Econ 302: Microeconomics II - Strategic Behavior

Midtern # 1 – June 9 2016

1. *(8 points)* Provide a brief explanation to the following questions using an example or diagram.

   (a) Suppose a monopoly is for sale (i.e. someone is thinking to buy this monopoly). What specifically must be purchased by the buyer in order to retain its market position? How much would it be worth?

   Answer: The buyer would have to purchase whatever the source is of the monopolists barrier to entry, for example, a patent, or the control of a resource needed for production. The value of a barrier to entry is the discounted stream of profits that a monopolist could expect to earn from that monopoly. In the case of a patent it would be the discounted stream of profits that could be earned in the remaining years before the patent expires.

   (b) *True/False question:* The less elastic is the demand for a monopoly's product, the greater is that monopoly's market power.

   Answer: True. The less elastic the demand for the firm's product, the greater is the firm's ability to set price over marginal cost.

   (c) *True/False question:* Since there are no close substitutes for the monopoly's product, the monopoly can charge any price it wishes.

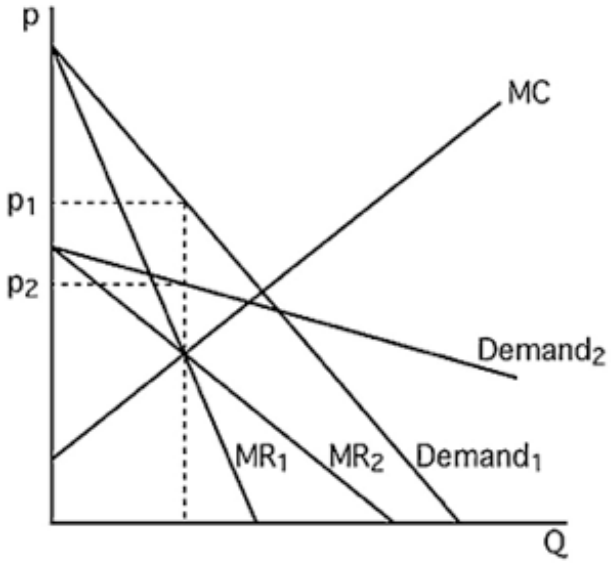
   Answer: False. The monopoly is still constrained by the demand curve, which reflects the price that people are willing to pay for the quantity produced.

   (d) Explain why a lot of countries subsidize education. Try to relate this to the concept of externality.

   Answer: Education as a form of private investment in human capital will increase peoples future earning potential. In addition to that, it makes those receiving it better citizens in various aspects. Hence education has a positive externality. Therefore, it is welfare-improving for the government to subsidize education.

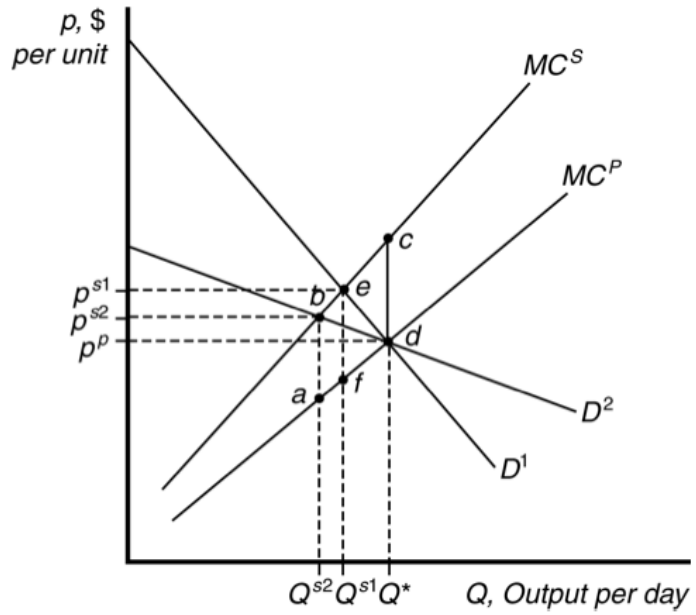
2. *(8 points)* Provide a brief answer to the following questions using a graph. Make sure to label the graph axis, the lines and all the areas asked in question.

   (a) Draw a graph that shows a shift in the demand curve that causes the optimal monopoly price to change, while the quantity remains the same. *Answer:*



(b) Show, using a graph, that the more elastic the demand curve, the greater the social cost of ignoring a negative production externality.

Answer: In the graph, MC^P is the private marginal cost, and MC^S is the marginal social cost of production. Of the two demand curves shown, D^1 is less elastic. The dead weight loss with demand curve D^1 is ecd. The dead weight loss with demand curve D2 is bcd. The cost of the externality is greater with this more elastic demand curve. The reason for the difference is the larger increase in output when social costs are ignored on the more elastic demand curve.



(c) The market demand curve of public goods is the vertical sum of private demand curves. What would the market demand curve of a public goods look like if the number of private demand curves gets sufficiently large? What is the economic implication?

Answer: As the number of people demanding a public goods gets larger, the market demand curve approaches a vertical line. It implies that the social demand for public goods will be invariant to the marginal cost of supplying that public goods.

