



EDO UNIVERSITY IYAMHO
COURSE CODE: ECO 311
COURSE TITLE: Intermediate Microeconomics
NUMBER OF UNITS: Three
COURSE LECTURER: **Dr. (Mrs.) Evelyn Ogbeide-Osaretin**

Lecture Two

SHORT-RUN AND LONG-RUN PRICING-OUTPUT DECISION IN A MONOPOLY MARKET

INTENDED LEARNING OUTCOMES

At the successful completion of this course, students are expected to:

- i) Know the various causes of monopoly
- ii) Analyze the equilibrium conditions facing the monopolist
- iii) Discuss how the monopolist reacts to the imposition of different types of tax

Outline

- i) Characteristics of the monopoly market.
- ii) Causes of monopoly
- iii) The relationship between demand, average revenue and the marginal revenue
- iv) Short-run equilibrium of the monopolist
- v) Long run equilibrium of the monopolist
- vi) The effect of tax on the price and output of the monopolist

Characteristics of the monopoly market

The monopoly market is one where there is a single producer of a product that has no close substitute. The monopoly market is characterized by the following

- Single producer of the product

- Large numbers of buyers and one
- There is no free entry into the market
- Profit maximization
- The firm is a price giver.

Causes of Monopoly

Some of the causes of the existence of monopoly are:

Natural: this is a situation where the firm has the ownership of a specific and strategic raw material.

Size of the market: the size of the market may be too small that it will not allow more than one producer.

Government: When the government gives the licensing/regulations to a firm e.g patents right.

Technology: this is a case when a firm has the unique ability and specific materials to produce what other firms can't duplicate either through inventions, discoveries, recipes. Example Microsoft owns Windows.

Nature of the good: the good/service may be too large requiring large scale production and hence cannot be carried out by a private producer but only the government as in the case of government monopoly firm e.g power supply.

Demand and marginal revenue of the monopolist

The monopolist firm is the industry and as a result of this, the firm is faced with the market demand curve. The demand and the revenue curve of the monopolist is downward sloping. The MR curve is twice as steep as the demand curve, but with same intercept. The marginal revenue is less than the price showing that the firm can lower price to increase output sold. The demand curve is also the AR.

Given the demand function $Q = b_0 - b_1 P$

The slope of the demand curve is $\partial Q / \partial P = -b_1$

Total revenue = $R = P \cdot Q$, from the demand equation,

$$P = b_0 / b_1 - b_1^* / b_1^* Q.$$

$$\text{let } b_0 / b_1^* = b_0 \text{ and } b_1^* / b_1^* = b_1$$

$$\text{Then, } P = b_0 - b_1 Q.$$

$$R = (b_0 - b_1 Q) \cdot Q$$

$$R = b_0 Q - b_1 Q^2$$

$$AR = R/Q = b_0 - b_1 Q$$

$$AR = b_0 - b_1 Q = \text{DD curve}$$

$$MR = \partial R / \partial Q = \partial (b_0 Q - b_1 Q^2) / \partial Q$$

$$MR = b_0 - 2b_1 Q$$

The relationship between price and MR

$$R = PQ$$

$$MR = \partial R / \partial Q = P \partial Q / \partial Q + Q \partial P / \partial Q$$

$$MR = P + Q \partial P / \partial Q$$

$$P = MR - Q \partial P / \partial Q$$

Since demand is negatively sloping, firm will reduce price to sell more

The relationship between the MR and price elasticity e

$$\text{Recall that } MR = P + Q \partial P / \partial Q$$

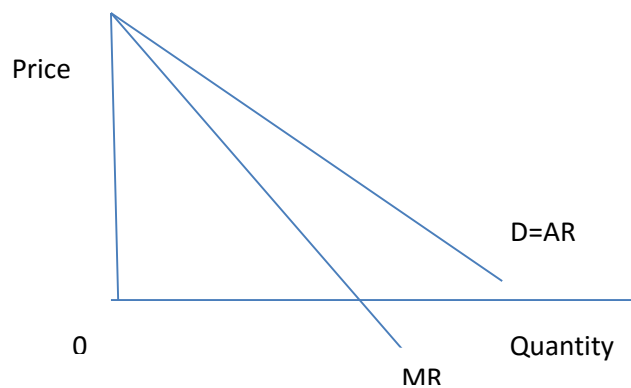
The elasticity of demand is given as $e = -\partial Q / \partial P \cdot P / Q$

