B.COM (H) (GE – 1)-Semester-1

MICRO ECONOMICS

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SYLLABUS

(GE – 1)
MICRO ECONOMICS

Objective: Objective of the course is to acquaint the students with the concepts of microeconomics
dealing with consumer behavior. The course also makes the student understand
the supply side of the market through the production and cost behavior of firms.

Unit: I Demand and Consumer behaviour

Concept of demand: demand function, law of demand, derivation of individual and market
demand curves, shifting of the demand curve, elasticity of demand,
Consumer behavior, Marshallian utility approach and Indifference Curve approach; utility
maximization conditions . Income-Consumption Curve (ICC) and Price-Consumption Curve
(PCC)

Unit: II Production and Cost

Production function: Short-run and Long-run; Total Product, Average Product and Marginal
Product, Law of returns to a variable factor, Law of Returns to Scale; Concepts of Iso-quant
and iso-cost line;
Cost: Accounting and Economic Costs; Social and Private Costs; Short-run and Long-run
Costs; Relation between Average and Marginal

Unit: III Perfect Competition

Concept of Perfectly Competitive market: Assumptions, Profit maximization conditions;
Related concepts of Total Revenue, Average Revenue and Marginal Revenue, Short-run and
Long- run equilibrium of a firm; determination of short-run supply curve of a firm, measuring
producer surplus under perfect competition

Unit: IV Imperfect Competition

Monopoly

Concept of Monopoly: Sources of monopoly power; Short-run and Long-run equilibrium of a
monopoly firm; Price discrimination; Social Cost of Monopoly (concept only).

Monopolistic Competition

Concept of Imperfectly Competitive market; Monopolistic Competition: Features and
examples; Oligopoly: Non-Collusive Oligopoly: Sweezy's Kinked demand Curve Model,
Collusive Oligopoly: Cartel (concept with example)

Learning Outcomes: The students would be able to apply tools of consumer behaviour and
firm theory to business situations.

Text Books Recommended

1. Micro Economics-K C Dash- Himalaya Publishing House
2. Ahuja, H.L, Micro Economics, S.Chand

Suggested Readings:

1. Mehta P.K, Singh M. – Micro Economics – Taxmann Publication
2. Micro Economics-T.R. Jain , B.D. Majhi, V.K. Global
3. Browining, E.K. and J.M. Browning; Microeconomic Theory and Applications,
4. Kalyani Publishers, New Delhi.
5. Microeconomics I and Statistics: Das & Sengupta, Oxford University Press
6. N. Gregory mankiw, Principles of Micro Economics, Cengage Learning
7. Dwivedi, D.N. Micro Economics, Vikash Publication
8. Pindyck, R.S., D. L. Rubinfeld and P. L. Mehta; Microeconomics, Pearson Education.
9. N. Gregory mankiw, Principles of Micro Economics, Cengage Learning
10. Maddala G.S.and E.Miller; Microeconomics: Theory and Applications,
11. MCGraw-Hill International.

Contents

UNIT-I

DEMAND AND CONSUMER BEHAVIOUR

1.1 CHAPTER

THE DEMAND ANALYSIS

Objectives

After studying this unit, you should be able to:

- understand the concepts of revenue/ demand curves under different market conditions
- define demand and its determinants
- explain the Law of Demand
- identify differences between Firm's and Market Demand Curve
- understand the concept and types of elasticity of demand
- assess the price elasticity of demand as well as the determinants

Structure

1.1.31 Summary

1.1.32 Self Assessment Questions

1.1.1 Concepts of revenue: Marginal and Average Revenue under conditions of Perfect and imperfect competition

Introduction

The costs and revenues of a firm determine its nature and the levels of profit. Cost refers to the expenses incurred by a producer for the production of a commodity. Revenue denotes the amount of income, which a firm receives by the sale of its output. The revenue concepts commonly used in economic are total revenue, average revenue and marginal revenue.

Total Revenue (TR)

Total revenue refers to the total sale proceeds of a firm by selling its total output at a given price. Mathematically TR = PQ, where TR = Total Revenue, P = Price, Q = Quantity sold. Suppose a firm sells 100 units of a product at the price of Rs.5 each, the total revenue will be 100 × Rs.5 = Rs.500.

Average Revenue (AR)

Average revenue is the revenue per unit of the commodity sold. It is obtained by dividing the total revenue by the number of units sold. Mathematically AR = TR/Q; where AR = Average revenue, TR = Total revenue and Q = Quantity sold. In our example, average revenue is = 500/100 = Rs.5. Thus, average revenue means price.

Marginal Revenue (MR)

Marginal revenue is the addition to total revenue by selling one more unit of the commodity. Mathematically MR = ΔTR/ΔQ; where MR = Marginal revenue, ΔTR = Change in Total revenue and ΔQ = Change in Quantity sold.

Suppose 5 units of a product are sold at a total revenue of Rs. 50 and 6 units are sold at a total revenue of Rs. 60. The marginal revenue will be (Rs. 60 – Rs.50)/(6 - 5) = 10/1= Rs.10.

1.1.2 Relationship between AR and MR under Perfect Competition

Under perfect competition, a very large number of firms are assumed to be present selling homogeneous products. So any increase or decrease in production by any one firm exerts no perceptible influence on the total supply and on the price in the market. The collective forces of demand and supply determine the price in the market so that only one price tends to prevail for the whole industry. Each firm has to take the market price as given and sell its quantity at the ruling market price. Thus, the firm is a 'price-taker' and hence the firm's demand curve is infinitely elastic (Horizontal in shape). As the firm sells more and more at the given price, its total revenue will increase but the rate of increase in the total revenue will be constant which implies AR = MR. The relationship between AR and MR for a firm under perfect competition has been depicted in Table-1 and Fig.1 given below.

Table-1.1.2 Relationship between AR and MR under perfect competition

Q	**AR (P)**	**TR**	**MR**
1	10	10	10
2	10	20	10
3	10	30	10
4	10	40	10
5	10	50	10
6	10	60	10
7	10	70	10

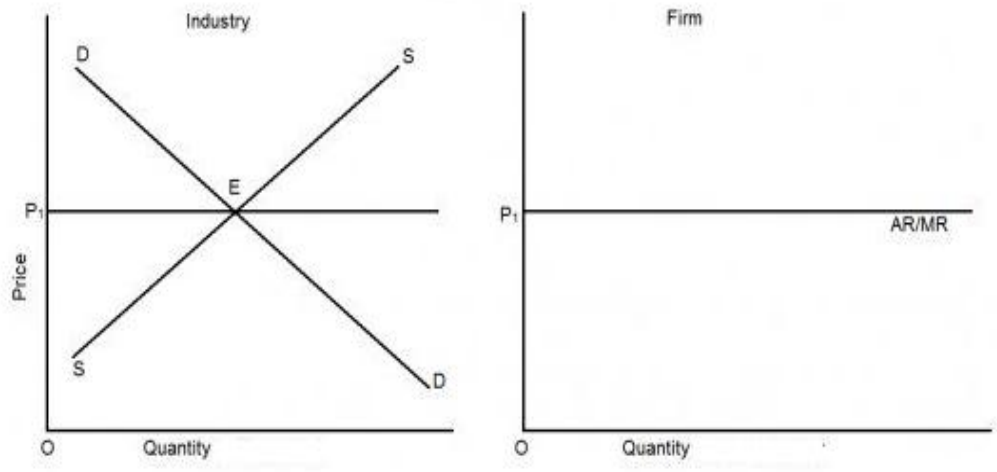


Fig.1.1.2. The Demand curve (AR) of a Firm under Perfect Competition

In figure 1.1.2, OX – axis represents the number of units sold and OY axis represents the price per unit. The price of the unit remains constant at P_1. Consequently AR and MR curves coincide with each other.

1.1.3 Relationship between AR and MR under Imperfect Competition

Unlike under perfect competition, a firm under imperfect competition such as under monopoly can sell more only by lowering its price. Therefore, the average revenue curve is downward sloping and its corresponding marginal revenue curve lies below it.

Table-1.1.3 Relationship between AR and MR under Monopoly

Q	AR (P)	TR	MR
1	10	10	10
2	9	20	10
3	8	30	10
4	7	40	10
5	6	50	10
6	5	60	10

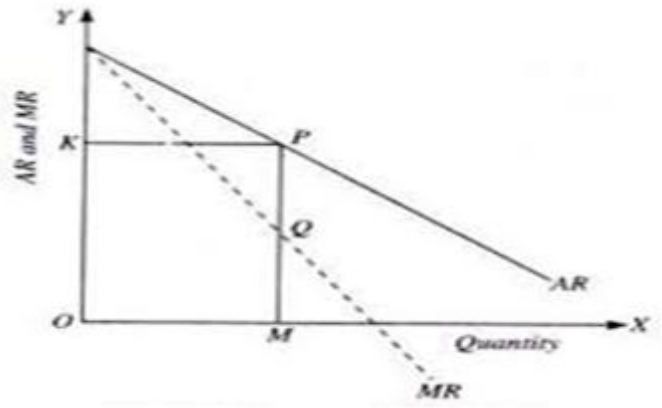


Fig. 1.1.3 Average and Marginal Revenue Curves under Monopoly

In figure 1.1.3, OX – axis represents the number of units of the commodity sold. OY represents the price. The AR curve as well as the MR curve slope downwards. **However, the rate of fall in marginal revenue is double that of the fall of the average revenue.**

How much is MR below AR under imperfect competition?

(i) When MR and AR are straight lines and slope downwards

When AR and MR are straight lines, sloping downwards, the marginal revenue falls twice as much as the fall in the average revenue. In other words, the marginal revenue will cut any line perpendicular to the Y- axis at halfway to the average revenue curve. This can be proved mathematically. In the following figure 1.1.3 (a), AB = BC.

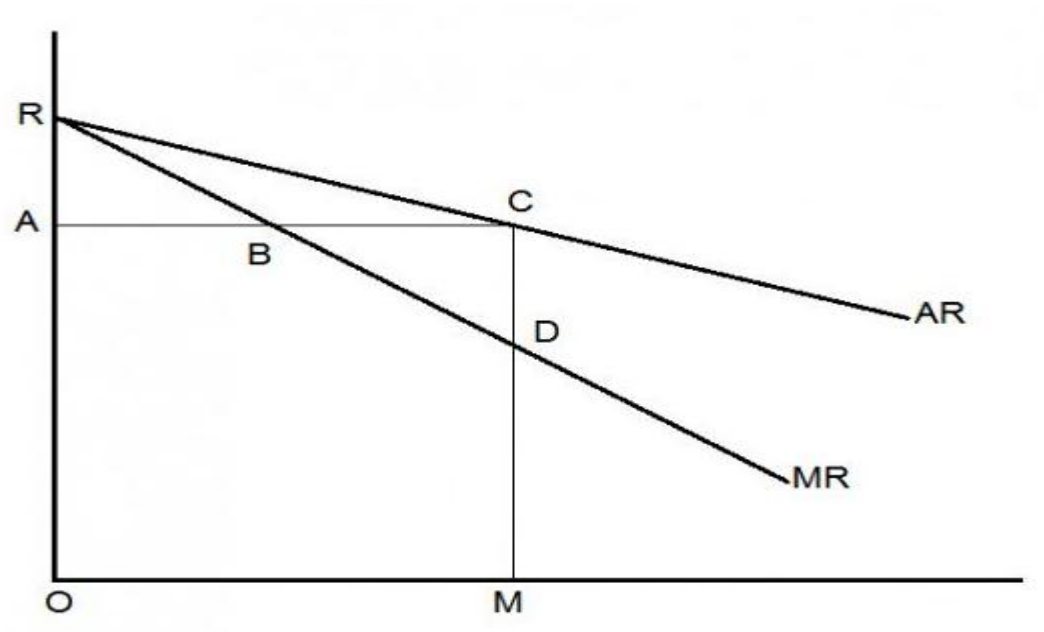


Fig. 1.1.3 (a) Relationship between AR & MR Curves under imperfect competition

Total Revenue = Average Revenue × Output

CM × OM = Area of Rectangle ACMO

Also Total Revenue = Area under the marginal revenue curve = RDMO

Also ACMO = ABDMO + BCD and RDMO = ABDMO + RAB

Therefore, ABDMO + BCD = ABDMO + RAB

Or BCD = RAB

But RAB = BCD, being right angles

And RBA = CBD, being vertically opposite angles.

