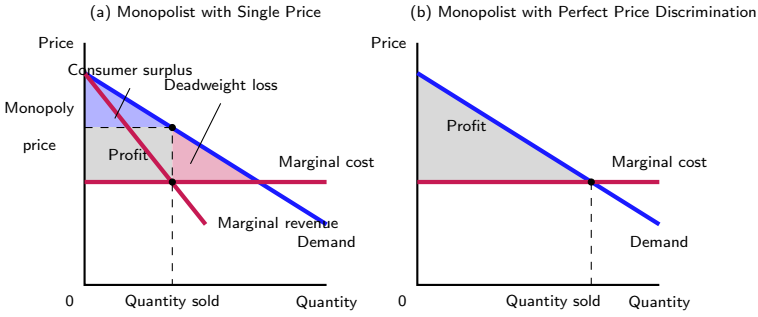
- Firm will price at $p(q)$ for the q-th unit and continue to produce until $p(q) = MC(q)$

- Firm will price at $p(q)$ for the q-th unit and continue to produce until $p(q) = MC(q)$

- Firm gets all of the consumer surplus as his profits:

$$\Pi = \int_0^{q^*} (p(q) - c'(q))dq = \int_0^{q^*} p(q)dq - c(q^*),$$

where q^* is the quantity at which $p(q^*) = c'(q^*)$.


(a) Monopolist with Single Price
Price
Consumer surplus
Deadweight loss
Monopoly
price
Profit
Marginal cost
Marginal revenue
Demand
0
Quantity sold
Quantity
(b) Monopolist with Perfect Price Discrimination
Price
Profit
Marginal cost
Demand
0
Quantity sold
Quantity

- Firm can do this is because it knows the exact demand curve of each consumer
- Such activity is prohibited in many countries

- Firm can do this is because it knows the exact demand curve of each consumer
- Such activity is prohibited in many countries
- Amazon tries to estimate everyone's demand curve

Lecture 8: Price Discrimination

- Suppose that a bar has a monopoly in a community
- Each drink costs c dollars to provide
- Consumers have diminishing marginal returns on the alcohol consumed

This bar would produce q at price $p(q)$ such that

$$p'(q)q + p(q) = c$$

if it were only able to charge one price

- Many bars have a cover charge (an entry fee)

- Does this increase profits?

- Two quantities (f, q^*) where f is the entry fee and q is the drinks sold

- Two quantities (f, q^*) where f is the entry fee and q is the drinks sold
- How much are consumers willing to pay to enter the bar when there are q^* units of drinks being served:

$$\int_0^{q^*} (p(q) - p(q^*))dq.$$

- Two quantities (f, q^*) where f is the entry fee and q is the drinks sold
- How much are consumers willing to pay to enter the bar when there are q^* units of drinks being served:

$$\int_0^{q^*} (p(q) - p(q^*))dq.$$

- As long as

$$f \leq \int_0^{q^*} (p(q) - p(q^*))dq,$$

then all consumers will come to the bar

- Two quantities (f, q^*) where f is the entry fee and q is the drinks sold
- How much are consumers willing to pay to enter the bar when there are q^* units of drinks being served:

$$\int_0^{q^*} (p(q) - p(q^*))dq.$$

- As long as

$$f \leq \int_0^{q^*} (p(q) - p(q^*))dq,$$

  then all consumers will come to the bar
- For a fix q^*, the monopolist will always charge an entry fee of

$$f = \int_0^{q^*} (p(q) - p(q^*))dq.$$

- What is then the profit maximizing price and quantity given this entry fee?

- What is then the profit maximizing price and quantity given this entry fee?
-

$$\max_{q^*} \int_0^{q^*} (p(q) - p(q^*))dq + p(q^*)q^* - cq^* = \max_{q^*} \int_0^{q^*} (p(q) - c)dq.$$

- What is then the profit maximizing price and quantity given this entry fee?
- $$\max_{q^*} \int_0^{q^*} (p(q) - p(q^*))dq + p(q^*)q^* - cq^* = \max_{q^*} \int_0^{q^*} (p(q) - c)dq.$$
- The first order condition is:
$$p(q) - c = 0$$

