Ch.12--Price discrimination

(Also do the solved problem: 12.2)

A monopoly sells its good in the U.S. and Japanese markets. The American inverse demand function is $P_A = 100 - Q_A$, and the Japanese inverse demand function is $P_J = 80 - 2Q_J$, where both P_A and P_J are measured in dollars. The firm's marginal cost of production is m= 20 in both countries, and assume that there is no fixed cost.

a. Determine the equilibrium prices and quantities in each country and the overall profits that result from the actions of a price discriminating monopolists.

b. Determine the price elasticities of demand in each market, evaluated at the equilibrium prices and quantities.

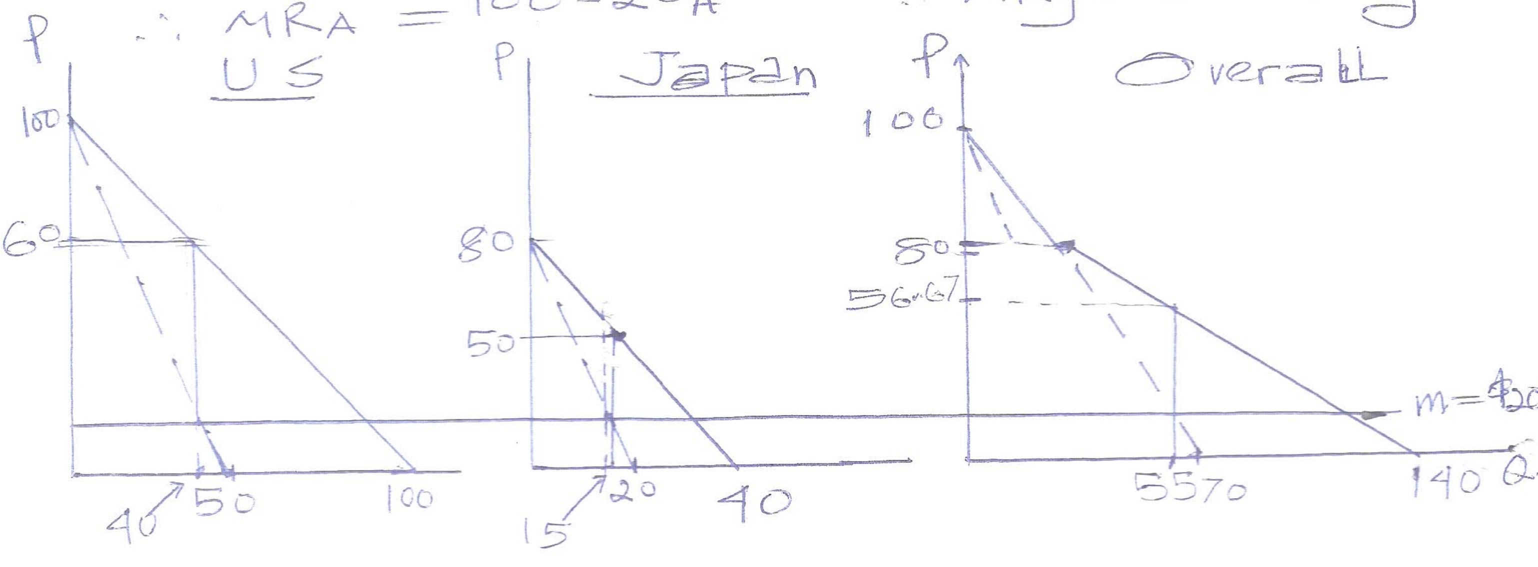
c. What is the relationship between the price elasticities of demand in each market and the prices prevailing in each market?

d. Determine the equilibrium price and quantity and profit, if the monopolist charges the same price in both countries.

Answer: Given $MC = m = \$20$, and

$P_A = AR_A = 100 - Q_A$ $\qquad$ $P_J = AR_J = 80 - 2Q_J$

$\therefore MR_A = 100 - 2Q_A$ $\qquad$ $\therefore MR_J = 80 - 4Q_J$



F.O.C. of Profit maximization [Eq. 12.7 → book]

(a) $MC = MR_A = MR_J$

$\therefore 20 = 100 - 2Q_A$ $\qquad$ $20 = 80 - 4Q_J$

$\therefore 2Q_A = 80$ $\qquad$ $4Q_J = 80 - 20$

$Q_A = 40$ units $\qquad$ $Q_J = 15$ units

$\therefore P_A = 100 - 40 = \$60$ $\qquad$ $P_J = \$50 \leftarrow [80 - 2(15)]$

$$\pi = R_1 + R_2 - C \qquad \left[\overset{\text{see}}{\text{Eq. } 12.4}\right]$$

$$= P_A Q_A + P_J Q_J - C\left[Q_A + Q_J\right]$$

$$= 2400 + 750 - 20\left[40+15\right]$$

$$3150 - 1100 = \$2050$$

[overall profit from Price discrimination]

(b)

$$\epsilon = \frac{dQ}{dP} \cdot \frac{P}{Q}$$

U.S.

$$Q_A = 100 - P_A$$

$$\therefore \frac{dQ}{dP} = -1$$

$$\epsilon_A = (-1)\left[\frac{60}{40}\right]$$

$$= -\frac{3}{2}$$

Japan: $P_J = 80 - 2Q_J$

$$\therefore Q_J = 40 - \frac{1}{2} P_J$$

$$\frac{dQ}{dP} = -\frac{1}{2}$$

$$\epsilon_J = -\frac{1}{2} \cdot \frac{50}{15}$$

$$= -\frac{5}{3}$$

(c)

MC: $m = MR_A = MR_J$

$$MR_A = P_A\left[1 + \frac{1}{\epsilon_A}\right]$$

$$\therefore m = P_A\left[1 + \frac{1}{-\frac{3}{2}}\right]$$

$$P_A\left[1 - \frac{2}{3}\right] = 20$$

$$\therefore P_A = (20)3 = \$60$$

$$MR_J = P_J\left[1 + \frac{1}{-\frac{5}{3}}\right]$$

$$P_J\left[1 - \frac{3}{5}\right] = 20$$

$$\frac{2}{5} P_J = 20$$

$$\therefore P_J = \frac{(20)5}{2} = \$50$$

(d)

The ~~total~~ demand has a kink at $Q=20$

$Q = Q_A + Q_J$

$\therefore Q = Q_A = 100 - P$; when $0 \leq Q \leq 20$

and $Q = Q_A + Q_J$ for $Q > 20$

$= (100 - P) + \left(40 - \frac{P}{2}\right)$

$Q = 140 - \frac{3}{2}P$

$\frac{3}{2}P = 140 - Q$

$\therefore AR = P = \frac{280}{3} - \frac{2}{3}Q$

$MR = \frac{280}{3} - \frac{4}{3}Q$

$20 = \frac{280}{3} - \frac{4}{3}Q$

$\frac{4}{3}Q = \frac{280}{3} - 20$

$= \frac{280 - 60}{3} = \frac{220}{3}$

$\therefore Q = \frac{220}{4} = 55$ units

$P = \frac{280 - 2(55)}{3} = \$56.67$

$\pi = R - C$

$= 55\left(\frac{170}{3}\right) - 55(20)$

$= 3117 - 1100$

$= \$2017$

$< \pi_{discrim}$ ($2050)