Thus, the two triangles are equal in area and BCD = RAB

Therefore, AB = BC

Hence, it is proved that marginal revenue curve will cut any line perpendicular to the Y-axis at halfway to the average revenue curve.

Price Elasticity, Average Revenue and Marginal Revenue

Mrs. Joan Robinson in her book 'The Economics of Imperfect Competition' has shown the empirical relationship between price elasticity, average revenue and marginal revenue.

The relationship is expressed in the formula.

AR = MR or AR = MR(e/(e-1)) or MR = AR ((e-1)/e); where, AR = Average Revenue, MR = Marginal Revenue and 'e' = price elasticity of demand.

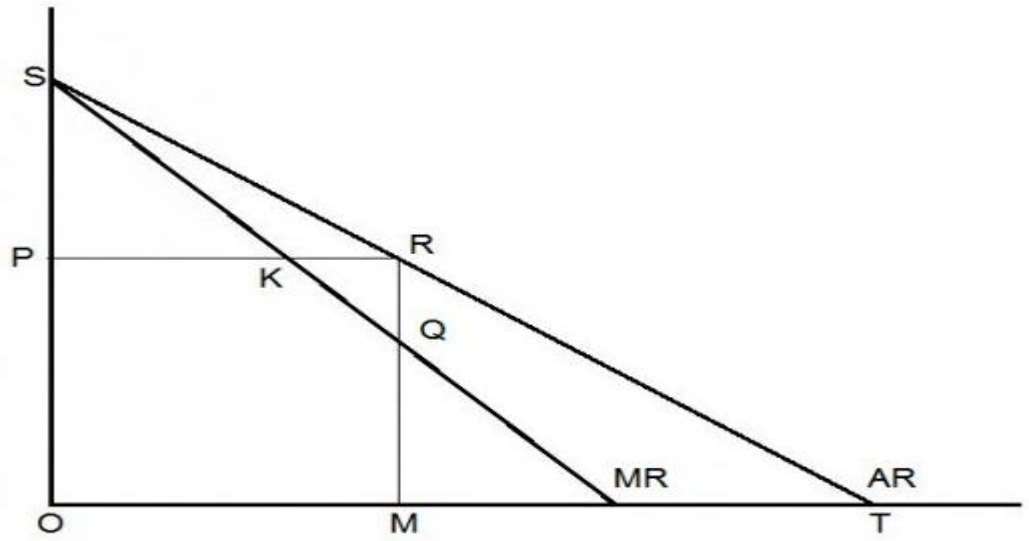


Fig. 1.1.3 (b) Relationship between AR,MR & Price elasicity under imperfect competition

In figure 1.1.3 (b), AR and MR are the average revenue and the marginal revenue curves. Elasticity of demand at point R on the average revenue curve = RT/RS

In triangles PSR and MRT,

$\angle$SPR = $\angle$RMT (right angles)

$\angle$SRP = $\angle$RTM (corresponding angle)

Therefore, $\angle$PSR = $\angle$MRT

Therefore, triangles PSR and MRT are similar.

Hence, RT/RS = RM/SP ----------(1)

Now in triangle PSK and KRQ,

PK = KR

∟PKS = ∟RKQ (vertically opposite angles)

∟SPK = ∟KRQ (right angles)

Therefore, triangles PSK and RQK are congruent.

Hence, PS = RQ ----------(2)

From (1) and (2), we get,

Elasticity at R = (RT/RS) = (RM/SP) = (RM/RQ)

But RM/RQ = RM/(RM-RQ)

But RM = Average revenue = price

QM = Marginal revenue

Elasticity at R = Average revenue/(Average revenue – Marginal revenue)

= AR/(AR-MR)

If A stands for Average revenue, M stands for Marginal revenue and ‘e’ stands for elasticity on the average revenue curve, then e = A/(A-M).

Therefore, e(AR) – e(MR) = AR

e(AR) – AR = e(MR)

AR = e(MR)/(e-1)

AR = MR(e/(e-1))

MR = AR((e-1)/e) = $AR\ \frac{e-1}{e}\ = AR\,(1-\frac{1}{e}) = P\,(1-\frac{1}{e})$

A few examples:

1. Suppose the price of a product is $6 and the elasticity of demand is 2. Marginal revenue will be MR = AR((e-1)/e) = $6 × (2-1)/2 = $6 × (1/2) = $3.
2. When the price of the product is $6 and price elasticity of demand is 1, marginal revenue will be MR = AR((e-1)/e) = $6 × (1-1)/1 = $6 × 0 = 0.

If MR = 0, it is a case in which the MR curve coincides with the X-axis.

Some Special Cases of Revenue Curves

Mrs. Joan Robinson has also pointed out many special cases of Marginal and Average revenue curves.

Rectangular Hyperbola: If the demand for the firm's product is unitary elastic (e = 1), then the average revenue will assume the form of a rectangular hyperbola. This limiting case is possible under pure monopoly where the monopoly product has no substitutes at all.

According to the formula MR = AR ((e-1)/e)

Putting e=1, we have MR = AR ((1-1)/1) = AR × 0 = 0

Thus, when the price elasticity of demand (e or PED as shown in Figure below) is equal to one or unity, though not the average revenue curve, the marginal revenue curve will be zero. Therefore, the marginal revenue curve coincides with the X-axis. Further, when PED >1, MR is positive (MR > 0) and when PED<1, MR is negative (MR< 0) as shown in Fig.1.1.3 (C).

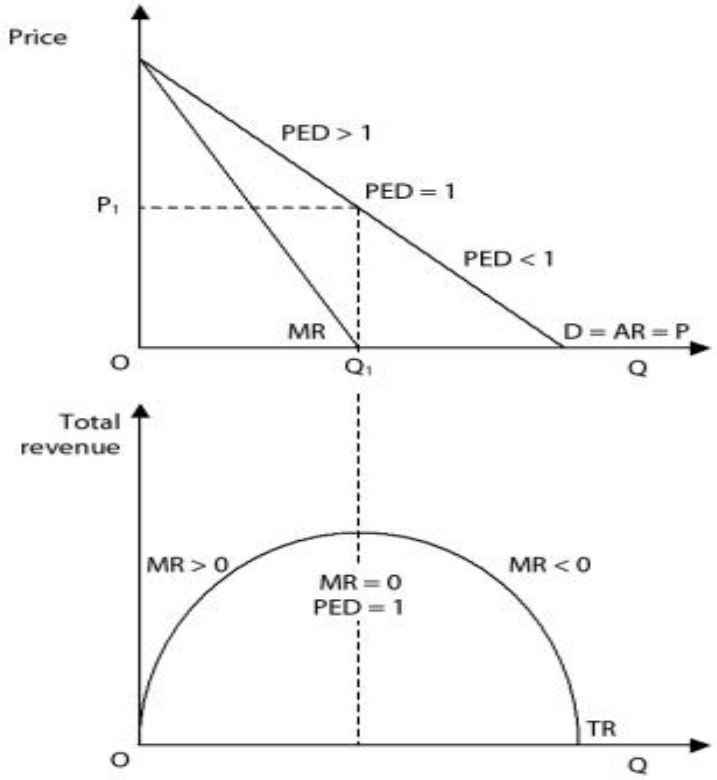


Fig. 1.1.3 (C) Some Special Cases of Revenue Curves

1.1.3.1 Average and Marginal Revenue curves under Monopolistic Competition

The average revenue and marginal revenue curve under monopolistic competition is also down sloping. It has resemblance with that of AR & MR under monopoly. As in imperfect competition the firms are price marker the shape of AR and MR are as follows.

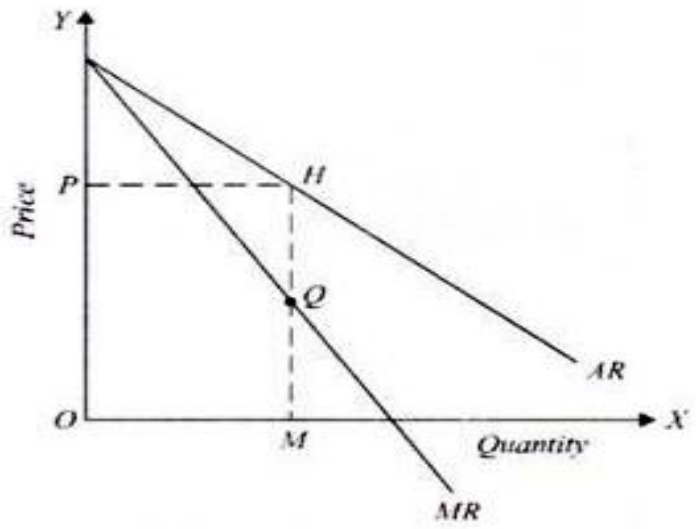


Fig. 1.1.3.1 Average and Marginal Revenue curves under Monopolistic Competition

1.1.3.2 Revenue curves under Oligopoly

Oligopoly is a market where there are only few sellers. The demand curve of a firm under oligopoly is not supposed to be smooth. The demand curve has a kink at point K on the demand curve indicating the price policy of the firm. If the firm raises the price above this price determined at the point of kink i.e. K, his rivals will not follow the suit. Consequently, his sales and profit will suffer. On the contrary, if it lowers the price, the rival firms will retaliate by following the same action. Therefore, the firm cannot gain more by lowering the price. When there is a kink in the average revenue curve, the marginal revenue is discontinuous at the point of the kink. The gap in the marginal revenue depends upon the nature of the elasticity on the upper and lower portions of the kinked demand curve. This is shown in the following figure 1.1.3.2.