Thus, $1/e = \partial P / \partial Q \cdot Q / P$. Solve for $\partial P / \partial Q$

$\partial P / \partial Q = -1/e \cdot P / Q$. fix into the MR equation,

$MR = P + Q(-1/e \cdot P / Q)$ eliminate Q and factor P out

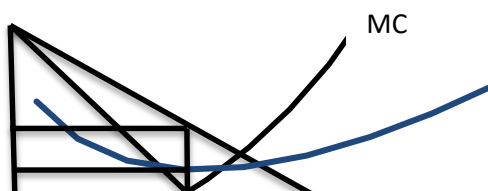
$$MR = P(1 - 1/e)$$



Equilibrium in the short run

The monopolist is aimed at profit maximization as a major objective. Profit is maximized at the point when the firm is at equilibrium. For the monopolist, profit is maximized when

- $MR = MC$
- The slope of the MC must be greater than the slope of the MR



P0

SAC

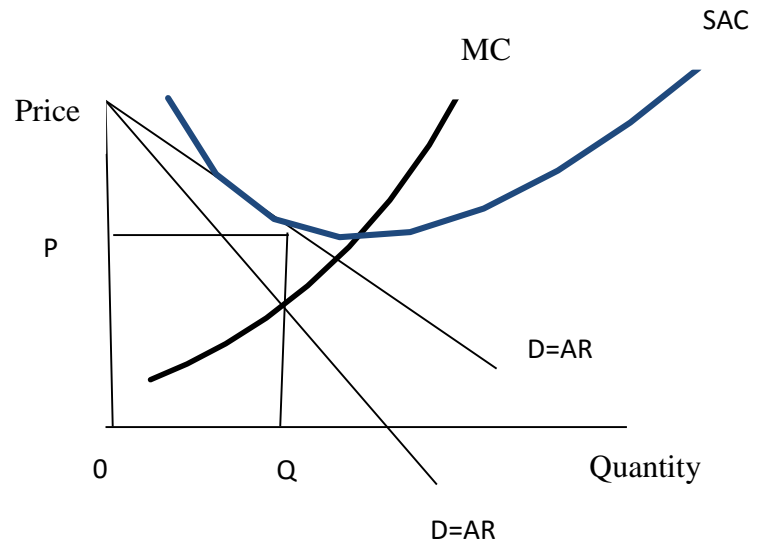
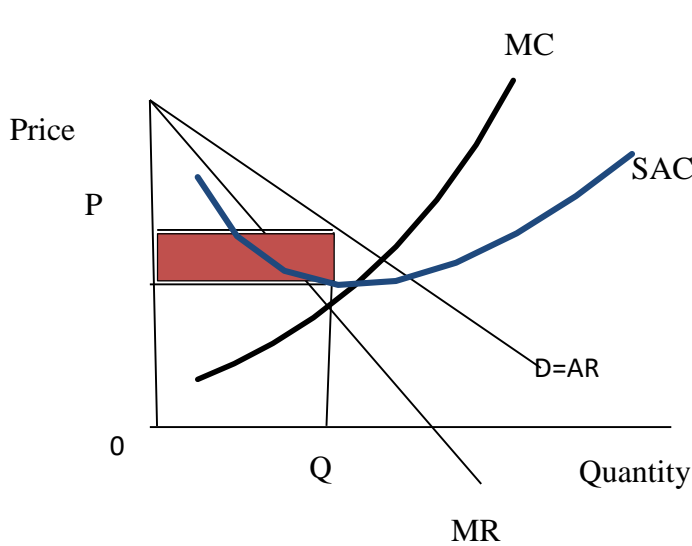
D=AR

