PROBLEM SET THREE--ECON 3010

1. A monopolist can segment its market into two sub-markets, call them 1 & 2. TC = \$200 + 5Q, with $Q = q_1 + q_2$. The demand in the sub-markets is:

   $P_1 = 20 - q_1/2$ & $P_2 = 35 - q_2$.

   a) Find the profit-maximizing q_1, q_2, P_1, P_2, & π. Also find E_P^D in each sub-market at the profit-maximizing P & q.
   b) Which sub-market gets the lowest P? Why?

2. In Figure 1, is π maximized when $q_A = 30$ & $q_B = 20$? Explain.

3. Assume there is a monopoly with TFC = 0 & a constant MC. Draw the diagram for this. What are the profit-maximizing P, Q ($\equiv$ q), & π? What is the DWL due to this monopoly? How does your answer change if competitive *rent seeking* occurs?

4. To operate in a certain occupation, one must have a permit. No new permits have been issued, one can buy a permit from someone who has one (they are good for perpetuity), & the restriction on entry means each individual in the occupation expects π of \$25,000 per year. What will be the price of a permit (P_P) be if r = .05?

5. Going to school now for 4 years will cost \$40,000 per year & will add to your earnings by \$20,000 per year. If r = 4% & you will work for 40 years, what is the net PV of this investment?

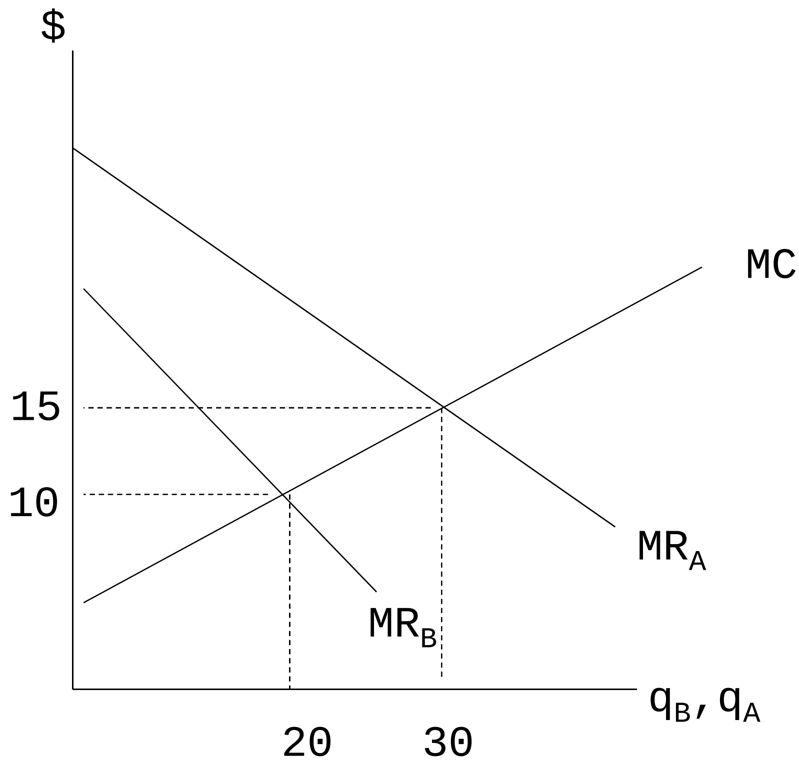
6. Suppose a seller (for whom there are no competitors) has 2 types of buyers: *Premium* & *Discount*. The firm offers 2 goods for sale, A & B, with A of higher quality. The values buyers have for A & B are:

   $Value_A^{Premium}$ \$10, $Value_B^{Premium}$ = \$6, $Value_A^{Discount}$ \$7, & $Value_B^{Discount}$ = \$4

   MC = AC = \$6 for A & \$3 for B. There are N_D Discount customers & N_P Premium customers.

   a) What are the profit-maximizing P_A & P_B, & what is π?
   b) Suppose the seller can downgrade B to product C, at a lower per unit cost of 50¢. Also, $Value_C^{Premium}$ = \$4 & $Value_C^{Discount}$ = \$3. What are the profit-maximizing P_A & P_C, & when would it pay the seller to switch from B to C?

Figure One



Answers

1. a) & b) MC = \$5. $TR_1 = 20q_1 - \frac{q_1^2}{2}$ & $TR_2 = 35q_2 - q_2^2$. Thus $MR_1 = 20 - q_1$ & $MR_2 = 35 - 2q_2$.
Set MR_1 = MC & MR_2 = MC: $20 - q_1 = 5$ & $35 - 2q_2 = 5$, so $q_1 = q_2 = 15$.

Insert q_1 into the demand for sub-market 1 & do likewise for sub-market 2 & get P_1 & P_2: P_1 = \$12.5 & P_2 = \$20.

$\pi = P_1q_1 + P_2q_2 - 200 - 5(q_1 + q_2)$ = \$137.5.