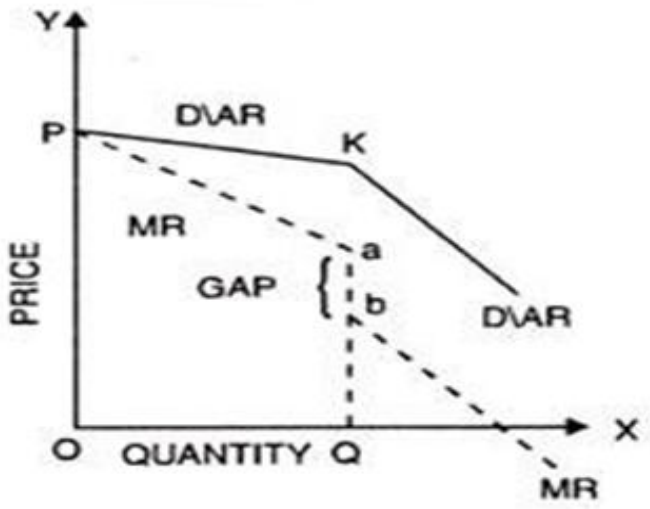


Fig. 1.1.3.2 Average and Marginal Revenue curves under Oligopoly

1.1.4 Significance of the Concept of Revenue

(a) In determining the nature of profit

The concepts of MR and AR both together constitute a powerful analytical tool in economic analysis. Average revenue is the price per unit of output. To find out whether the firm earns super normal profits or only normal profits or losses the following rule is followed. At the point of equilibrium –

1. If AR is tangent to AC there will be normal profit
2. If AR is above AC there will be super normal profits
3. If AR is below AC there will be loss
4. Helpful in decision-making

The concept is also vital in determining the equilibrium of a firm. The aim of every firm is to obtain maximum profits. The rule for profit maximization is MC = MR.

If MR > MC expansion in output will be profitable

If MR < MC expansion incurs loss

If MC = MR equilibrium output is attained

The intersection of MC = MR determines price, output, and the profit or loss of a firm.

(b) Concept of excess capacity

This concept is helpful to indicate to the entrepreneur whether the firm possesses excess capacity or not. Under perfect competition, production will be carried on up to the minimum point of the LAC. Therefore, excess capacity is not possible.

However, under imperfect competition (monopoly or monopolistic competition) the firm can earn more by reducing its output. So, production will not be carried on up to the minimum point of the long-run average cost curve. Thus, imperfect competition leads to idle capacity. It is a wastage from the society's point of view.

(c) Factor-Pricing

In fixing the prices of factors in the factor markets, AR and MR concepts are very useful. In factor pricing, the average revenue curve becomes the average revenue productivity curve, and marginal revenue curve becomes the marginal revenue productivity curve, ARP and MRP are inverted 'U' (bell Shaped) curves. The point of intersection of MFP and MFC (Marginal Factor Cost) determines the equilibrium level of price, output and profit for a firm under various cost conditions.

1.1.5 Demand - Concept

Demand for a commodity refers to the desire for the commodity backed by willingness and ability to pay for that commodity. So demand includes the desire to buy the commodity accompanied by the willingness to buy it and sufficient purchasing power to purchase it. For instance-Everyone might have willingness to buy Car but only a few have the ability to pay for it. Thus, everyone cannot be said to have a demand for the car.

Demand may arise from individuals, household and market. When goods are demanded by individuals, it is called as individual demand. Goods demanded by household constitute household demand. Demand for a commodity by all individuals/households in the market in total

constitutes market demand. The Market demand is the horizontal summation of individual demand.

1.1.6 Demand Function (Determinants of Demand)

Demand function is showing relationship between the quantity demanded of a commodity and the factors influencing demand. **Dx = f (Px, Py, T, Y, A, Pp, Ep, U)**

In the above equation,
Dx = Quantity demanded of a commodity
Px = Price of the commodity
Py = Price of related goods
T = Tastes and preferences of consumer
Y = Income level
A = Advertising and promotional activities
Pp = Population (Size of the market)
Ep = Consumer's expectations about future prices
U = Specific factors affecting demand for a commodity such as seasonal changes, taxation policy, availability of credit facilities, etc.

1.1.7 Law of Demand

The law of demand states that there is an inverse relationship between quantity demanded of a commodity and its price, other factors being constant. In other words, higher the price, lower the demand and vice versa, other things remaining constant.

Demand Schedule

Demand schedule is a tabular representation of the quantity demanded of a commodity at various prices. For instance, there are four buyers of apples in the market, namely A, B, C and D.

Demand schedule for apples

PRICE (Rs. per dozen)	Buyer A (demand in dozen)	Buyer B (demand in dozen)	Buyer C (demand in dozen)	Buyer D (demand in dozen)	Market Demand (dozens)
10	1	0	3	0	4

9	3	1	6	4	14
8	7	2	9	7	25
7	11	4	12	10	37
6	13	6	14	12	45

The demand by Buyers A, B, C and D are individual demands. Total demand by the four buyers is market demand. Therefore, the total market demand is derived by summing up the quantity demanded of a commodity by all buyers at each price.

Demand Curve

Demand curve is a diagrammatic representation of demand schedule. It is a graphical representation of price- quantity relationship.

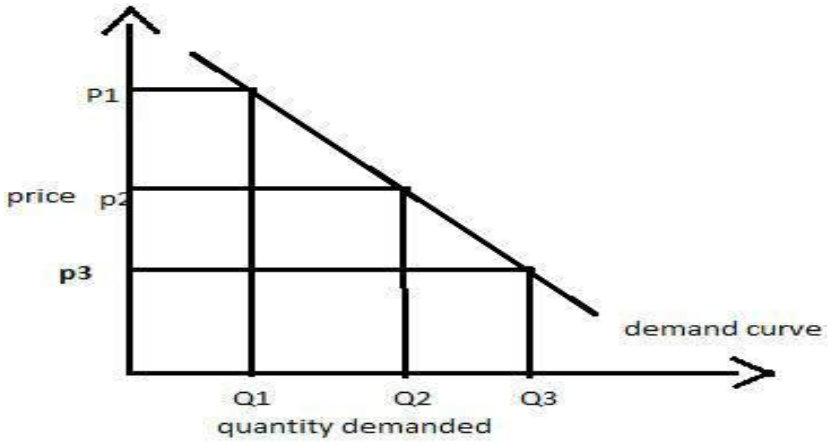


Fig. 1.1.7 Demand Curve

Demand curve has a negative slope, i.e, it slopes downwards from left to right depicting that with increase in price, quantity demanded falls and vice versa. The reasons for a downward sloping demand curve can be explained as follows-

1. **Income effect-** With the fall in price of a commodity, the purchasing power of consumer increases. Thus, he can buy same quantity of commodity with less money or he can purchase greater quantities of same commodity with same money. Similarly, if the price of a commodity rises, it is equivalent to decrease in income of the consumer as now he has to spend more for buying the same quantity as before. This change in purchasing power (real income) due to price change is known as income effect.

2. **Substitution effect-** When price of a commodity falls, it becomes relatively cheaper compared to other commodities whose price have not changed. Thus, the consumer tend to consume more of the commodity whose price has fallen, i.e, they tend to substitute that commodity for other commodities which have not become relatively dear.
3. **Law of diminishing marginal utility-** It is the basic cause of the law of demand. The law of diminishing marginal utility states that as an individual consumes more and more units of a commodity, the utility derived from it goes on decreasing. So as to get maximum satisfaction, an individual purchases in such a manner that the marginal utility of the commodity is equal to the price of the commodity. When the price of commodity falls, a rational consumer purchases more so as to equate the marginal utility and the price level. Thus, if a consumer wants to purchase larger quantities, then the price must be lowered. This is what the law of demand also states.

Exceptions to Law of Demand

The instances where law of demand is not applicable are as follows-

1. There are certain goods which are purchased mainly for their snob appeal, such as, diamonds, air conditioners, luxury cars, antique paintings, etc. These goods are used as status symbols to display one's wealth. The more expensive these goods become, more valuable will be they as status symbols and more will be there demand. Thus, such goods are purchased more at higher price and are purchased less at lower prices. Such goods are called as **conspicuous goods**.
2. The law of demand is also not applicable in case of **Giffen goods**. Giffen goods are those inferior goods, whose income effect is stronger than substitution effect. These are consumed by poor households as a necessity. For instance, potatoes, animal fat oil, low quality rice, etc. An increase in price of such good increases its demand and a decrease in price of such good decreases its demand.
3. The law of demand does not apply in case of expectations of change in price of the commodity, i.e, in case of **speculation**. Consumers tend to purchase less or tend to postpone the purchase if they expect a fall in price of commodity in future. Similarly, they tend to purchase more at high price expecting the prices to increase in future.

1.1.8 Market demand curve

Although the behaviour of an individual in respect of selection and purchase of goods forms the basis of demand theory, the aggregate demand or market demand for a good is most important for its producer. The aggregate quantity of a good that the buyers purchase or demand at a particular price and in a particular period is called the market demand for the good at the said price. Also, the curve that gives us the market demand for a good at any particular price is known as its market demand curve.

It is obvious from the definition of **market demand that the horizontal or lateral summation of the individual demand curves** for a good would give us its market demand curve. The market demand curve for a good would also slope downward towards right, since, owing to the law of demand.

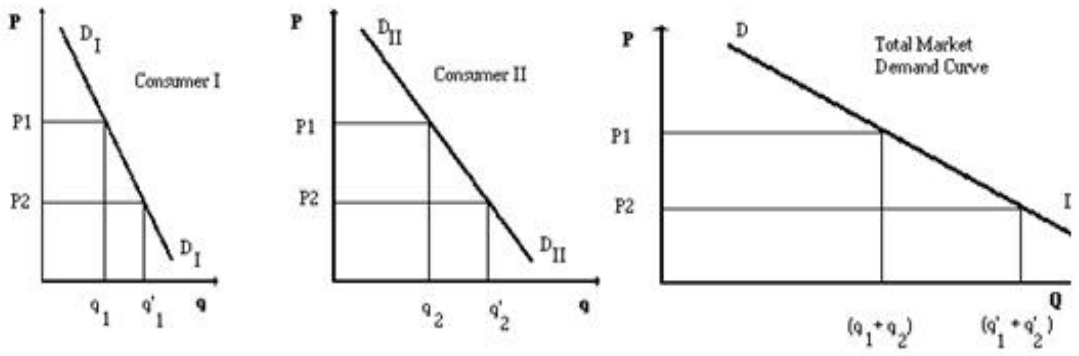


Fig. 1.1.8 Market Demand Curve

The market demand curve can be obtained from the individual demand curves with the help of Figure. To make our analysis simple, suppose that the number of buyers of a good is only two and their individual demand curves are respectively d_1 and d_2 .The market demand corresponding to price p_1 and p_2 .has been shown in the figure given above. It is obvious from this that the market demand curve for a good is the horizontal summation of its individual demand curves.

1.1.9 Shift in Demand Curve

The demand curve shift to the right of left to the original demand curve parallelly when we reflex the assumption of other things reaming constant. The shift in demand curve has been shown as follows**.**

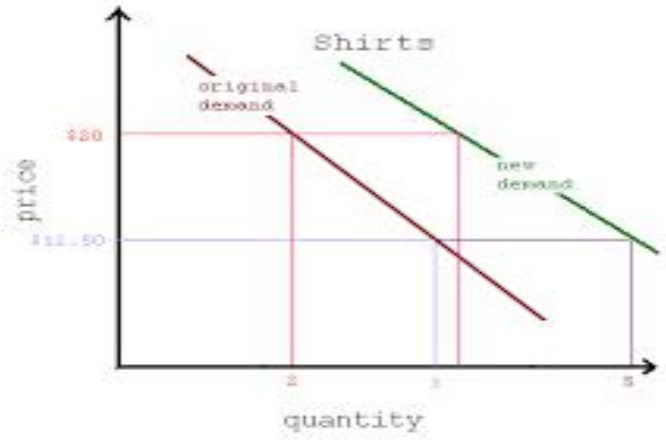


Fig. 1.1.7 Shift in Demand

1.1.10 Elasticity of Demand

Elasticity's of Demand: Price, Income and Cross-Elasticity of Demand

There are as many elasticities of demand as its determinants.