- What is then the profit maximizing price and quantity given this entry fee?
- $$\max_{q^*} \int_0^{q^*} (p(q) - p(q^*))dq + p(q^*)q^* - cq^* = \max_{q^*} \int_0^{q^*} (p(q) - c)dq.$$
- The first order condition is:
$$p(q) - c = 0$$
- Then
$$p(q^*) = c.$$
then all consumers will come to the bar

- What is then the profit maximizing price and quantity given this entry fee?
- $$\max_{q^*} \int_0^{q^*} (p(q) - p(q^*))dq + p(q^*)q^* - cq^* = \max_{q^*} \int_0^{q^*} (p(q) - c)dq.$$
- The first order condition is:
$$p(q) - c = 0$$
- Then
$$p(q^*) = c.$$
then all consumers will come to the bar
- The entry fee is:
$$\int_0^{p^{-1}(c)} (p(q) - c)dq$$

- Quantity produced is efficient
- Consumer surplus is 0

Lecture 8: Price Discrimination

- Under both first price discrimination and two-part tariff, the firm is able to extract all of the consumer surplus
- What is the difference between first degree price discrimination and two-part tariff?
- Let's see with an example

$$p_A = 2 - \frac{1}{4} q_A$$
$$p_B = 8 - q_B$$

Marginal cost of production of 1

- If the monopolist knew the demand curve of each consumer

- If the monopolist knew the demand curve of each consumer
- First degree price discrimination

- If the monopolist knew the demand curve of each consumer
- First degree price discrimination
  - Different price for each consumer and each unit, and extract all consumer surplus

- If the monopolist knew the demand curve of each consumer
- First degree price discrimination
  - Different price for each consumer and each unit, and extract all consumer surplus
- Two-part tariff

- If the monopolist knew the demand curve of each consumer
- First degree price discrimination
  - Different price for each consumer and each unit, and extract all consumer surplus
- Two-part tariff
  - Different fee and different price for each consumer

- If the monopolist knew the demand curve of each consumer
- First degree price discrimination
  - Different price for each consumer and each unit, and extract all consumer surplus
- Two-part tariff
  - Different fee and different price for each consumer
  - Price of 1 to all consumers

- If the monopolist knew the demand curve of each consumer
- First degree price discrimination
  - Different price for each consumer and each unit, and extract all consumer surplus
- Two-part tariff
  - Different fee and different price for each consumer
  - Price of 1 to all consumers
  - Entry fee of 2 for consumer A (consumer surplus when $p = 1$)

- If the monopolist knew the demand curve of each consumer
- First degree price discrimination
  - Different price for each consumer and each unit, and extract all consumer surplus
- Two-part tariff
  - Different fee and different price for each consumer
  - Price of 1 to all consumers
  - Entry fee of 2 for consumer A (consumer surplus when $p = 1$)
  - Entry fee of $49/2 = 24.5$ for consumer B (consumer surplus when $p = 1$)

- What if monopolist doesn't know who is who

- What if monopolist doesn't know who is who
- First degree price discrimination

- What if monopolist doesn't know who is who
- First degree price discrimination
  - Aggregate demand

- What if monopolist doesn't know who is who
- First degree price discrimination
  - Aggregate demand

- What if monopolist doesn't know who is who
- First degree price discrimination
  - Aggregate demand

$$p_A = 2 - \frac{1}{4} q_A$$

$$p_B = 8 - q_B$$

- What if monopolist doesn't know who is who
- First degree price discrimination
  - Aggregate demand

$$p_A = 2 - \frac{1}{4} q_A$$
$$p_B = 8 - q_B$$

$$q_A = 8 - 4p_a$$
$$q_B = 8 - p_B$$

  - if $p \leq 2$

- What if monopolist doesn't know who is who
- First degree price discrimination
  - Aggregate demand

$$p_A = 2 - \frac{1}{4} q_A$$
$$p_B = 8 - q_B$$

$$q_A = 8 - 4p_a$$
$$q_B = 8 - p_B$$

  - if $p \leq 2$

- What if monopolist doesn't know who is who
- First degree price discrimination
  - Aggregate demand