e

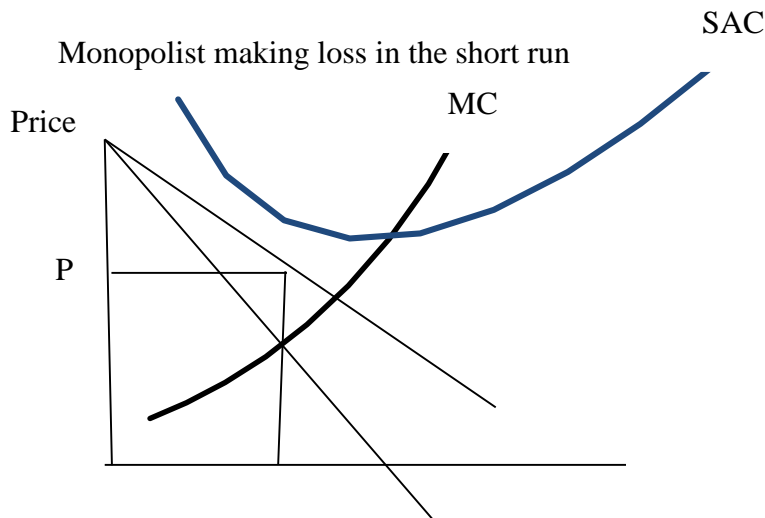
In the short run, the monopolist can be making abnormal profit, normal profit or loss. However, the normal profit and zero profit are only available to a government monopolist as the private monopolist will always set his price at the point that he is making abnormal profit. The abnormal profit, normal profit or loss state is determined by the position of the SAC. When the SAC is below the price sold in the market, ($SAC < P$) the monopolist is making abnormal profit (the shaded portion). When the minimum point of the SAC is at intersection with the price ($SAC = P$), the firm is making normal profit while the loss condition is the point where the SAC is above the P ($SAC > P$). These are as shown below.

Monopolist making short-run abnormal profit

Monopolist making short-run normal profit



Monopolist making loss in the short run





Mathematically,

$$\Pi = TR - TC$$

$$\text{FOC } \partial \Pi / \partial Q = \partial TR / \partial Q - \partial TC / \partial Q = 0$$

$$MR - MC = 0$$

$$MR = MC$$

The SOC requires that $\partial^2 \Pi / \partial Q^2 = \partial M^2 R / \partial Q^2 - \partial M^2 C / \partial Q^2 < 0$

$$\partial M^2 R / \partial Q^2 < \partial M^2 C / \partial Q^2$$

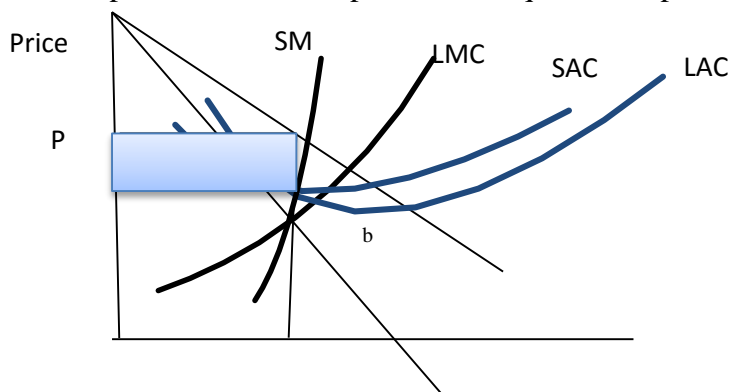
$$\text{Slope of MR} < \text{Slope of MC}$$

Example: Given the demand function of the monopolist as $X = 50 - 0.5P$ and cost function of $C = 50 + 40X$, calculate the equilibrium price and output, the total profit and show that SOC is satisfied at the SR equilibrium point.