The most important of these elasticity's are:

(a) The price elasticity,

(b) The income elasticity,

(c) The cross-elasticity of demand.

(d) Promotional elasticity of demand

1.1.11 Price elasticity of demand:

The price elasticity measures the degree of responsiveness of the change in quantity demanded for a commodity due to the change in its price, other things remaining constant. If the changes in price are very small the **point elasticity of demand** is used to measure the responsiveness of demand. If the changes in price are not small **arc elasticity of demand** is used as the relevant measure.

Point elasticity of demand

The point elasticity of demand is defined as the proportionate change in the quantity demanded resulting from a very small proportionate change in price. Symbolically we may write

$$e_p = \left(\frac{dQ}{Q}\right) / \left(\frac{dP}{P}\right)$$

or $$e_p = \left(\frac{dQ}{dP}\right) / \left(\frac{P}{Q}\right)$$

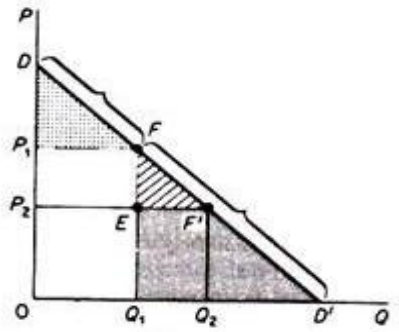
If the demand curve is linear i.e. $Q = b_0 - b_1P$

Its slope is $\frac{dQ}{dP} = -b_1$. Substituting in the elasticity formula, we get

$$e_p = -b_1 . \frac{P}{Q}$$

It implies that the elasticity changes at the various points of the linear-demand curve. Graphically the point elasticity of a linear-demand curve is shown by the ratio of the segments of the line to the right and to the left (i.e. ratio of lower segment to upper segment) of the particular point.

In figure 1.1.11.1 the elasticity of the linear-demand curve at point F is the ratio of $\frac{FD'}{FD}$



Fig, 1.1.11.1 Point elasticity of demand

Proof

From the above figure it can be proved that point elasticity of a linear-demand curve is the ratio of lower segment to upper segment (i.e. FD ′/ FD)

$\Delta P = P_1 P_2 = EF$
$\Delta Q = P_1 P_2 = EF'$
$P = OP_1$
$Q = OQ_1$
If we consider very small changes in P and Q, then the point elasticity will be

$$e_p = \frac{dQ}{dP} \Big/ \frac{P}{Q} = Q_1Q_2 / P_1P_2 = \frac{EF'}{EF} \cdot \frac{OP1}{OQ1}$$

From the figure also we can see that the triangles FEF′ and FQ_1D' are similar (because each corresponding angle is equal). Hence, $\frac{EF'}{EF} = Q_1D' / FQ_1 = Q_1D' / OP_1$.

Thus, $e_p = Q1D' / OP_1 = OP_1 / OQ_1 = Q_1D' / OQ_1$
Further, the triangles and DP_1F and FQ_1D' are similar and hence,
$Q_1D' / FD' = P_1F / FD = OQ_1 / FD$
Rearranging the above equation, we get the point price elasticity at point F as
$e_p = Q_1D' / OQ_1 = FD' / FD$ = Lower Segment / Upper Segment

Given this graphical measurement of point elasticity it is obvious that at the mid-point of a linear-demand curve $e_p = 1$ (point M in the figure 1.1.11.2 given below). At any point to the right of M the point elasticity is less than unity ($e_p < 1$); finally at any point to the left of M, $e_p > 1$. At point D the $e_{p=} \infty$, while at point D' the $e_p = 0$. The price elasticity is always negative because of the inverse relationship between Q and P implied by the 'law of demand'. However, traditionally the negative sign is omitted when writing the formula of the elasticity.

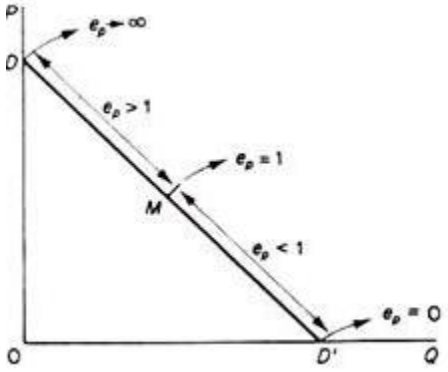


Fig. 1.1.11.2 Point elasticity of demand

Arc elasticity of demand

The above formula for the price elasticity is applicable only for infinitesimal changes in the price. If the price changes appreciably we use the following formula, which measures the arc elasticity of demand

$$\mathbf{e_p} = \frac{\Delta Q}{\Delta P} \cdot \left[\frac{\frac{P_1+P_2}{2}}{\frac{Q_1+Q_2}{2}}\right] = \frac{\Delta Q}{\Delta P} \cdot \frac{P_1+P_2}{Q_1+Q_2}$$

They are elasticity is a measure of the average elasticity, that is, the elasticity at the midpoint of the chord that connects the two points (A and B) on the demand curve defined by the initial and the new price levels (figure 1.1.11.3). It should be clear that the measure of the arc elasticity is an approximation of the true elasticity of the section AB of the demand curve, which is used when we know only the two points A and B from the demand curve, but not the intermediate ones. Clearly the more convex to the origin the demand curve is, the poorer the linear approximation attained by the arc elasticity formula.

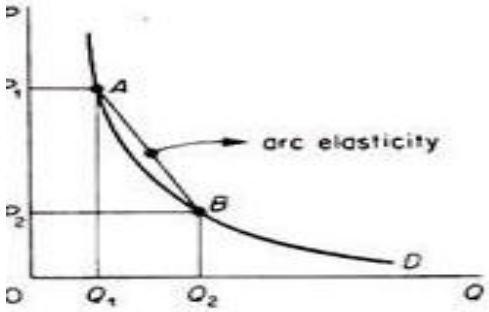


Figure 1.1.11.3 Arc elasticity of demand

Types of Price Elasticity of Demand

The extent of responsiveness of demand with change in the price is not always the same. The demand for a product can be elastic or inelastic, depending on the rate of change in the demand with respect to change in price of a product. Elastic demand is the one when the response of demand is greater with a small proportionate change in the price. On the other hand, inelastic demand is the one when there is relatively a less change in the demand with a greater change in the price. For better understanding the concepts of elastic and inelastic demand, the price elasticity of demand has been divided into five types, which are shown in Figures 1.1.11.4, 1.1.11.5 and 1.1.11.6.

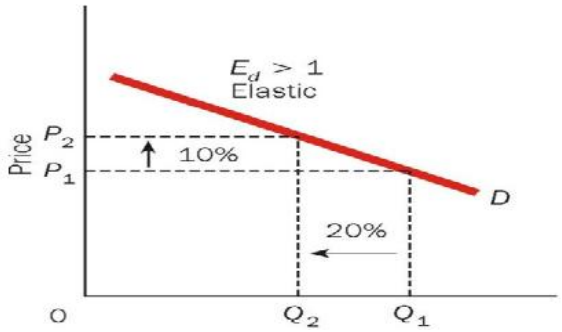


Fig. 1.1.11.4 Elastic

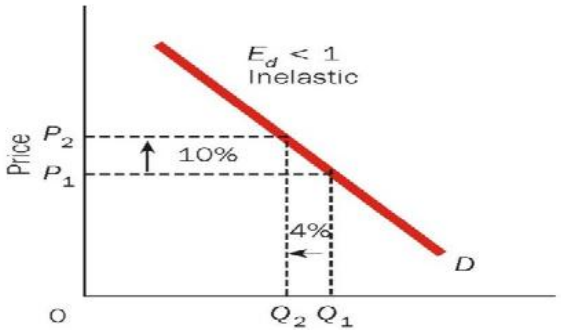


Fig.1.1.11.5 Inelasic

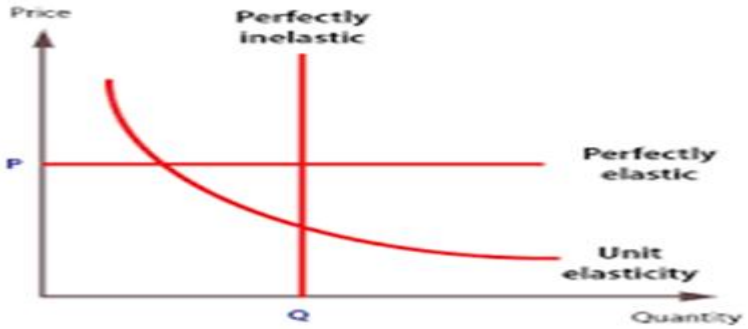


Fig.1.1.11.6

Perfectly elastic, inelastic and unitary elastic

Table- 1.1.11

Types, Nature and Value of Price Elasticity of Demand (e_p)

Types	Nature	Value of e_p	Shape of demand curve
Perfectly Elastic Demand	Given the price, any quantity can be demanded.	$e_p = \infty$	**Horizontal**
Perfectly Inelastic Demand	No change in quantity demanded despite the changes in price.	$e_p = 0$	**Vertical**
Unitary Elastic Demand	The percentage change in demand is equal to the percentage change in the price	$e_p = 1$	**Rectangular hyperbola**
Relatively Elastic Demand	The percentage change in demand is more than the percentage change in the price of a product A small change in price leads to relatively a larger change in quantity demanded and vice-versa	$e_p > 1$	**Flatter**
Relatively Inelastic Demand	The percentage change in demand is less than the percentage change in the price of a product. It means A greater change in price leads to relatively a larger change in quantity demanded and vice-versa	$e_p < 1$	**Steeper**

Relationship between Price elasticity and Revenue

The relationship between Price elasticity and Revenue such as (Marginal Revenue and Total Revenue) has been shown as follows:

Price elasticity (e) and Marginal Revenue (MR): $MR = AR(1 - \frac{1}{e})$

When, $e > 1$, $MR > 0$

$e < 1$, $MR < 0$

$e = 1$, $MR = 0$

Price elasticity (e) and Total Revenue (TR):

Price change	If , e > 1	If , e < 1	If , e = 1
Price rises	TR decreases	TR increases	TR unchanged
Price falls	TR increases	TR decreases	TR unchanged

Determinants of Price Elasticity of Demand

(1) The availability of substitutes; the demand for a commodity is more elastic if there are close substitutes for it.

(2) The nature of the need that the commodity satisfies. In general, luxury goods are price elastic, while necessities are price inelastic.

(3) The time period. Demand is more elastic in the long run.

(4) The number of uses to which a commodity can be put. The more the possible uses of a commodity the greater its price elasticity will be.

(5) The proportion of income spent on the particular commodity.

1.1.12 Income elasticity of demand:

The income elasticity is defined as the proportionate change in the quantity demanded resulting from a proportionate change in income. Symbolically we may write

$$e_y = \frac{\frac{dQ}{Q}}{\frac{dY}{Y}} = \frac{dQ}{dY} \cdot \frac{Y}{Q}$$

The income elasticity is positive for normal goods. Some experts have used income elasticity in order to classify goods into 'luxuries' and 'necessities'. A commodity is considered to be a '**luxury' if its income elasticity is greater than unity.** A commodity is a '**necessity' if its income elasticity is less than unity.**

The main determinants of income elasticity are:

1. The nature of the need that the commodity covers the percentage of income spent on food declines as income increases (this is known as Engel's Law and has sometimes been used as a measure of welfare and of the development stage of an economy).