$$p_A = 2 - \frac{1}{4} q_A$$
$$p_B = 8 - q_B$$

$$q_A = 8 - 4p_a$$
$$q_B = 8 - p_B$$

  - if $p \leq 2$

$$Q = q_A + q_b = 16 - 5p$$

- What if monopolist doesn't know who is who
- First degree price discrimination
  - Aggregate demand

$$p_A = 2 - \frac{1}{4} q_A$$
$$p_B = 8 - q_B$$

$$q_A = 8 - 4p_a$$
$$q_B = 8 - p_B$$

  - if $p \leq 2$

$$Q = q_A + q_b = 16 - 5p$$

$$P = \frac{16 - Q}{5}$$

  - if $p > 2$

- What if monopolist doesn't know who is who
- First degree price discrimination
  - Aggregate demand

$$p_A = 2 - \frac{1}{4} q_A$$
$$p_B = 8 - q_B$$

$$q_A = 8 - 4p_a$$
$$q_B = 8 - p_B$$

  - if $p \leq 2$

$$Q = q_A + q_b = 16 - 5p$$

$$P = \frac{16 - Q}{5}$$

  - if $p > 2$

- What if monopolist doesn't know who is who
- First degree price discrimination
  - Aggregate demand

$$p_A = 2 - \frac{1}{4} q_A$$
$$p_B = 8 - q_B$$

$$q_A = 8 - 4p_a$$
$$q_B = 8 - p_B$$

  - if $p \leq 2$

$$Q = q_A + q_b = 16 - 5p$$

$$P = \frac{16 - Q}{5}$$

  - if $p > 2$

$$Q = q_A + q_b = 8 - p$$

- What if monopolist doesn't know who is who
- First degree price discrimination
  - Aggregate demand

$$p_A = 2 - \frac{1}{4} q_A$$
$$p_B = 8 - q_B$$

$$q_A = 8 - 4p_a$$
$$q_B = 8 - p_B$$

  - if $p \leq 2$

$$Q = q_A + q_b = 16 - 5p$$

$$P = \frac{16 - Q}{5}$$

  - if $p > 2$

$$Q = q_A + q_b = 8 - p$$

$$P = 8 - Q$$

$$Q(p) = \begin{cases} 16 - 5p \text{ if } p \leq 2 \\ 8 - p \text{ if } p \geq 2 \end{cases}$$

$$P(Q) = \begin{cases} \frac{16-Q}{5} \text{ if } Q \geq 6 \\ 8 - Q \text{ if } Q \leq 6 \end{cases}$$

- We are unsure where the monopoly will maximize

- We are unsure where the monopoly will maximize
- $\max \pi = qp(q) - q$

- We are unsure where the monopoly will maximize
- $\max \pi = qp(q) - q$
- FOC: $p(q) + qp'(q) - 1 = 0$

- We are unsure where the monopoly will maximize
- $\max \pi = qp(q) - q$
- FOC: $p(q) + qp'(q) - 1 = 0$
- If $Q \geq 6$

- We are unsure where the monopoly will maximize
- $\max \pi = qp(q) - q$
- FOC: $p(q) + qp'(q) - 1 = 0$
- If $Q \geq 6$
  - FOC: $\frac{16-Q}{5} - \frac{Q}{5} = 1$

- We are unsure where the monopoly will maximize
- $\max \pi = qp(q) - q$
- FOC: $p(q) + qp'(q) - 1 = 0$
- If $Q \geq 6$
  - FOC: $\frac{16-Q}{5} - \frac{Q}{5} = 1$
  - $Q = \frac{11}{5} = 2.2$

- We are unsure where the monopoly will maximize
- $\max \pi = qp(q) - q$
- FOC: $p(q) + qp'(q) - 1 = 0$
- If $Q \geq 6$
  - FOC: $\frac{16-Q}{5} - \frac{Q}{5} = 1$
  - $Q = \frac{11}{5} = 2.2$
  - Cannot be a solution

- We are unsure where the monopoly will maximize
- $\max \pi = qp(q) - q$
- FOC: $p(q) + qp'(q) - 1 = 0$
- If $Q \geq 6$
  - FOC: $\frac{16-Q}{5} - \frac{Q}{5} = 1$
  - $Q = \frac{11}{5} = 2.2$
  - Cannot be a solution
- If $Q \leq 6$

