

Monopoly, Product Quality and durability

consider inverse demand function $P(Q, X)$ where X is Quality of Product.

$$\frac{\partial P}{\partial Q} < 0 \quad \text{and} \quad \frac{\partial P}{\partial X} > 0$$

let $C(Q, X)$ denotes cost function

$$\text{Profit}(\pi) = P(Q, X) \cdot Q - C(Q, X)$$

first order conditions [2 equations we have]
 Q^* and X^*

$$(i) \quad \frac{\partial \pi}{\partial Q} = P(Q, X) \cdot 1 - Q \frac{\partial P}{\partial Q} - \frac{\partial C}{\partial Q} = 0$$

$$(ii) \quad \frac{\partial \pi}{\partial X} = Q \frac{\partial P}{\partial X} - \frac{\partial C}{\partial X} = 0$$

Solving (1) and (2) we get x^* and q^*

Equation (2) targets marginal consumer.

note)

Marginal consumer's valuation of quality per unit is multiplied by monopoly output when determining $x^{\max}$ choice in expression (2).

- level of Product Quality under competitive Condition

$$\text{net social welfare (SW)} = \underbrace{\int_0^{Q^*} P(Q, x) \cdot dQ}_{\text{Benefit}} - \underbrace{C(Q, x)}_{\text{Cost}}$$

now we differentiate this SW function with respect to x for the value of Q^* (Q^* is competitive market output)

$$\frac{\partial SW}{\partial x} = \int_0^{Q^*} P_x(Q, x) dQ - C_x = 0 \quad \text{--- (3)}$$

$$\text{where } P_x = \frac{\partial P}{\partial x} \text{ ; } C_x = \frac{\partial C}{\partial x}$$

this equation targets average consumer, comparing equation (2) and (3) we conclude that even if monopoly and perfectly competitive industry chose same level of output Q^* , they might of for different quality levels (x^*) because each of them is concerned with different

margin in its decision making process.
monopoly targets marginal consumer where as
competitive industry targets average consumer.

Durability of goods

Swan's independent assumption

its states that output decisions are independent of decisions about product durability. monopoly while determining durability of goods like automobiles, houses etc. target on profit maximisation. they provide service of these goods for several periods rather than for one period. but intuitive notion of monopoly may suggest under prodⁿ of durability.

So it is not always the case that monopoly will produce less durability than competitive market, durability decisions depends upon nature of demand for durability.

Type inconsistency and heterogeneous demand

for monopoly firm at profit maximisation
O/P $P > MC$, which gives an incentive to
a firm to produce higher level of
output,

But in case of durable goods this
incentive will lead to reduction in profits
in subsequent period.

Hence eventually this will drive down price
to MC , Hence Coase argues that the only
way to have potential monopoly power is
that monopoly doesn't produce more O/P in
subsequent period so that $P > MC$ (remain)

also in case of heterogeneous demand monopolies
must settle down with optimal scheme for
each category of buyers.

Price discrimination

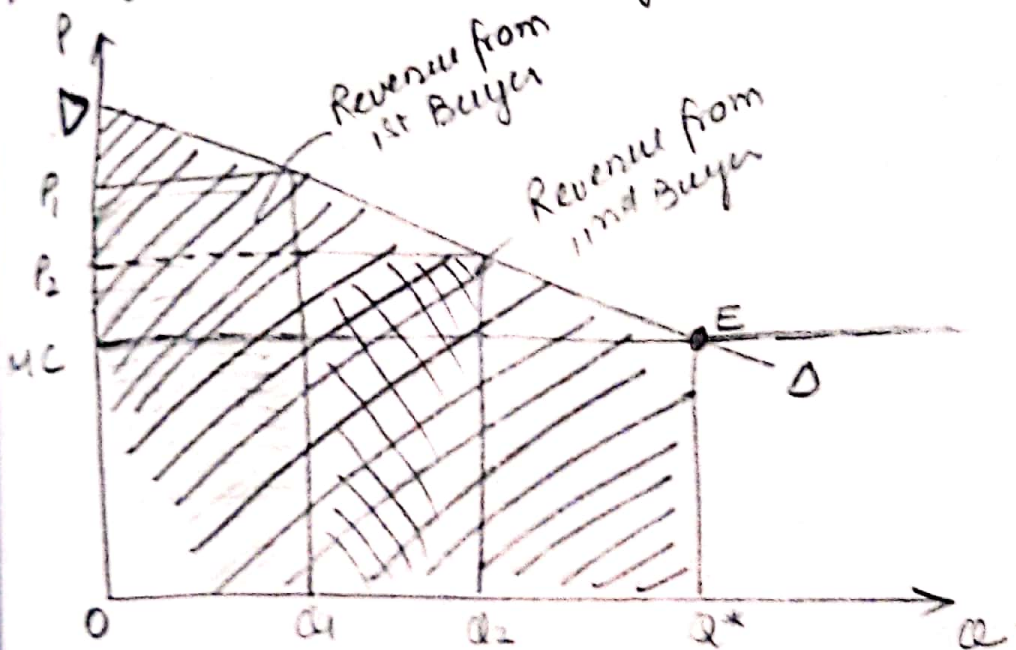
Monopoly engages in price discrimination if it
able to sell otherwise identical units of
output at different prices.