2. The initial level of income of a country. For example, a TV set is a luxury in an underdeveloped, poor country while it is a 'necessity' in a country with high per capita income.
3. The time period, because consumption patterns adjust with a time-lag to changes in income.

1.1.13 Cross-elasticity of demand:

The cross-elasticity of demand helps in the classification of commodities into substitutes and complements.

The cross-elasticity of demand is defined as the proportionate change in the quantity demanded of x resulting from a proportionate change in the price of y. Symbolically,

$$e_{xy} = \frac{dQ_x}{Q_x} \Big/ \frac{dP_y}{P_y} = \frac{dQ_x}{dP_y} \cdot \frac{P_y}{Q_x}$$

The sign of the cross-elasticity is negative if x and y are complementary goods, and positive if x and y are substitutes. The higher the value of the cross-elasticity the stronger will be the degree of substitutability or complementarity of x and y.

The main determinant of the cross-elasticity is the nature of the commodities relative to their uses. If two commodities can satisfy equally well the same need, the cross- elasticity is high, and vice versa. The cross-elasticity has been used for the definition of the firms which form an in-dustry

1.1.14 Promotional or Advertising Elasticity of Demand

Advertising Elasticity of Demand (AED) measures degree of change in demand brought about by change in advertising expenditure. It means Proportionate change in demand brought about by a unit change in advertising expenditure.

AED can be expressed as AED = (Δ Dx) / (Δ AE) x AE/Dx

Where Dx = Original (initial) Demand for commodity x ΔDx = Change in demand for x AE = Original Advertising Expenditure Δ AE = change in Advertising Expenditure It can also be expressed as AED = (% change in Dx) / (% change in AE)

Numerical Values of Advertising Elasticity of Demand will vary from zero to infinity. It would mean that if AED is zero, advertising expenditure has no effect on demand at all.

Types of AED

Relatively Elastic Demand

If AED > 1, it is relatively elastic demand. It means that demand is more sensitive to the advertising expenditure and proportionately giving more than proportionate increase in demand.

Relatively Inelastic Demand

If AED < 1, it is relatively inelastic demand. It means that change in advertising expenditure brings about less than proportionate change in demand.

Perfectly Inelastic Demand

If AED = 0 it is Perfectly Inelastic demand. It means that increase in advertising expenditure has no effect at all on demand.

Determinants of AED

- Type of product i.e. whether the product is already existing or new product
- Brand name
- Number of competitors and substitutes in the market
- Strategies of competitors
- Frequency of advertisements
- Mode of advertisements
- Time of advertisements
- Other factors influencing demand like tastes, professions, income etc.

Uses of AED

- Helps in evaluating success of adverting campaign
- Helps the firms in deciding advertising expenditure or budget
- Helps in choosing more effective media for promotion
- Helps in withdrawing ineffective promotional campaigns
- Helps in strategic management to respond to competitor's promotional policies
- Helps in building brands

Limitations of AED

- Value of AED does not help in analyzing effect of advertising a single product
- Difficult to analyze the effectiveness of promotional strategies at a particular period of time, especially when the campaigns are over a long period of time
- The Purpose of campaigns may be to create brands, rather than only influencing size of demand
- AED does not take into account effect of other factors influencing demand.

1.1.15 Summary

Total Revenue (TR) is equal to the total quantity sold multiplied by price per unit. Marginal Revenue (MR) is the slope of total revenue. It means MR is an addition to TR by selling an additional unit of output. Average Revenue (AR) is nothing but the price per unit of output. The relationship between revenue and price elasticity reveals that MR=AR[(e-1)/e]. MR is positive for e>1, negative for e<1 , zero for e=1.

The shape of AR (Demand curve) is horizontal for a perfectly competitive firm indicating AR=MR. But in case of Monopoly the AR and MR are downward sloping and MR cuts half way the distance between origin and AR on OX axis. Similarly in Monopolistic competition also the AR and MR are downward sloping. But in case of Oligopoly the AR (Demand curve) is kinked in shape showing elastic in upper and inelastic in lower portion of the kinked demand curve and MR curve is discontinuous.

The demand is affected by many factors. Assuming other factors constant the law of demand establishes an inverse relationship between price and quantity demanded. Hence the slope of demand curve is downward sloping. The parallel shift in demand curve occurs if the assumption of other things remaining constant is relaxed. The law of demand doesnot operate in case of Giffen goods.

The elasticity of demand refers to the percentage change in quantity demanded due to the percentage change in any one of the factors affecting demand. The elasticity of demand mainly classified into Price, Income, Cross and Promotional elasticity of demand.

The Price elasticity of demand of a commodity refers to the ratio of the percentage change in quantity demanded to the percentage change in price of the commodity other things remaining constant. The price elasticity of demand can be measured by point method, Arc method and total outlay method. There are five types of price elasticity of demand such as perfectly elastic ($e= \infty$), perfectly inelastic ($e=0$), unitary elastic ($e= 1$), relatively more elastic or elastic ($e>1$), relatively less elastic or inelastic ($e<1$). The TR and MR vary with the variation in the value of price elasticity of demand.

The Income elasticity of demand of a commodity refers to the ratio of the percentage change in quantity demanded to the percentage change in income things remaining constant. The income elasticity of demand is relatively more elastic or elastic ($e>1$) for luxurious goods whereas it is relatively less elastic or inelastic ($e<1$) for necessary goods.

The cross-elasticity of demand helps in the classification of commodities into substitutes and complements. The cross-elasticity of demand is defined as the proportionate change in the quantity demanded of x resulting from a proportionate change in the price of y. The sign of the cross-elasticity is negative if x and y are complementary goods, and positive if x and y are substitutes. The higher the value of the cross-elasticity the stronger will be the degree of substitutability or complementarity of x and y.

Promotional or Advertising Elasticity of Demand (AED) measures degree of change in demand brought about by change in advertising expenditure. It means Proportionate change in demand brought about by a unit change in advertising expenditure. Numerical Values of Advertising Elasticity of Demand will vary from zero to infinity. It would mean that if AED is zero (perfectly

inelastic), advertising expenditure has no effect on demand at all. If AED > 1 (relatively elastic), demand is more sensitive to the advertising expenditure. If AED < 1(relatively inelastic), demand is less sensitive to the advertising expenditure.

1.1.16 Self Assessment Questions

1. Define TR, MR and AR. Explain the relationship between AR and MR.
2. Define Demand. State the determinants of demand. Discuss the Law of demand with assumptions and exceptions.
3. Define Price elasticity of demand. Discuss its methods of Measurement and Types.
4. What is Price elasticity of demand? Discuss its relationship with TR and MR.
5. Write short notes on
   (a) Income elasticity of demand
   (b) Cross elasticity of demand
   (c) Promotional elasticity of demand

1.2 CHAPTER

THE INDIFFERENCE CURVE ANALYSIS

Objectives

After studying this unit, you should be able to:

- Understand the ordinal utility approach for analyzing the consumer behavior
- Define and draw the Indifference Curve
- Analyze consumer's equilibrium under Indifference Curve (IC) Approach
- Analyze the Substitution effect, Income effect and Price effect of a price change under IC analysis
- Derive the consumer demand curve from the IC approach

Structure

1.2.1 Consumer Behaviour- Introduction

There are broadly three approaches in economics to study the consumer behaviour such as Cardinal utility approach (Marginal Utility approach), Ordinal utility approach (Indifference Curve approach) and Behavioural approach (Revealed Preference approach). Here, the indifference curve approach has been discussed in the context of analyzing consumer's equilibrium.

The indifference curve is a geometrical device developed by J.R.Hicks and R.G.D. Allen for explaining how choices between two alternatives are made based on ordinal utility approach. It may be viewed as a replacement or improvement over the neo-classical cardinal utility approach or concept. In contrast to the cardinal measurement of utility, the indifference curve measures the utility ordinally. It means, unlike cardinal utility approach, based on preference orderings how the consumers are assumed to select commodities in such a way to be remained indifferent in deriving satisfaction from the consumption of any of the available combination of two goods on the same indifference curve is explained by the indifference curve analysis.

1.2.2 Indifference Curve Analysis

An **indifference curve** is a graph showing combination of two goods that give the consumer equal satisfaction and utility. Each point on an **indifference curve** indicates that a consumer is **indifferent** between the two and all points give him the same utility.

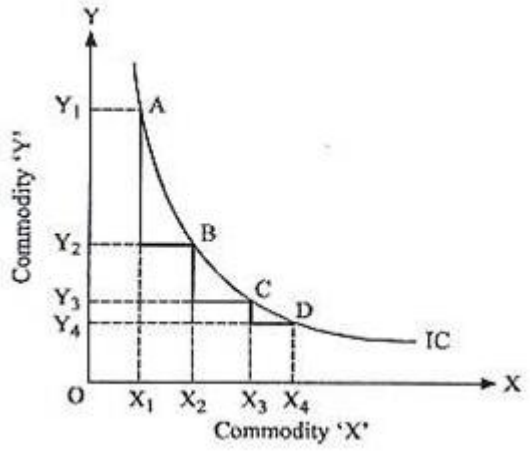


Fig. 1.2.2 Indifference Curve (IC)

Marginal Rate of Substitution

The marginal rate of substitution is the amount of a good that a consumer is willing to give up for another good, as long as the new good is equally satisfying. It's used in indifference theory to analyze consumer behaviour. The slope of the indifference curve is called the MRS which is the ratio of the marginal utilities of the two commodities. This is expressed as $\mathbf{MRS}_{x,y} = -\Delta X / \Delta Y = MU_x/MU_y$. The Law of Diminishing Marginal Rates of Substitution states that MRS decreases as one moves down the standard convex-shaped curve, which is the indifference curve.

1.2.3 Important Properties of Indifference Curve:

Property I. Indifference curves slope downward to the right

The indifference curves must slope downward from left to right. As the consumer increases the consumption of X commodity, he has to give up certain units of Y commodity in order to maintain the same level of satisfaction. In the following Figure 1.2.3.1, various combinations of commodity X and commodity Y is shown by the points A, B, C and D on the same indifference curve. Thus, the consumer is indifferent towards any of the points as they represent equal level of satisfaction.

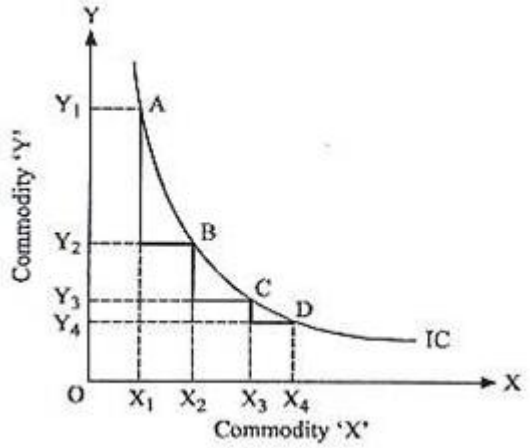


Fig. 1.2.3.1

Property II: Indifference curves are convex to the origin (diminishing MRS_{xy})

This is an important property of indifference curves. They are convex to the origin. As the consumer substitutes commodity X for commodity Y, the marginal rate of substitution of X for Y (Slope of IC) diminishes along an indifference curve. In other words, Indifference curves are convex to the origin because the marginal utility of each product consumed decreases with subsequent consumption. The reason that marginal rate of substitution diminishes is due to the principle of diminishing marginal utility. The indifference curve could not be concave, as this would mean that the marginal rate of substitution increases (which is not possible as the

consumer gives up one good for another and hence it violets the fundamental feature of consumer behaviour).

