Department of Economics

Carleton University

ECON 2009A – Managerial Economics

Quiz #5 - December 6, 2018 (45 minutes)

1. (20 points) Explain if and which of the three types of price discrimination mechanisms described in class applies to each example below:

   (a) (5 points) Ikea sells the same POANG chair in France and Germany but it is 20 euros more expensive in France. These chairs are produced in the same plant in Sweden and shipping costs to France and Germany are identical.
   This corresponds to group or third-degree price discrimination because there is no cost difference.

   (b) (5 points) The supermarket is running a promotion on frozen cranberries. One package costs $5 but 2 packages go for $8.
   This is second-degree price discrimination or quantity discounts. The per unit price is lower for higher quantities.

   (c) (5 points) Bed, Bath and Beyond is mailing a coupon to its customers that offers a 10% discount on a specific Cuisinart coffee maker.
   This is group price discrimination. People who use the coupon pay a lower price than those who don't.

   (d) (5 points) Via Rail charges its business class train passengers 50% more than its economy passengers while offering them free snacks and blankets and access to a business lounge.
   This is not what we call price discrimination because it also involves differences in the cost of providing the service or good to the different customers.

2. (15 points) A monopolist faces identical customers, each with an inverse demand given by: $P = 30 - Q$. The monopolist also has a constant marginal and average cost of $4/unit.

   (a) (5 points) What is the single price that maximizes the monopolist's profit? What is that profit (per customer)?
   The monopolist sets $MR = MC$. You can also maximize the profit function which will also lead to that condition:

$$\pi = P(Q)Q - C(Q)$$
$$\pi = (30 - Q)Q - 4Q \quad \text{Note: } TC = AC \times Q = 4Q$$
$$\pi = 30Q - Q^2 - 4Q$$
$$\pi = -Q^2 + 26Q$$

The first order condition is:

$$\frac{d\pi}{dQ} = -2Q + 26 = 0 \quad \text{This is identical to setting MR = MC}$$

$$\frac{26}{2} = Q^*$$

$$13 = Q^*, \text{ replacing in the demand function } \rightarrow \boxed{p^* = \$17}$$

Replacing both of these back into the monopolist's profit function:

$$\pi = P(Q^*)Q^* - C(Q^*) = 17 \times 13 - 4 \times 13 = 169$$

(b) (5 points) Suppose now that the monopolist wants to change its pricing to a two-part tarif. What is the per-unit price and the fixed fee that maximizes the monopolist's profit? What is that profit (per consumer)?

The two-part tarif that maximizes profit is such that $P = MC$ and the fixed fee is equal to the implied consumer surplus. So

$$P = 4$$

The implied consumer surplus is:

$$CS = 0.5\text{base} \times \text{height}$$

$$CS = 0.5Q \times (\underbrace{30}_{\text{inverse demand intercep}} - P)$$

$$CS = 0.5 \times 26 \times 26 = 338$$

The per-unit price is \$4 and the fixed fee is \$338. Because the price is equal to the constant marginal cost, the profit is equal to the fixed fee.

(c) (5 points) Does the monoplist prefer the single-price in (a) or the two-part tarif in (b)? Can the monopolist make higher profit than in its preferred choice?

The monopolist prefers the two-part tarif because the profit is higher. The profit cannot be higher than that because it maximizes and extracts all the consumer surplus (like in perfect price discrimination).

3. (25 points) A pharmaceutical company is selling a patented drug in two countries. The demand for

the drug in each country is given by:

$$Q_A = 100 - 2P$$
$$Q_B = 80 - 4P$$

(a) (10 points) If the marginal and average cost of the company is constant and equal to \$10, what price would the company charge in each country?

The firm will set $MR = MC$ in each country.