Long run equilibrium of the monopolist

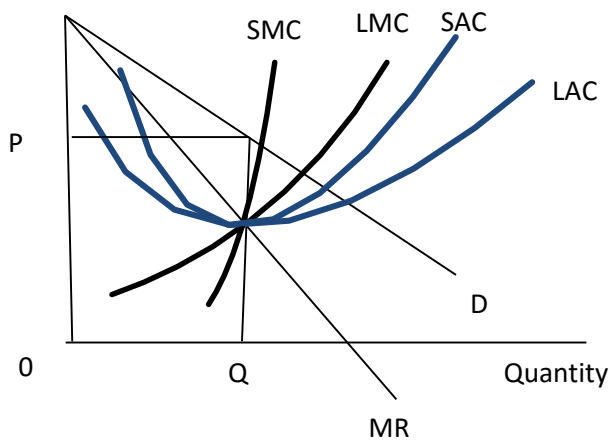
In the long run, the monopolist will expand his production capacity and continues production until he reaches the minimum point of the LAC which is his optimum point. Since there is no entry, the monopolist will earn abnormal profit, even in the long run but will close down if he is making lose. This equilibrium position depends on the market demand, plant size and the usage of the plant. He can be operating at the suboptimum point (at the falling part of LAC), optimum (minimum point of the LAC) or surpass optimal (at the rising part of the LAC).

At suboptimal operation, the plant is under-utilized, the market demand is low and the SRAC is tangent to the LAC as the falling part of the curve. As shown in the fig below, while the minimum point of LAC is at point b, the equilibrium point is at e.



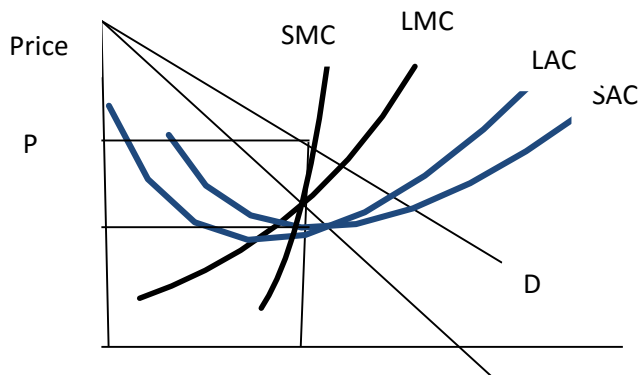


Optimal: when the firm is operating at optimal point in the long run, there is full utilization of the plant size. Thus the firm at equilibrium will be operating at the minimum point of the long run average cost. The SRAC is tangent to the LAC at its minimum point and both tangent to the MC and MR equilibrium point. As shown in the figure below.



Surpass optimum: at this point, the market size is too large for the plant size of the firm and the market demand is high. Since the monopolist want to cover/meet up with the demand, the firm will expand its production beyond the capacity of the plant size producing more than the minimum point of the LAC. SRAC is tangent to the LAC at the rising part of the LAC. The cost of production will be high because of the over utilization of the plant size and the firm will also experience diseconomies of scale

Fig here



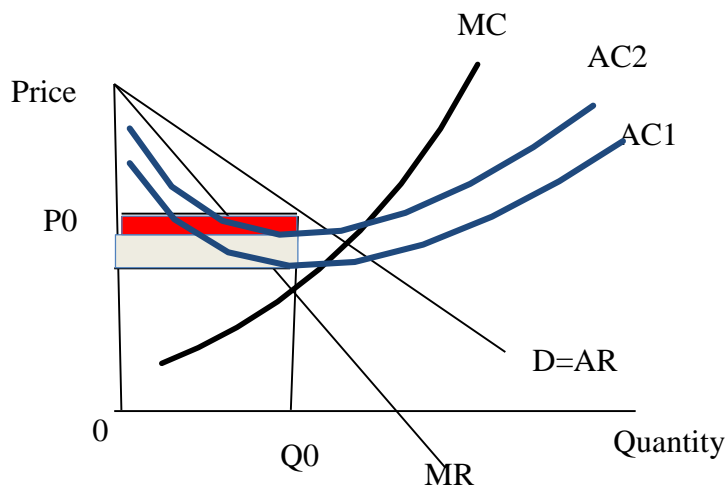
0 SAC MR Quantity

Homework: Make a comparison between the monopolist and the perfect competitive market.