In the following Figure 1.2.3.2, as the consumer moves from A to B to C to D, the willingness to substitute good X for good Y diminishes. The slope of IC is negative. In this diagram, diminishing MRSxy is depicted as the consumer is giving up AP>BQ>CR units of Y for PB=QC=RD units of X. Thus indifference curve is steeper towards the Y axis and gradual towards the X axis. It is convex to the origin.

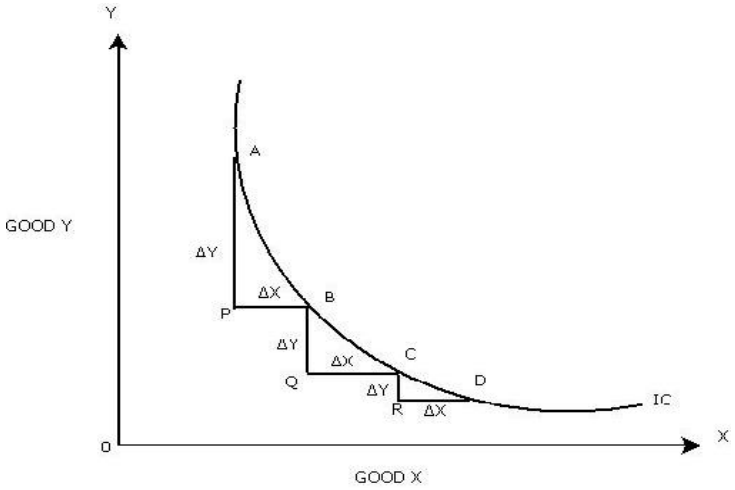


Fig. 1.2.3.2

Property III: A higher indifference curve represents a higher level of satisfaction than a lower indifference curve

Indifference curve that lies above and to the right of another indifference curve represents a higher level of satisfaction. The combination of goods which lies on a higher indifference curve will be preferred by a consumer to the combination which lies on a lower indifference curve.

In the following Figure 1.2.3.3, there are three indifference curves, IC1, IC2 and IC3 which represents different levels of satisfaction. The indifference curve IC3 shows greater amount of satisfaction and it contains more of both goods than IC2 and IC1.In short it can be interpreted as IC3 > IC2> IC1.

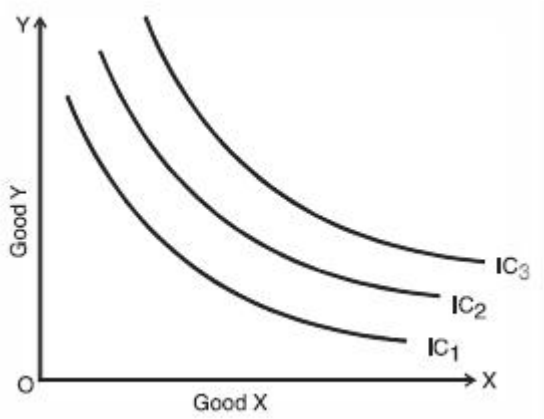


Fig.1.2.3.3

Property IV: Indifference curves cannot intersect each other

The indifference curves cannot intersect each other. It is because at the point of tangency, the higher curve will give as much as of the two commodities as is given by the lower indifference curve. This is absurd and impossible.

In the following Figure 1.2.3.4, it is shown that two indifference curves (IC_1 and IC_2) intersect at point C. By definition of IC, C = A and C= B but by property III (as above) A > B. So it is obvious that under no circumstances A = B. Thus, due to this inconsistency in consumer behavior which violets the fundamental feature of IC, two indifference curves cannot intersect to each other.

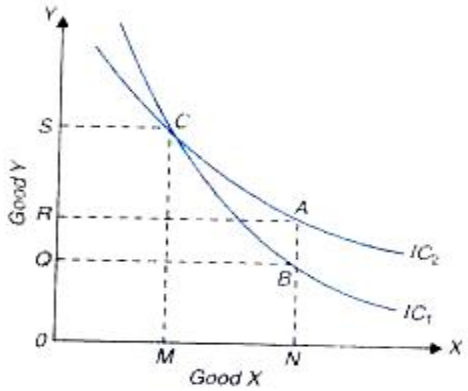


Fig. 1.2.3.4

Property V: Indifference curves cannot be circular in shape

Indifference curve cannot e circular as because it violets the property II (i.e. Convexity condition as given above). In the circle as shown in the following figure both the convex and concave portions are present which violets the fundamental principles of IC.

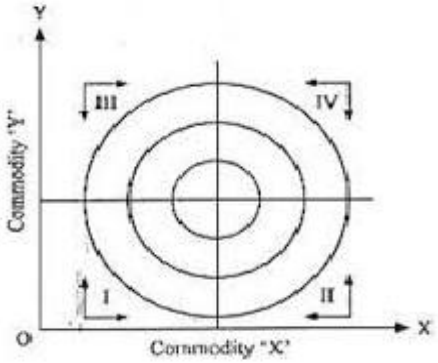


Fig. 1.2.3.5

Indifference Curves of Perfect Substitutes and Perfect Complements:

The degree of convexity of an indifference curve depends upon the rate of fall in the marginal rate of substitution of X for Y. But when two goods are perfect substitutes of each other, the indifference curve is a straight line on which marginal rate of substitution remains constant. Straight-line indifference curves of perfect substitutes are shown in Fig. 1.2.3 (a) below. In case of perfect substitutes, the indifference curves are parallel straight lines because the consumer equally prefers the two goods and is willing to exchange one good for the other at a constant rate.

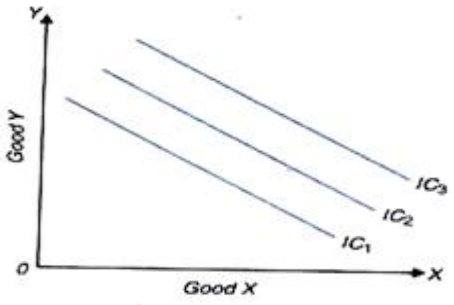


Fig. 1.2.3 (a) Indifference curves of Perfect Substitutes

Similarly, when two goods cannot at all be substituted for each other, that is, when the two goods are perfect complementary goods, the indifference curve will consist of two straight lines with a right angle bent which is convex to the origin as shown in the following figure 1.2.3 (b). As will

be seen in Fig. the left- hand portion of an indifference curve of the perfect complementary goods is a vertical straight line which indicates that an infinite amount of Y is necessary to substitute one unit of X and the right-hand portion of the indifference curve is a horizontal straight line which means' that an infinite amount of X is necessary to substitute one unit of Y. All this means that the two perfect complements are used in a certain fixed ratio and cannot be substituted for each other. Complements are thus those goods which are used jointly in consumption so that their consumption increases or decreases simultaneously. Pen and ink, right shoe and left shoe, automobile and petrol sauce and hamburger, type writer and typists are some examples of perfect complements.

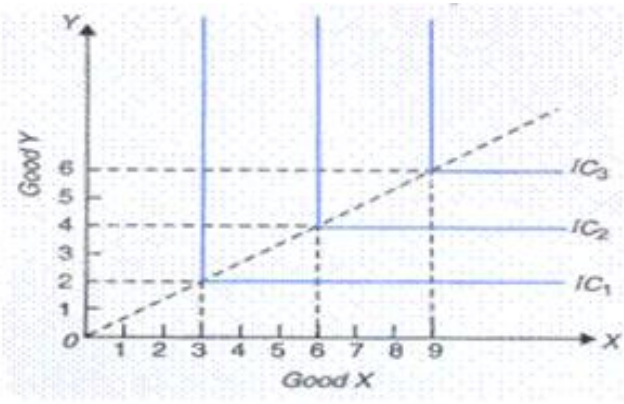


Fig. 1.2.3 (a) Indifference curves of Perfect Complements

1.2.4 The Budget (Price) Line:

A budget line incorporates information on both the limited income of the consumer to spend and the prices of two purchasable goods. A budget line is a locus of points showing alternative combinations of two goods that can be purchased with a fixed amount of money income given prices of the two goods.

If we know the budget (or the spending power) of the consumer and his Indifference Map we can find out what quantity of each commodity he will purchase. With the same information we can measure the effect of changes in the prices of commodities and of changes in the income of the consumer.

Suppose a consumer has a fixed income M which he spends on two goods X and Y. Suppose P_x is the price of X and P_y is the price of Y. Let OB be the amount of Y which can be purchased

if the whole of the consumer's income (M) is spent on Y. Then OB x Py = M. Or OB = M/Py. Similarly, let OL be the amount of X which can be purchased with M. Then OL x p_x = M. Join B and L. BL is called the Price Line or the Budget Line or the Consumption-Possibility Line (See Fig.1.2.4). The line BL has important characteristics. Every point on it shows a possible distribution of the consumer's income (M) between X and Y. **The slope of the line is:** OB / OL = M/py / M/px = M/py. py/xy = **px/py.**

This is known as the price ratio. The equation of the budget line is M = Px. X + Py. Y.

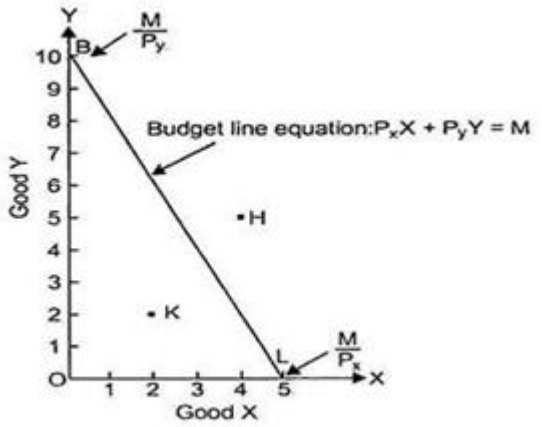


Fig. 1.2.4 Budget Line

Shift in budget line due to change in Price and Income*:*

A budget line is derived from a given income and given prices. So any change in income or price leads to a new budget line. If the price of one of the purchasable commodities falls there is a change in the slope of the budget line. Given the income and price of good Y, when the price of good X decreases the original price line BL shifts to the right i.e. BL' and when the price of good X increases the original price line BL shifts to the left i.e. BL'' as shown in figure 1.2.4.1. The similar pattern is observed for the price of good Y given the income and price of good X as shown figure 1.2.4.2. A higher income leads to parallel shifts of the budget line outward (without changing its slope) i.e. BL shifts to the right i.e. BL' and a lower income leads to parallel shifts the budget line inward (without changing its slope) i.e. BL shifts to the right i.e. BL'' as shown in Figure 1.2.4.3

