



B.E. International Program
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EE311 Microeconomics Theory, Semester 2/2019

Homework Assignment #6 | Due date: Wednesday 8 April 2020

Instruction:

- 1) Attempt all questions.
- 2) You may study and discuss in group but you have to write up your solutions independently and by handwriting only. Copying and/or Plagiarism is considered as a serious crime in academic arena and it will not be tolerated. If detected, all parties involved receive 'zero.'
- 3) If you have any questions, please feel free to email me at pongpalin@econ.tu.ac.th

Price Discrimination (CH 12)

Question: Solve Example 2 of Block Tariff (Page 19 of Topic 9 Part 1)

12. Consider a market with 100 identical individuals, each with the demand schedule for electricity of $P = 10 - Q$. They are served by an electric utility that operates with a fixed cost 1,200 and a constant marginal cost of 2. A regulator would like to introduce a two-part tariff, where s is a fixed subscription charge and m is a usage charge per unit of electricity consumed. How should the regulator set s and m to maximize the sum of consumer and producer surplus while allowing the firm to earn exactly zero economic profit?
 $MC = 2$ $P = 10 - Q$ $TC = 1200 + VC$

12.** Consider a bar whose owner plans to set profit-maximizing two-part tariff (entry fee and per-drink price) on two types of customers. The owner would like to welcome both types into his bar, meaning that he will not charge an entry fee that is too high.

There are 20 people of the X-type whose individual demand is given by $P = 10 - Q_x$. There are 30 people of the Y-type whose individual demand is given by $P = 10 - 2Q_y$. The $MC = AC = \$2$ per drink.

Find the optimal entry fee and per-drink price. Also, calculate the profit the bar can make from these 50 customers.

14. Suppose that Acme Pharmaceutical Company discovers a drug that cures the common cold. Acme has plants in both the United States and Europe and can manufacture the drug on either continent at a marginal cost of 10. Assume there are no fixed costs. In Europe, the demand for the drug is $Q_E = 70 - P_E$, where Q_E is the quantity demanded when the price in Europe is P_E . In the United States, the demand for the drug is $Q_U = 110 - P_U$, where Q_U is the quantity demanded when the price in the United States is P_U .

$$TR = 70 - Q(Q) = 70Q - Q^2$$

$MP = 2Q$

a) If the firm can engage in third-degree price discrimination, what price should it set on each continent to maximize its profit? $ML = MR$

b) Assume now that it is illegal for the firm to price discriminate, so that it can charge only a single price P on both continents. What price will it charge, and what profits will it earn?

(HINT: You should find the “total” demand for drugs by using the horizontal summation, i.e. $Q = Q_U + Q_E$.)

20. A cruise line has space for 500 passengers on each voyage. There are two market segments: elderly passengers and younger passengers. The demand curve for the elderly market segment is $Q_1 = 750 - 4P_1$. The demand curve for the younger market segment is $Q_2 = 850 - 2P_2$. In each equation, Q denotes the number of passengers on a cruise of a given length and P denotes the price per day. The marginal cost of serving a passenger of either type is \$40 per person per day. Assuming the cruise line can price discriminate, what is the profit-maximizing number of passengers of each type? What is the profit-maximizing price for each type of passenger?

22. You are the only European firm selling vacation trips to the North Pole. You know only three customers are in the market. You offer two services, round trip airfare and a stay at the Polar Bear Hotel. It costs you 300 euros to host a traveler at the Polar Bear and 300 euros for the airfare. If you do not bundle the services, a customer might buy

your airfare but not stay at the hotel. A customer could also travel to the North Pole in some other way (by private plane), but still stay at the Polar Bear. The customers have the following reservation prices for these services:

Reservation Prices (in euros)		
Customer	Airfare	Hotel
1	100	800
2	500	500
3	800	100

a) If you do not bundle the hotel and airfare, what are the optimal prices P_A and P_H , and what profits do you earn?

b) If you only sell the hotel and airfare in a bundle, what is the optimal price of the bundle P_B , and what profits do you earn?

c) If you follow a strategy of mixed bundling, what are the optimal prices of the separate hotel, the separate airfare, and the bundle (P_A , P_H , and P_B , respectively) and what profits do you earn?

Example 2 Topic 9 part 3

inverse demand $p = 100 - Q$ $MC = 10$

$$PS = P_1 Q_1 + P_2 (Q_2 - Q_1) - MC(Q_2)$$

$$PS = (100 - Q_1)(Q_1) + (100 - Q_2)(Q_2 - Q_1) - 10Q_2$$

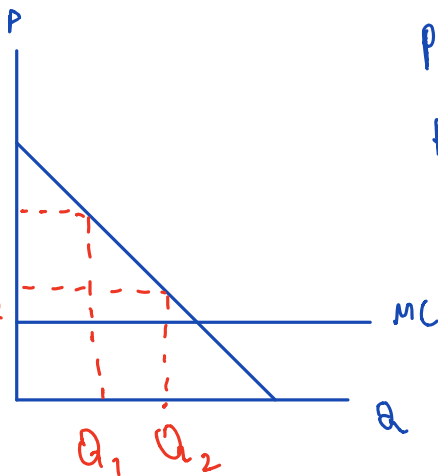
$$\frac{\partial PS}{\partial Q_1} : 100 - 2Q_1 - 100 + Q_2 = 0$$