Marginal revenues

$$Q_A = 100 - 2P \rightarrow \quad P = 50 - \frac{Q_A}{2} \rightarrow \quad MR_A = 50 - Q_A$$
$$Q_B = 80 - 4P \rightarrow \quad P = 20 - \frac{Q_B}{4} \rightarrow \quad MR_B = 20 - \frac{Q_B}{2}$$

$$MR_A = MC$$
$$50 - Q_A = 10 \rightarrow \boxed{Q_A = 40}$$

$$MR_B = MC$$
$$20 - \frac{Q_B}{2} = 10 \rightarrow \boxed{Q_B = 20}$$

Replacing both quantities in the inverse demands yields $P_A = 30$ and $P_B = 15$.

(b) (5 points) What are the profits in each country and in total?

$$\pi_A = P_A \times Q_A - AC \times Q_A$$
$$\pi_A = (30 - 10)40 = 800$$
$$\pi_B = P_B \times Q_B - AC \times Q_B$$
$$\pi_B = (15 - 10)20 = 100$$

Total profit is \$900.

(c) (10 points) Suppose now that the two countries sign an agreement forcing pharmaceutical companies to charge the same price in both countries. What would that price be? What would total profit be in that case?

Calculate aggregate demand

$$Q_A = 100 - 2P$$
$$Q_B = 80 - 4P$$
$$Q = Q_A + Q_B = 180 - 6P \rightarrow P = 30 - \frac{Q}{6}$$

Monopolist sets $MR = MC$

$$MR = MC$$
$$30 - \frac{Q}{3} = 10 \rightarrow \boxed{Q = 60}$$

Replacing this quantity in the aggregate demand: $P = 20$.

$$\pi = (P - AC)Q = (20 - 10)60 = 600$$

4. (20 points) The table below shows the resevation prices (maximum willingness to pay) of three cosumers for shampoo, conditioner and a bundle composed by 1 shampoo and 1 conditioner.

	Shampoo	Conditioner	Bundle
Customer A	$4	$16	$20
Customer B	$12	$10	$22
Customer C	$11	$9	$20

(a) (10 points) Suppose the marginal cost is $1 for producing either a bottle of shampoo or a bottle of conditioner. What are the separate prices for shampoo and conditioner that maximize profit? What is that profit?

We use as condidate prices the reservation values for each product:

- Shampoo:

Price	Profit per unit	Units	Total profit
$4	$3	3	$9
$12	$11	1	$11
$11	$10	2	$20

- Conditioner:

Price	Profit per unit	Units	Total profit
$16	$15	1	$15
$10	$9	2	$18
$9	$8	3	$24

So the profit-maximizing price for shampoo is $11 and for conditioner $9. Total profit is $20+$24=$44.

(b) (10 points) What is the pure bundling price that maximizes profit? What is that profit?
We again use as candidate prices, the reservation values for the bundle:

Price	Profit per unit	Units	Total profit
$20	$18	3	$54
$22	$20	1	$20

The profit-maximizing price for the bundle is $20 with a total profit of $54.

5. (20 points) Barkley is a firm that is currently in the market and is expecting Allied, another firm, to enter. Barkley wants to decide on its pricing strategy (high or low) at the same time as Allied is decided whether to enter the market or not. The table below shows the payoffs to Barkley and Allied. The first payoff in each cell corresponds to Barkley.

		Allied	
		Enter	Not Enter
Barkley	High price	1,10	4,5
	Low price	2,6	3,4

(a) (10 points) Do either Allied or Barkley have dominant strategies? Which ones? Explain
Yes, Allied has a dominant strategy in Entering because its payoff is always higher if it enters than if it doesn't. Barkley does not have a dominant strategy. If Allied enters, then Barkley will set a low price. But if Allied does not enter, Barkley will set a high price.

(b) (10 points) Is there a Nash equilibrium in this game? Explain why it is a Nash equilibrium.
Barkley setting a low price and Allied entering is a Nash equilibrium because both firms are playing their best strategy given the other's choice. Allied enters because that is its dominant strategy. Given that Allied enters, Barkley sets a low price because then it gets 2, compared to the 1 it would get with the high price.