If the market demand and cost of the monopolist are given as $X=75-P$ and $C=70+20X$, find the equilibrium price and output sold in this monopoly market and the profit accruing to the monopolist.

The effect of tax on price-output decision of a monopoly

Lump-sum tax: the imposition of a lump-sum tax will lead to an increase in the total cost only. Hence there will be an upward shift in the AC only as a result of the increase AFC (in the short run analysis) while the MC will not be affected. This will lead to a reduction of the excess profit (new profit region in red in the fig below) of the monopolist while equilibrium price and output remains the same. This is however on the condition that the monopolist is not earning normal profit and the tax do not exceed the abnormal profit.

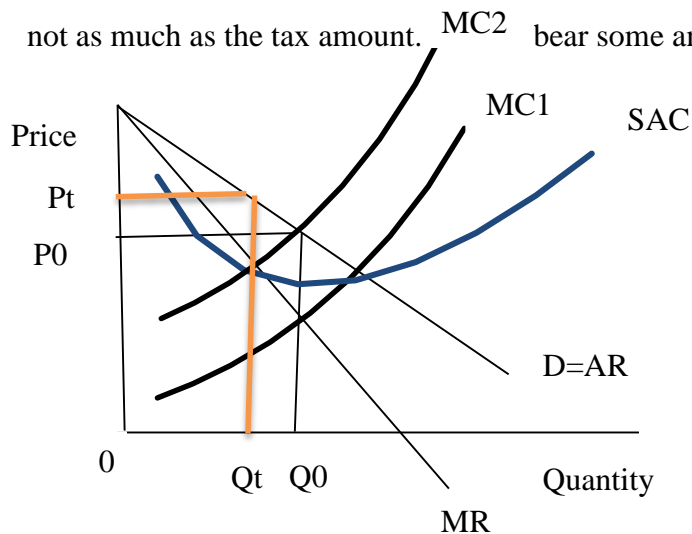


Profit tax: the profit tax is also a one-time tax and has same effect of the lump-sum tax.

Specific tax/sales tax: this is a per unit tax and will affect the marginal cost of the market. The specific tax will shift the marginal cost upward resulting in the change in equilibrium price and output and a new equilibrium price and output is arrived at p_t and Q_t . However the rate of increase in the price as a result of the tax depends on the shape/ elasticity of the MC of the

market. When the monopolist is having a positive sloping MC, the increase in price will be smaller than the specific tax as is the case of the perfect competitive market. The monopolist will pass part (less than 50%) of the tax to the consumer.

If the MC of the monopolist is horizontal, perfectly elastic, the monopolist will raise the price but not as much as the tax amount. MC2 bear some and pass some (50%) to the consumer.



Resources

Course Lecture Notes: <http://www.edouniversity.edu.ng/oer/economics/eco311.pdf>

Books

- Chauhan, S.P.S (2009). Microeconomics: An advanced treatise. New Delhi: PHI Learning private limited,
- Varian, H.R (2010). Intermediate Microeconomics, a modern approach. New Delhi: Affiliated East-West press private limited.
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LECTURE THREE

PRICE DISCRIMINATING ACTION AND THE EQUILIBRIUM DETERMINATION OF A PRICE DISCRIMINATING MONOPOLIST.

Introduction

Price discrimination occurs when a firm charges different prices to different customers for reasons other than differences in costs

Price discrimination is the practice of the monopolist charging different prices for the same quantity and quality of a good/service to different individuals or groups of individuals. This can effectively be done by service givers such as the doctor, lawyers, flight ticket etc.