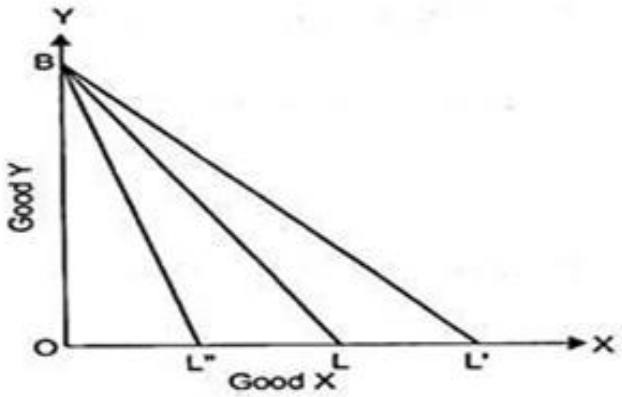


Fig. 1.2.4.1 Changes in Budget Line as a Result of Changes in Price of Good X

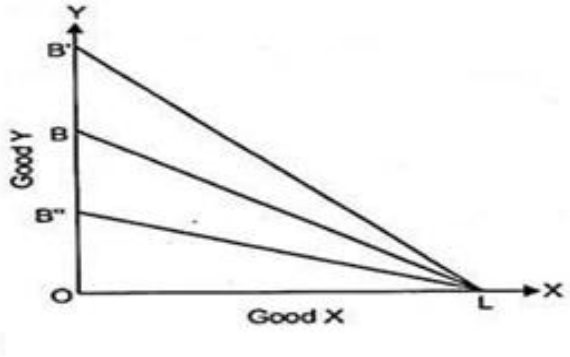


Fig. 1.2.4.1 Changes in Budget Line as a Result of Changes in Price of Good Y

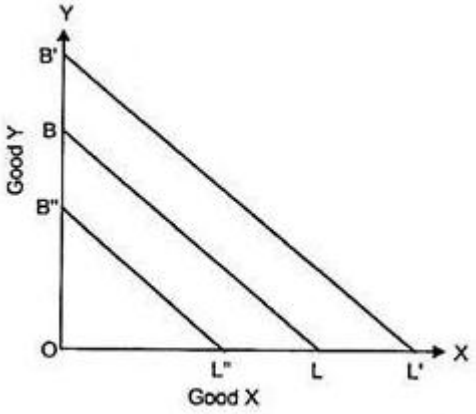


Fig. 1.2.4.1 Shifts in Budget Line as a Result of Changes in Income

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1.2.5 Consumer's Equilibrium through Indifference Curve (IC) Analysis:

Definition:

"The term **consumer's equilibrium** refers to the amount of goods and services which the consumer may buy in the market given his income and given prices of goods in the market". The aim of the consumer is to get maximum satisfaction from his money income. Given the price line or budget line and the indifference map, "A consumer is said to be in equilibrium at a point where the price line is touching the highest attainable indifference curve from below".

Assumptions:

The following assumptions are made to determine the consumer's equilibrium position.

(i) Rationality: The consumer is rational. He wants to obtain maximum satisfaction given his income and prices.

(ii) Utility is ordinal: It is assumed that the consumer can rank his preference according to the satisfaction of each combination of goods.

(iii) Transitivity: The consumer is supposed to be consistent about his tastes and preference. For example if he prefers A to B and B to C then it follows that he also prefers A to C. This assumption is called Transitivity.

(iv) Diminishing Marginal Substitutability: Suppose a consumer buys orange and apple. It can be assumed that as more and more of units of apple are substituted for orange, the consumer will be willing to give up fewer and fewer units of orange for additional units of apple. This is called the Principle of Diminishing Marginal Substitutability. The Principle of Diminishing Marginal Substitutability corresponds to the older law of diminishing marginal utility.

(v) Perfect competition: There is perfect competition in the market from where the consumer is purchasing the goods.

Conditions of consumer's equilibrium under IC analysis

Thus the consumer's equilibrium under the IC analysis must meet the following two conditions:

1. **Necessary Condition or First order condition:** A given price line should be tangent to an indifference curve. It means marginal rate of substitution of good X for good Y

(MRS_{xy}) must be equal to the price ratio of the two goods. i.e. $\mathbf{MRS_{xy} = P_x / P_y = MU_x/MU_y}$.

2. **Sufficient Condition or Second order condition:** The second order condition is that indifference curve must be convex to the origin (diminishing $\mathbf{MRS_{xy}}$) at the point of tangency.

Explanation:

The consumer's equilibrium position is only at a point where the price line is tangent to the highest attainable indifference curve from below. In the following figure 1.2.5, there are three indifference curves IC_1, IC_2 and IC_3. The price line BA is tangent to the indifference curve IC_2 at point C. The consumer gets the maximum satisfaction or is in equilibrium at point E by purchasing ON units of good Y and OM units of good X with the given money income.

The consumer cannot be in equilibrium at any other point on indifference curves. For instance, point F and G lie on lower indifference curve IC_1 and hence yield less satisfaction. As regards point H on indifference curve IC_3, the consumer no doubt gets higher satisfaction but that is outside the budget line and hence not achievable to the consumer. The consumer's equilibrium position is only at point E where the price line is tangent to the highest attainable indifference curve IC_2 from below.

Further, At point E the two conditions of equilibrium gets satisfied viz. (1) Slope of the Price Line to be Equal to the Slope of Indifference Curve i.e. $\mathbf{MRS_{xy} = P_x / P_y}$ **and (2)** Indifference Curve is Convex to the Origin (MRS of X for Y must be diminishing) at the point of equilibrium.

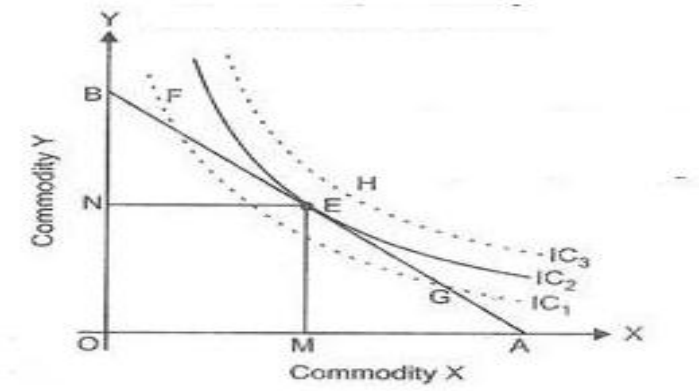

Fig. 1.2.5 Consumer's Equilibrium under IC Analysis

1.2.6 Price elasticity and price consumption curve

In indifference curve technique the price effect is measured along the Price Consumption Curve (PCC). The PCC is the equilibrium points corresponding to the changing slope of price line due to changes in the relative prices of the two goods, the consumer's money income and other things remaining constant. PCC can be downward or upward or horizontal sloping in case of normal goods but backward-sloping for giffen goods.

Let us observe how the price elasticity of demand can be known from different shapes or slopes Price Consumption curve (PCC). In other words, whether price elasticity of demand is more than one (elastic), less than one (inelastic) or equal to one (unitary elastic) can be judged from the slope of price consumption curve (PCC). The downward sloping price consumption curve (PCC) for a good means that demand for the good is elastic, upward-sloping PCC means that demand for the good is inelastic and horizontal straight-line PCC means that demand for the good is unitary elastic.

Downward Sloping PCC (Demand: Elastic)

It can be seen from the following figure 1.2.6.1 that PCC is derived by joining the points Q, R, S and T where each of the points represents equilibrium points on different slopes of budget lines due to the decrease in price of good X other things remaining unchanged. The PCC derived in this figure is downward sloping. It indicates that **when price of good X is decreasing** remaining the price of Y and money income unchanged as indicated by the shift in budget line from L_1 to L_2 to L_3 to L_4, the consumer is **demanding proportionately higher quantity of good X** and small quantity of good Y as shown in this figure. It is evident from it that the price elasticity of demand for Good X is elastic and hence the PCC derived for good X in this case is downward sloping.

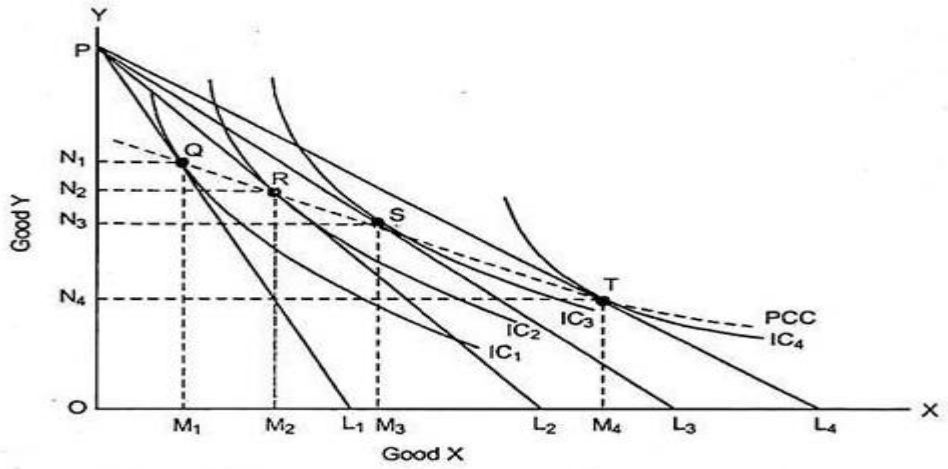

Fig. 1.2.6.1 Downward Sloping PCC showing Elastic Demand

Upward Sloping PCC (Demand: Inelastic)

It can be seen from the following figure 1.2.6.2 that PCC is derived by joining the points Q, R, S and T where each of the points represents equilibrium points on different slopes of budget lines due to the decrease in price of good X other things remaining unchanged. The PCC derived in this figure is upward sloping. It indicates that **when price of good X is decreasing** remaining the price of Y and money income unchanged as indicated by the shift in budget line from L_1 to L_2 to L_3 to L_4, the consumer is demanding more of both good X and good Y but the **proportionate increase in demand for good X is less**. It is evident from it that the price elasticity of demand for Good X is inelastic and hence the PCC derived for good X in this case is upward sloping.

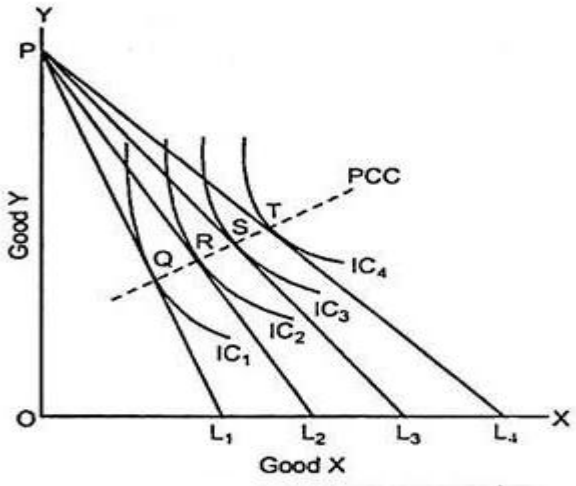

Fig. 1.2.6.2 Upward Sloping PCC showing Inelastic Demand

Horizontal PCC (Demand: Unitary elastic)

It can be seen from the following figure 1.2.6.3 that PCC is derived by joining the points Q, R, and S where each of the points represents equilibrium points on different slopes of budget lines due to the decrease in price of good X other things remaining unchanged. The PCC derived in this figure is Horizontal. It indicates that **when price of good X is decreasing** remaining the price of Y and money income unchanged as indicated by the shift in budget line from L_1 to L_2 to L_3 to L_4, the consumer is **demanding more of good X remaining the demand for good Y same**. It is evident from it that the price elasticity of demand for Good X is unitary elastic and hence the PCC derived for good X in this case is Horizontal.