example

senior citizen discounts, different movie tickets
prices on weekdays and weekends etc.

1st degree / Perfect Price discrimination

If each Buyer is separately identified by monopolist then it may be possible to charge each the maximum price he would be willing to pay for the good.



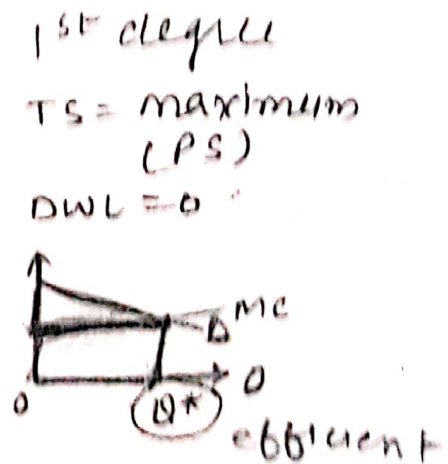
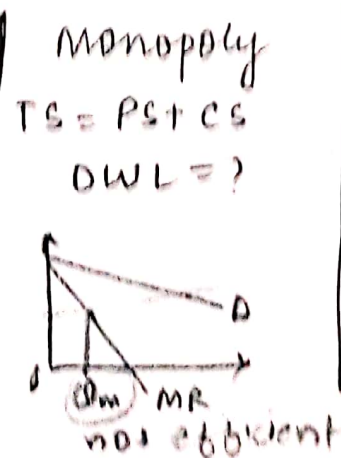
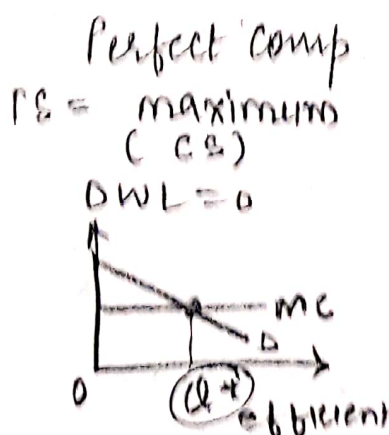
in diagram

- 1) Buyers are arranged in descending order of their willingness to pay (WTP).
- 2) From first Buyer monopoly charge P_1 price for Q_1 units and extracts a revenue of $P_1 Q_1$.
- 3) for second Buyer P_2 Price is charged for $(Q_2 - Q_1)$ units and extracts a revenue of $P_2 (Q_2 - Q_1)$.
- 4) Optimal Quantity is equal to Q^* .
- 5) Total revenue = DEQ^*O .
- 6) Consumer surplus = 0.

7) Dead weight loss = 0

8) Q^* is efficient allocation and total surplus is maximum though CS is equal to 0. But TS is still maximum because entire surplus (CS) transferred to Producer Surplus.

note) Hence Q^* is efficient and goods are allocated to those who value them the most.