The characteristic used in price discrimination is the willingness to pay (WTP). A firm can increase profit by charging a higher price to buyers that have higher WTP.

Forms of price discrimination

Price discrimination can take different forms depending on the circumstances surrounding the discrimination. Among the form of price discrimination are:

- **Personal discrimination:** this occurs when different prices are charged for different people at the same time and market.
- **Geographical discrimination:** When different prices are charged to different people at different places at the same time.

- Time or inter-temporal discrimination: this is a situation where different prices are charged at different time from same consumer in same market.

Price discrimination can be private or regulated/government discrimination. Private discrimination leads to geographical and time discrimination while government leads to use base/quantity base e.g electricity boards charging different rate for commercial and home use of electricity.

Reasons for price discrimination:

Objectives of private discrimination is profit motive while that of regulated is to recover cost incurred or regulate the consumption of the good by some groups of individuals. By discriminating, a monopoly firm makes greater profits than it would make by charging both groups the same price.

Fig here

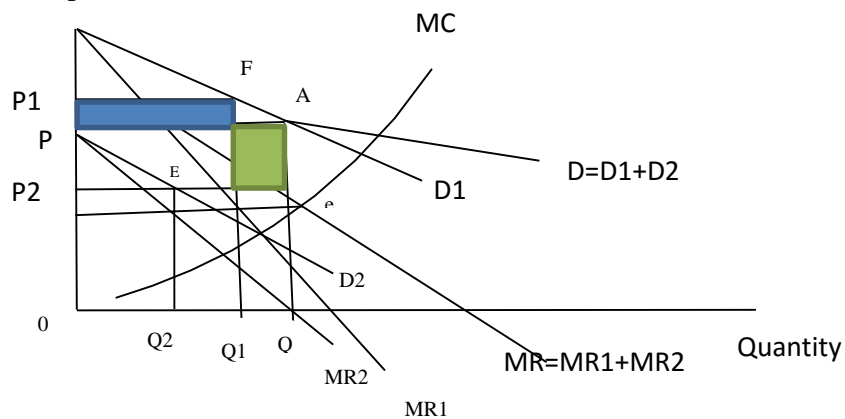


Fig 3.1

As shown in the Fig 3.1, the monopolist has two demand and MR curves D_1 and D_2 ; MR_1 and MR_2 . The total market demand $D = D_1 + D_2$ is while the total MR is given as $MR = MR_1 + MR_2$. Market equilibrium is obtained at the point of interception of the aggregate MR and the fixed MC, e. The monopolist sells Q_1 at P_1 in market 1 and Q_2 at P_2 in market 2 having revenue OQ_1FP_1 and OQ_2EP_2 in market 1 and 2 respectively. But if the monopolist did not discriminate he will only sell Q at P getting $OQAP$. Thus from discrimination, he will make an excess profit of the blue shaded portion as a result of high price sold in market 2 and a loss of green shaded portion as a result of the low price sold at market 1. However, the profit portion is greater than the loss hence in the end he will make more profit as compared to when he did not discriminate.

Conditions for effective price discriminating

For effective discrimination to be carried out, some conditions must hold.

- ❑ Identify different groups of customers who have different elasticities of demand and set different prices. This means it is expected that the market be effectively divided into different sub-market. Higher price are charged to customers with more inelastic demand and lower price to customers with more elastic demands.
- ❑ Segment the market and separate the customers. This will hinder consumers from moving from high priced market to low priced market. It will also limit their ability to resell the product between groups.
- ❑ For personal discrimination it is expected that the consumers do not belong to the same income/social group