3. *(4 points)* Show that for a monopolist with a constant marginal cost c and facing a linear demand curve $p = a - bq$, if a per-unit-tax, t, is imposed on the monopolist, the tax burden is shared equally between the monopolist and the consumers. (Hint: Calculate the price with and without per unit tax)

Answer: A monopolist facing demand p = a - bQ and marginal cost c chooses a price and quantity:

$$\max_q \pi = pQ - cQ$$

$$\text{FOC:} \quad \frac{d\pi}{dQ} = 0$$

$$a - 2bQ - c = 0 \quad \rightarrow \quad Q = \frac{a-c}{2b},\ p = (a+c)/2$$

With a tax of t, the monopolist's costs are essentially $c + t$, making the price:

$$p = (a + c)/2 + t/2$$

The price will rise by half of the tax.

4. *(12 points)* A monopolist faces two types of consumers: type 1 has a demand function $p = 16 - q$, type 2 has a demand function $p = 10 - q/2$. There are 200 buyers of type 1 and 100 buyers of type 2. The firm has constant marginal cost equal to 2.

(a) Determine the equilibrium price and quantity that would result from ordinary (linear) monopoly pricing.

Answer: Aggregate demand is: $Q = 200(16 - p) + 100(20 - 2p) = 5200 - 400p$, hence $p = 13 - \frac{1}{400}Q$. Therefore, the monopoly's profit is: $\pi = (13 - \frac{1}{400}Q)Q - 2Q$. Maximizing profit for the aggregate demand gives: $p_m = 7.5$, $q_m = 2200$, and $\pi = 12100$.

(b) Determine the profit-maximizing level of output and price in each market assuming that the monopolist can price discriminate. Calculate the price-elasticities of demand, and verify that the inverse elasticity rule holds in each market.

Answer: With direct price discrimination, prices are $p_1 = 9$ *and* $p_2 = 6$. *Quantities are* $q_1 = 1400$ *and* $q_2 = 800$. *To calculate elasticities, note that* $Q_1 = 200q_1 = 200(16 - p_1)$, *hence* $|\epsilon_1| = |\frac{dQ_1}{dp_1}\frac{p_1}{Q_1}| = 200\frac{9}{1400} = \frac{9}{7}$. *Similiarly,* $\epsilon_2 = \frac{3}{2}$ *and it is easy to verify that the inverse elasticity rule holds, e.g.* $\epsilon_1 = \frac{p_1}{p_1 - mc} = \frac{9}{7}$. *Total profit is* 13000.

(c) What are the equilibrium prices and quantities if the monopolist can use optimal two-part tariffs? (Continue to assume that the markets can be separated, so arbitrage is not a problem).

Answer: The optimal two-part tariffs $P_1 = F_1 + p_1Q_1$ *and* $P_2 = F_2 + p_2Q_2$ *set the price per unit at MC, so* $p_1 = p_2 = 2$ *and set the fixed fee equal to consumer surplus in each market. With* $p_1 = p_2 = 2$, $q_1 = 16 - 2 = 14, q_2 = 20 - 4 = 16$, *so the consumer surplus would be* $s_1 = 14 \times 14/2 = 98, s_2 = 8 \times 16/2 = 64$. *This gives* $F_1 = 98 \times 200 = 19600$ *and* $F_2 = 64 \times 100 = 6400$ *for a total profit of* $\pi = 260000$.

(d) Compare profits for each of the three scenarios (a), (b) and (c) and explain your finding.

Answer: That direct price discrimination is better for the monopolist than uniform prices is simply due to the fact that it allows the firm to capture additional consumer surplus by separating the demand groups and charging them different prices. Also note that the firm could always end up charging the same price for both groups if that was in fact optimal; the fact that it doesn't means that profits are higher otherwise. That two part-pricing is even better is explained by observing that ordinary direct price discrimination still leaves consumer surplus in each market. By charging a two-part tariff in each market, this surplus can be extracted.

5. *(8 points)* Arnie and Bert consider to share a flat for \$700 per month. Alternatively, they could each rent an apartment of their own, which would cost each \$450 per month. Aside from the rent, the two would be indifferent between living together and living separately, except for one problem: Bert smokes. The monetary equivalent of Arnie's disutility from having to breath smoke-filled air is \$300 per month. Bert's utility from smoking worth \$150 to him.

(a) What is the Pareto efficient solution? (Hint: Compare all different possible scenarios)

Answer: (a) The efficient solution is the one that maximizes total surplus (S). If each lives alone, $S = -900+150 = -750$ *(B gets utility form smoking, A gets no disutility). If they live together and B smokes,* $S = -700-300+150 = -850$

(B gets utility and A gets disutility). If they live together and B does not smoke, $S = -700$ *(B gets no utility from smoking, A gets no disutility). So total surplus is maximized if live together and B does not smoke.*

(b) Assuming no transaction cost, do you expect Arnie and Bert to live together? If they do, do you expect their apartment to be smoke-free? Explain!

Answer: (b) Rational parties will agree on efficient solution if there are no transaction cost and property rights well defined. Hence, we expect them to live together in smoke free apartment. In this solution, Arnie will bear a higher share of the rent (say, 425) to compensate Bert for not smoking. This makes Arnie better off than living smoke free alone and pay 450. Bert will not smoke and pays less rent (say, 275). This makes Bert better off than living alone and smoking, which gives him 150-450 = -300.