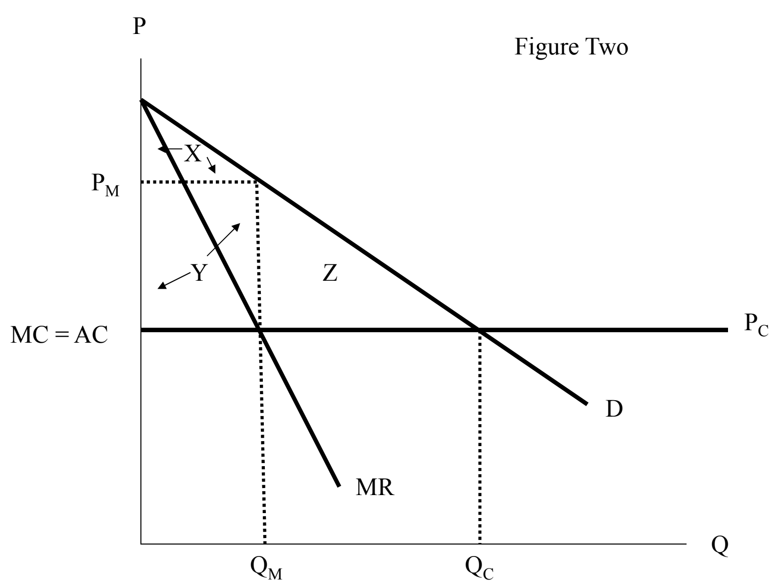
$E_p^D = \frac{1}{slope}\frac{P}{q}$, so $E_p^{D_1}$ = -2(12.5)/15 ≅ -1.67, & $E_p^{D_2}$ = -20/15 ≅ -1.33. The sub-market with the highest $|E_p^D|$ gets the lowest P---sub-market 1.

2. The relevant MC is MC for Q = 50, which is clearly > \$15. Thus, the π-maximizing Q < 50.

Given the firm sells Q = 50, it should sell more in sub-market A & less in sub-market B since, with $q_A = 30$ & $q_B = 20$, MR_A = \$15 & MR_B = \$10. If the firm sells 1 more unit in sub-market A & 1 less unit in sub-market B, ΔTR = \$15-\$10 = \$5 & $\Delta TC = 0$, so $\Delta\pi$ = \$5. The firm should continue to sell more in sub-market A & less in sub-market B until $MR_A = MR_B$, which $\Rightarrow q_A > 30$, $q_B < 20$, & \$10 < $MR_A = MR_B$ < \$15.

3. Using **Figure Two**, with no rent seeking, $P = P_M$, $Q = Q_M$, & π = PS = Y (TFC = 0), CS = X, & DWL = Z.

With competitive rent seeking, $P = P_M$, $Q = Q_M$, & π = PS = 0. All π = PS is competed away. DWL = Z + some of Y. If all rent seeking involves resource use (& not bribes), then DWL = Z + Y. If <u>only</u> bribes are used, DWL = Z.



4. P_P = expected π since individuals will continue to bid up the price until they would just break even (earn zero π after buying a permit). Thus, $P_P = \$25,000/.05 = \$500,000$.

5. We must find the PDV of a \$1 per year for 4 years (3.63), the PDV of a \$1 per year for 40 years (19.8), & $1/(1.04)^4 = .855$ since the individual receives the benefits starting 5 years (& not 1 year) from now.

Thus, PDV(benefits) = (.855)(19.8)(\$20,000) = \$338,580.

PDV(cost) = (3.63)(\$40,000) = \$145,200.

NPV = \$193,380.

6. a) With no competition, set P_B so $CS_B^{Discount} = 0$ (Discount buyers won't buy A given what optimal P_A will be). Thus, $P_B = \$4$. At $P_B = \$4$, $CS_B^{Premium} = \$2$. Thus, set P_A so $CS_A^{Premium} = \$2$, or

$Value_A^{Premium} - P_A = \$2$, $\$10 - P_A = \$2$, or $P_A = \$8$.
Call profit π_1. Now $\pi_1 = (4-3)N_D + (8-6)N_P = N_D + 2N_P$.

b) Now set P_C to take all CS from Discount buyers, so $P_C = \$3$.
With $P_C = \$3$, $CS_C^{Premium} = \$1$. Thus, set P_A so $CS_A^{Premium} = \$1$, or $P_A = \$9$.

Now $\pi = \pi_2 = (3-2.5)N_D + (9-6)N_P = .5N_D + 3N_P$.

$\pi_2 > \pi_1$ if $.5N_D + 3N_P > N_D + 2N_P$,

$N_P > .5N_D$.

If the # of Premium customers is more than ½ the # of Discount customers, it pays to degrade from B to C. Selling C & not B to Discount buyers lowers π from each of these buyers by 50¢ (P↓ by \$1 but cost per unit↓ by 50¢). Profit per Premium buyer↑ by \$1 (P_A↑ \$1).