Given that a monopolist charges P_1 and P_2 in two different market with elasticities e_1 and e_2 and MR in the two market being MR_1 and MR_2 , it can be shown that if $P_1 < P_2$, then $e_1 > e_2$

$$\text{Recall that } MR = P[1 - 1/e]$$

For different prices

$$MR_1 = P_1[1 - 1/e_1]$$

$$MR_2 = P_2[1 - 1/e_2]$$

The equilibrium condition for profit maximization requires that

$$\text{And } MR_1 = MR_2 = MC$$

$$\text{Thus } P_1[1 - 1/e_1] = P_2[1 - 1/e_2]$$

Dividing both sides by P_2 and $[1 - 1/e_1]$ we will have that

$$\frac{P_1}{P_2} = \frac{[1 - 1/e_2]}{[1 - 1/e_1]}$$

$$P_2 [1 - 1/e_1]$$

From the above, if $e_2 = e_1$ then $P_1/P_2 = 1$.

Meaning that $P_1 = P_2$. If this case, price discrimination will not be possible. However for effective discrimination

$$[1 - 1/e_1] < [1 - 1/e_2]$$

So that $P_1 > P_2$

Student: if $e_1 = 6$ and $e_2 = 8$ show that $P_1 > P_2$

The lower the elasticity of the market demand, the higher the price and more elastic the market demand, the lower the price.

Types/degrees of discriminating

- a) The first degree/ perfect price discrimination: Under this condition, the monopolist sells different unit of the good at different prices to different individuals. Each unit of the good is sold to the person who values it most at the highest price he is ready to pay for it. The monopolist gets all consumers' surplus of the market in this form of discrimination. He sells at a take or leave it price. E.g the prices set at bargaining.

From the Fig, the shaded region is the consumers' surplus.

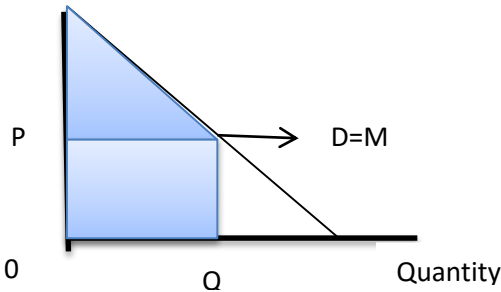


Fig 3.3

- b) Second Degree price discrimination: in this form of discrimination, the monopolist sells different unit at different prices but the individuals buy same amount of the goods/services at same price. He gets a larger part of the consumer's surplus but not all. E.g Price discrimination in air craft. As shown in the Fig 3.3 below, the shaded portion is the amount of consumers' surplus that the monopolist has gotten from discrimination.

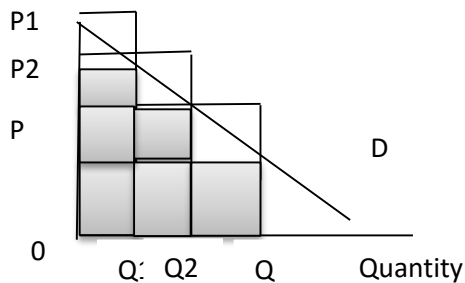
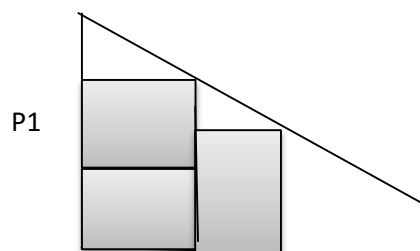


Fig 3.3

- c) Third degree price discriminating: this is the most common degree of discrimination. The monopolist in this case is only able to divide the market into two parts. He sells output to different people at different prices but every unit of output sold to a given person at the same price. From the fig below, is the monopolist is not discriminating, he will sell Q units and price P . but with discrimination he can sell Q_1 at P_1 and Q at P getting the shaded portion of the consumers' surplus as profit.