- We are unsure where the monopoly will maximize
- $\max \pi = qp(q) - q$
- FOC: $p(q) + qp'(q) - 1 = 0$
- If $Q \geq 6$
  - FOC: $\frac{16-Q}{5} - \frac{Q}{5} = 1$
  - $Q = \frac{11}{5} = 2.2$
  - Cannot be a solution
- If $Q \leq 6$
  - FOC: $8 - Q - Q = 1$

- We are unsure where the monopoly will maximize
- $\max \pi = qp(q) - q$
- FOC: $p(q) + qp'(q) - 1 = 0$
- If $Q \geq 6$
  - FOC: $\frac{16-Q}{5} - \frac{Q}{5} = 1$
  - $Q = \frac{11}{5} = 2.2$
  - Cannot be a solution
- If $Q \leq 6$
  - FOC: $8 - Q - Q = 1$
  - $Q = 3.5$

- We are unsure where the monopoly will maximize
- $\max \pi = qp(q) - q$
- FOC: $p(q) + qp'(q) - 1 = 0$
- If $Q \geq 6$
  - FOC: $\frac{16-Q}{5} - \frac{Q}{5} = 1$
  - $Q = \frac{11}{5} = 2.2$
  - Cannot be a solution
- If $Q \leq 6$
  - FOC: $8 - Q - Q = 1$
  - $Q = 3.5$
  - $P = 5.5$

- We are unsure where the monopoly will maximize
- $\max \pi = qp(q) - q$
- FOC: $p(q) + qp'(q) - 1 = 0$
- If $Q \geq 6$
  - FOC: $\frac{16-Q}{5} - \frac{Q}{5} = 1$
  - $Q = \frac{11}{5} = 2.2$
  - Cannot be a solution
- If $Q \leq 6$
  - FOC: $8 - Q - Q = 1$
  - $Q = 3.5$
  - $P = 5.5$
  - Is the solution

- What if monopolist doesn't know who is who

- What if monopolist doesn't know who is who
- Two-part tariff

- What if monopolist doesn't know who is who
- Two-part tariff
  - Price equal to 1

- What if monopolist doesn't know who is who
- Two-part tariff
  - Price equal to 1
  - Tariff ≤ 2

- What if monopolist doesn't know who is who
- Two-part tariff
  - Price equal to 1
  - Tariff ≤ 2
    - Everyone enters the bar. Tariff=2 and profit equal to 4

- What if monopolist doesn't know who is who
- Two-part tariff
  - Price equal to 1
  - Tariff ≤ 2
    - Everyone enters the bar. Tariff=2 and profit equal to 4
  - Tariff ≥ 2, but ≤ 24.5

- What if monopolist doesn't know who is who
- Two-part tariff
  - Price equal to 1
  - Tariff ≤ 2
    - Everyone enters the bar. Tariff=2 and profit equal to 4
  - Tariff ≥ 2, but ≤ 24.5
    - Only B enters the bar. Tariff=24.5 and profit equal to 24.5

- What if monopolist doesn't know who is who
- Two-part tariff
  - Price equal to 1
  - Tariff ≤ 2
    - Everyone enters the bar. Tariff=2 and profit equal to 4
  - Tariff ≥ 2, but ≤ 24.5
    - Only B enters the bar. Tariff=24.5 and profit equal to 24.5
  - Tariff ≥ 24.5

- What if monopolist doesn't know who is who
- Two-part tariff
  - Price equal to 1
  - Tariff ≤ 2
    - Everyone enters the bar. Tariff=2 and profit equal to 4
  - Tariff ≥ 2, but ≤ 24.5
    - Only B enters the bar. Tariff=24.5 and profit equal to 24.5
  - Tariff ≥ 24.5
    - No one enters the bar

- What if monopolist doesn't know who is who
- Two-part tariff
  - Price equal to 1
  - Tariff ≤ 2
    - Everyone enters the bar. Tariff=2 and profit equal to 4
  - Tariff ≥ 2, but ≤ 24.5
    - Only B enters the bar. Tariff=24.5 and profit equal to 24.5
  - Tariff ≥ 24.5
    - No one enters the bar
    - Zero profit