$$Q_2 = 2Q_1$$

$$\frac{\partial PS}{\partial Q_2} : 100 - 2Q_2 + Q_1 - 10 = 0$$

$$Q_1 - 2Q_2 = -90$$

$$\therefore Q_1 = 30 \quad Q_2 = 60$$



12) $TR = TC$

$$100s + 100m = VC + FC$$

$$100s = 1200$$

$$s = 12 \quad m = mL$$

$$m = 2$$

12.88x

$$Q_x = 10 - p$$

$$Q_y = \frac{10 - p}{2}$$

$$\pi = TR - TC$$

$$TR = 50 \cdot \frac{1}{2}(10 - p) \cdot Q_y + (Q_x \cdot p)20 + (Q_y \cdot p)30$$

$$= \frac{1}{2}(10 - p) \left(\frac{10 - p}{2} \right) \cdot 50 + 20p(10 - p) + 30p \left(\frac{10 - p}{2} \right)$$

$$= (5 - 0.5p)(5 - 0.5p)50 + 200p - 20p^2 + \frac{300p - 30p^2}{2}$$

$$= (25 - 5p + 0.25p^2)50 + 200p - 20p^2 + 150p - 15p^2$$

$$TC = 20 \cdot Q_x \cdot 2 + 30 \cdot Q_y \cdot 2 = 40(10 - p) + 60 \left(\frac{10 - p}{2} \right)$$

$$TC = 400 - 40p + 300 - 30p = 700 - 70p$$

$$\pi = 1250 + 100p - 22.5p^2 - 700 + 70p$$

$$\frac{\partial \pi}{\partial p} = 100 - 45p + 70 : 45p = 170 \quad p = 3.78$$

$$\text{entry free: } \frac{1}{2}(10 - p) \left(\frac{10 - p}{2} \right) = \frac{1}{2}(10 - 3.78) \left(\frac{10 - 3.78}{2} \right)$$

$$= 9.67$$

$$14) Q_E = 70 - P_E : P_E = 70 - Q_E, MR_E = 70 - 2Q_E$$

$$Q_U = 110 - P_U : P_U = 110 - Q_U, MR_U = 110 - 2Q_U$$

a) Find Q_U where $MR_U = MC_U$

$$110 - 2Q_U = 10$$

$$Q_U = 50 \text{ *}$$

Find Q_E where $MR_E = MC_E$

$$70 - 2Q_E = 10$$

$$Q_E = 30$$

$$b) Q = Q_E + Q_U$$

$$Q = 70 - P_E + 110 - P_U \quad \text{assume } P_E = P_U \text{ cause it must be the same}$$

$$Q = 180 - 2P ; P = 90 - \frac{1}{2}Q, MR = 90 - Q$$

$$\text{max } \uparrow MR = MC$$

$$90 - Q = 10$$

$$Q = 80$$

$$\text{and the } p \text{ will be } 90 - \frac{1}{2}(80) = 50$$

$$\text{Total } \uparrow = 50(80) - 10(80) = 3,200 \text{ *}$$

$$20) Q_1 = 750 - 4P_1 ; P_1 = 187.5 - \frac{1}{4} Q_1, MR_1 = 187.5 - \frac{1}{2} Q_1$$

$$Q_2 = 850 - 2P_2 ; P_2 = 425 - \frac{1}{2} Q_2, MR_2 = 425 - Q_2$$

$$MR_1 = MR_2 : 187.5 - \frac{1}{2} Q_1 = 425 - Q_2$$

$$Q_1 + Q_2 = 500 ; Q_1 = 500 - Q_2$$

$$187.5 - \frac{1}{2}(500 - Q_2) = 425 - Q_2$$

$$Q_2 = 325, Q_1 = 175$$

$$Q_1 = 175 \text{ so } P_1 = 187.5 - \frac{1}{4}(175) = 143.75$$

$$Q_2 = 325 \text{ so } P_2 = 425 - \frac{1}{2}(325) = 262.5$$

\therefore Q in elderly market is 175 with price 143.75 while
in young market the quantity is 325 with price 262.5 that will
maximize profit in both market

22) a) $MC^P = 300$ $MC^A = 300$

let $P_A = 800$, $P_H = 800$

$$\pi = (800 - 300) + (800 - 300) = 1,000$$

b) $P_B = 900$, all Q will be sold

c) $P_A = 800$ $P_H = 800$ $P_B = 1000$

customer 1 buy hotel = $800 - 300 = 500$ (π)

customer 2 buy bundle = $1000 - 600 = 400$ (π)

customer 3 buy Airfare = $800 - 300 = 500$ (π)

$$\pi = 500 + 400 + 500 = 1400 //$$