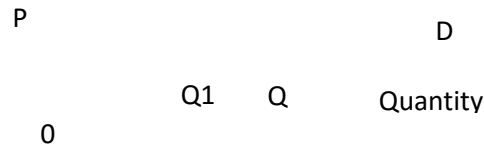


Fig 3.4

Effects of discrimination

- The monopolist is able to take a part or all the consumer's surplus making his total revenues high and making higher profit as compared to without discrimination
- The quantity that the monopolist will supply in the face of discriminating will be higher as degree of discrimination increases than without discrimination
- In the extreme case of discrimination as the marginal revenues curve keeps shifting up with different prices charged, given that demand is constant, the MR will coincide with the DD curve at the take or leave it discrimination.

The equilibrium determination of a price discriminating monopolist

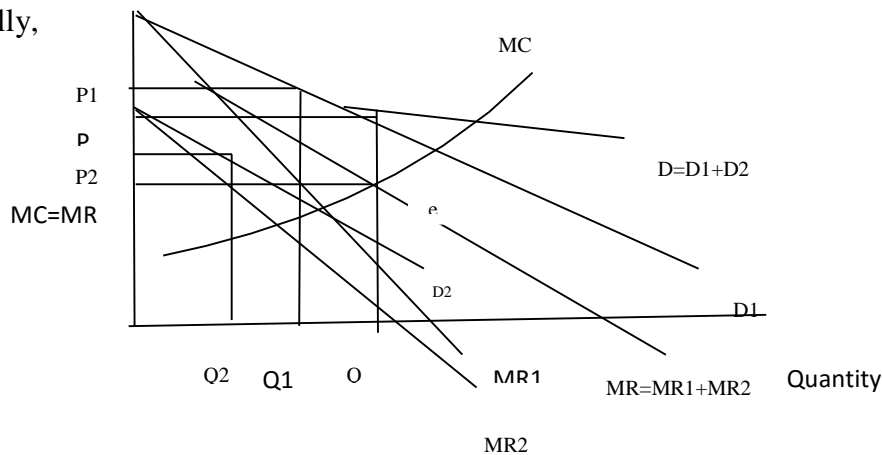
It has been established that a firm is at equilibrium at the point where $MR=MC$. This also applies to the discriminating monopolist. However, since the discriminating monopolist has two different demand structures, his marginal revenues will also differ. Hence for the discriminating monopolist, equilibrium is established in the markets at the

$MR_1=MC$; $MR_2=MC$ while the total profit maximization is at the point where

$$MR_1 = MR_2 = MC$$

The monopolist will sell more quantity in the market with the larger MR

Graphically,



Mathematically,

Given the total demand function of a monopolist as

$P=f(Q)$. If this monopolist is discriminating, the demand functions will be

$$P_1=f(Q_1)$$

$P_2=f(Q_2)$ with a total cost function of

$$C=f(Q)=f(Q_1+Q_2).$$

Profit will be given as

$$\Pi=R_1+R_2-C$$

FOC $\partial\Pi/\partial Q=0$. Thus,

$$\partial\Pi_1/\partial Q_1=\partial TR_1/\partial Q_1-\partial TC/\partial Q_1=0;$$

$$MR_1-MC=0$$

$$\partial\Pi_2/\partial Q_2=\partial TR_2/\partial Q_2-\partial TC/\partial Q_2=0$$

$$MR_2-MC=0. \text{ Hence, } MC=MR_1=MR_2$$

SOC requires that

$$\partial^2 TR_1/\partial Q_1^2 < \partial^2 TC/\partial Q_1^2$$

$$\partial^2 TR_2/\partial Q_2^2 < \partial^2 TC/\partial Q_2^2$$

Examples: Given that a monopolist discriminates between the sales in the domestic market and foreign market and the demand curves in the two markets are given as

$Q_d=32000-0.4P_d$ and $Q_f=18000-0.1P_f$, where the total cost function facing the monopolist is

$TC=50,000+40000Q$, calculate the outputs and prices sold by the monopolist in the two markets and the total profit accruing to the monopolist. Compare your result with the case when the monopolist does not discriminate. Also, show that SOC and the condition for effective discrimination are met.

Resources

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Books

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