(numerical)

$$P = 100 - \frac{Q}{20}$$

$$C(Q) = 0.05Q^2 + 10,000$$

$$MC = 0.1(Q)$$

1) find out $Q^* = ?$ for perfectly price discrimination

$$P = MC$$

$$\frac{2000 - Q}{20} = \frac{Q}{10}$$

$$2000 - Q = 2Q$$

$$\left[\frac{2000}{3} = Q^* \right]$$

$$\underline{\underline{666.66}}$$

$$P^* = 100 - \frac{666.66}{20}$$

$$P^* = \frac{2000 - 666.66}{20} = 66.6$$

$$MC = 66.6$$

$$Q = 666.66$$

Price and MC at margin, 1 for 1st commodity]

$$P = MC = 66.66$$

(ii) Profit for this perfectly discriminating monopolist

$$\pi = TR - TC$$

$$\pi = \int_0^{Q^*} P(Q) dQ - [0.05Q^2 + 10,000] \text{ at } Q^* = 666.66$$

$$\pi = \int_0^{666.66} \left(100 - \frac{Q}{20}\right) dQ - [0.05Q^2 + 10,000]$$

$$\pi = 55,711 - 32,178 \quad \text{--- [dmp]}$$

$$\pi = 23,333$$

Third degree price discrimination:

under 1st degree PD monopoly is burdened with information extraction problem. hence it may be more convenient for monopolist to just divide market into two sets.

examples [rural, urban,] [Prime tym, off tym] etc

Here price would be different in each market
But marginal cost is same, price is determined by inverse elasticity rule.

monopolist equates MR and MC in each market
i.e. $MR_1 = MC$; $MR_2 = MC \Rightarrow \boxed{MR_1 = MR_2}$

we know,

$$MR = AR \left(1 + \frac{1}{e}\right)$$

hence,

$$P_i \left(1 + \frac{1}{e_i} \right) = P_j \left(1 + \frac{1}{e_j} \right)$$

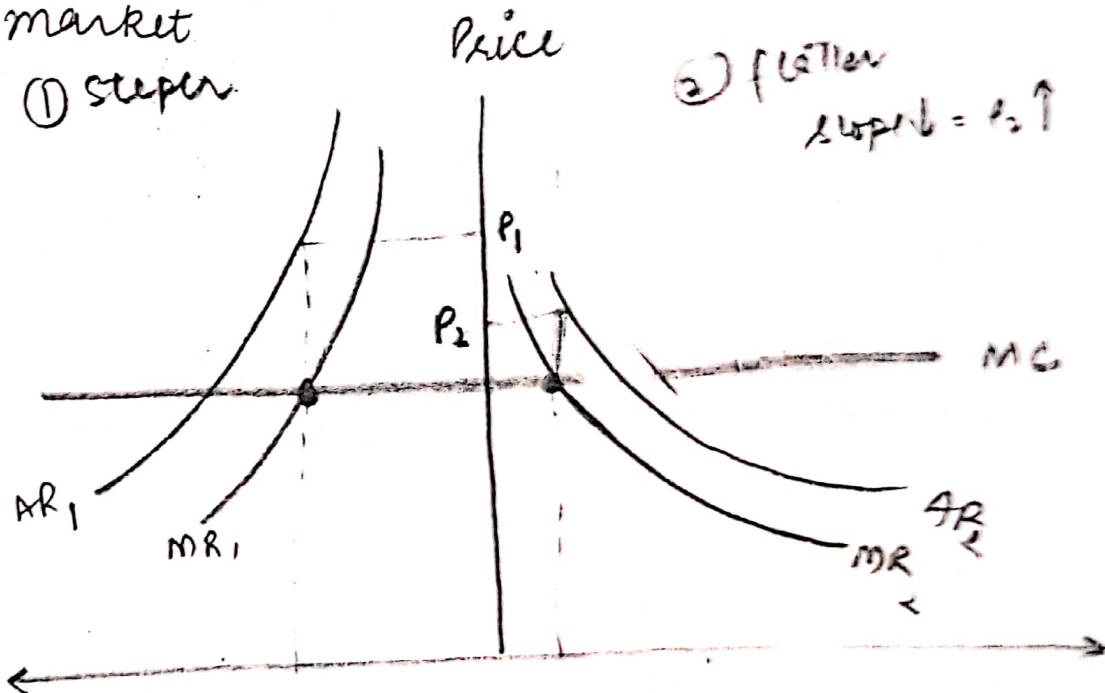
$$\boxed{\frac{P_i}{P_j} = \frac{(1 + 1/e_j)}{(1 + 1/e_i)}}$$

!

$P_i > P_j$ if $|e_i| < |e_j|$

that is price would be higher in less elastic market

① steeper



(i) DD_2 flatter than DD_1

(ii) $e_2 > e_1$

(iii) given inverse elasticity rule
 $P_1 > P_2$ or $\boxed{P_2 < P_1}$