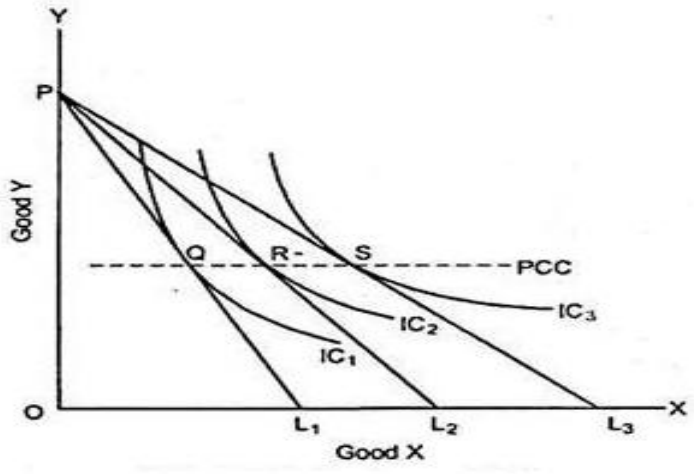

Fig. 1.2.6.3 Horizontal PCC showing unitary elastic Demand

PCC with Varying Elasticity of Demand

In the above analysis the PCC drawn shows either only elastic demand or only inelastic or unitary elastic demand over its entire range. However, since elasticity of demand varies at different prices, an indifference map can also be drawn that yields PCC which shows different elasticities at different price levels. It is depicted in figure 1.2.6.4 where it can be seen that from Q_1 to Q_2 PCC is downward sloping and hence the demand for the good is elastic (i.e. $e > 1$).

From Q_2 to Q_3 PCC is horizontal and hence the demand for the good is unitary elastic (i.e. e = 1).
From Q_3 to Q_4 PCC is upward sloping and hence the demand for the good is inelastic (i.e. e < 1).

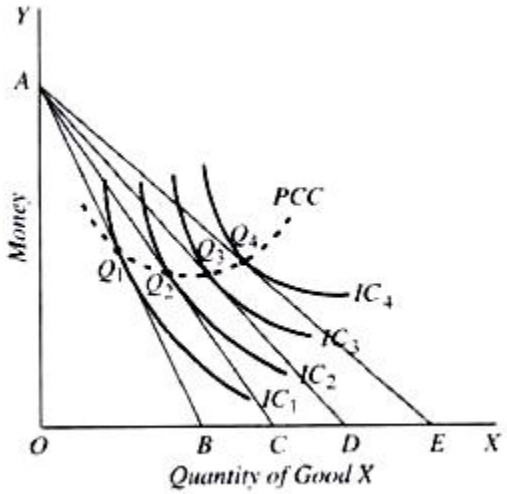

Fig. 1.2.6.4 PCC Varying Elasticity of Demand

Backward Sloping PCC

PCC can also be backward sloping as depicted in figure 1.2.6.5. Backward Sloping PCC for good X indicates that when price of good X falls, after a point smaller quantity of it is demanded or purchased. It happens in the case exceptional type of goods called Giffen Goods. Thus the price effect of a price change in case of Giffen goods is positive.

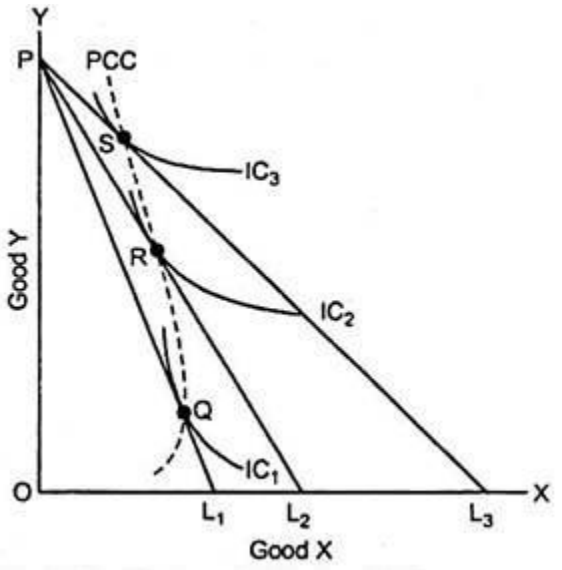

Fig. 1.2.6.5 Backward Sloping PCC

1.2.7 Income Consumption Curve (ICC)

Income effect refers to the change in consumer's purchases of the goods as a result of a change in his money income which is reflected by the Income Consumption Curve (ICC). The various points (E, E_1 & E_2) showing consumer's equilibrium at various level of income is connected together to get the ICC as shown in figure 1.2.7. The parallel shift in budget line from original budget line MN to M1N1 and M2N2 indicates change in income and the point of tangency of IC1, IC2 and IC3 on the respective budget lines represents equilibrium point as shown in the following figure 1.2.7. The ICC derived in this figure is for Normal goods.

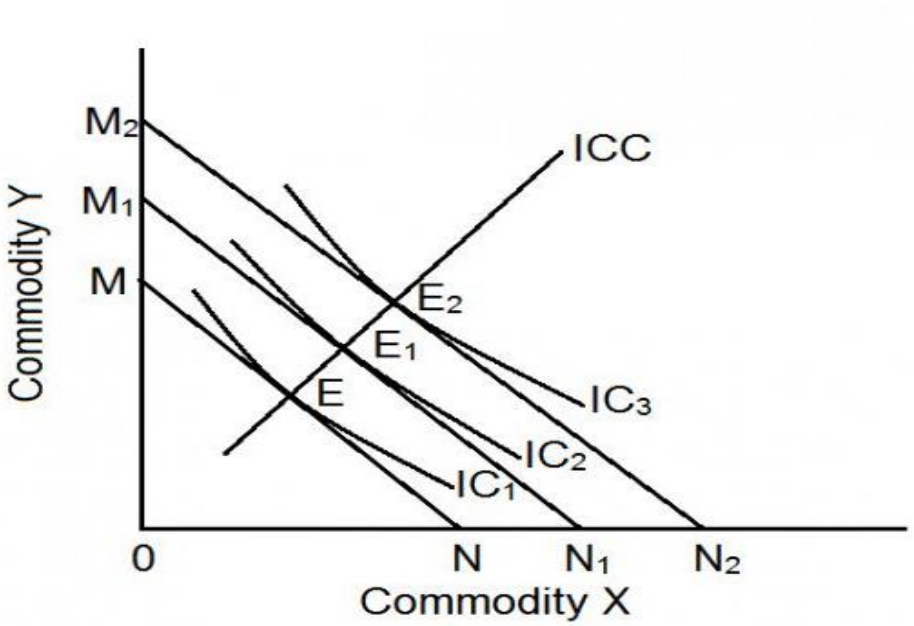

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Fig. 1.2.7 ICC for Normal goods

ICC for Inferior and other goods

The shapes of ICC based on the nature of the commodity such as inferior and others are depicted in figure 1.2.7 (a) as given below

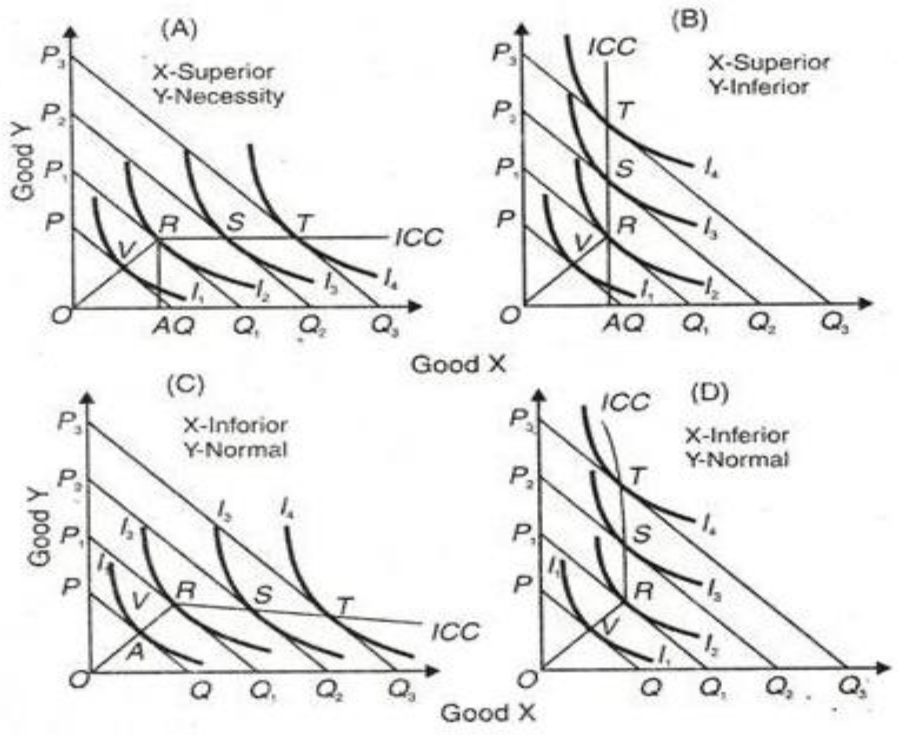

Fig. 1.2.7 (a) ICC for Inferior and other goods

Income Consumption Curve and Engel Curve

In indifference curve map income consumption curve is the locus of the equilibrium quantities consumed by an individual at different levels of his income. Thus, the income consumption curve (ICC) can be used to derive the relationship between the level of consumer's income and the quantity purchased of a commodity by him.

A nineteenth century German statistician Ernet Engel (1821-1896) made an empirical study of family budgets to draw conclusions about the pattern of consumption expenditure, that is, expenditure on different goods and services by the households at different levels of income. The conclusions he arrived at are still believed to be generally valid.

According to Engel's studies, as the income of a family increases, the proportion of its income spent on necessities such as food falls and that spent on luxuries (consisting of industrial goods and services) increases. In other words, the poor families spend relatively large proportion of their income on necessities, whereas rich families spend a relatively a

large part of their income on luxuries. This change in the pattern of consumption expenditure (that is, decline in the proportion of income spent on food and other necessities and increase in the proportion of income spent on luxuries) with the rise in income of the families has been called Engel's law.

Though Engel dealt with the relationship between income and expenditure on different goods, in order to keep the analysis simple it can be explained as the relationship between income and quantities purchased of goods. Thus, **the curve showing the relationship between the levels of income and quantity purchased of particular commodities can be called as Engel curve**. Based on this the derivation of Engel curve from income consumption curve can be made. In other words, here Engel curve relates quantity purchased of a commodity to the level of consumer's income. Thus, Engel curve shows relationship between income and quantity demanded, other factors (such as prices of goods, consumer preferences etc.) remaining the same.

Derivation of Engle Curve from ICC for Normal goods (in case of Necessities)

The Engel Curve (EC) from Income Consumption Curve (ICC) for necessary goods has been derived as shown in the following figure 1.2.7.1. The panel (b) of the figure depicts EC where the level of income and quantity purchased of commodity X are represented by Y-axis and X-axis are respectively. Given the indifference map (IC_1, IC_2 and IC_3) and the prices of two goods X and Y, Income Consumption Curve (ICC) is showing the equilibrium quantities purchased of commodities by the consumer as his income increases (shown by the parallel shift in budget lines) from Rs. 300 (B_1L_1)to Rs. 400 (B_2L_2)and to Rs. 500 (B_3L_3)as depicted in panel (a) of the figure. It is observed from panel (a) of the figure that R, S and T are representing the equilibrium points where IC is tangential to Budget line and hence the consumer is found buying more of commodity X (OQ_1, OQ_2 and OQ_3) when income increases from Rs. 300 to 400 to 500, given prices of goods X and Y.

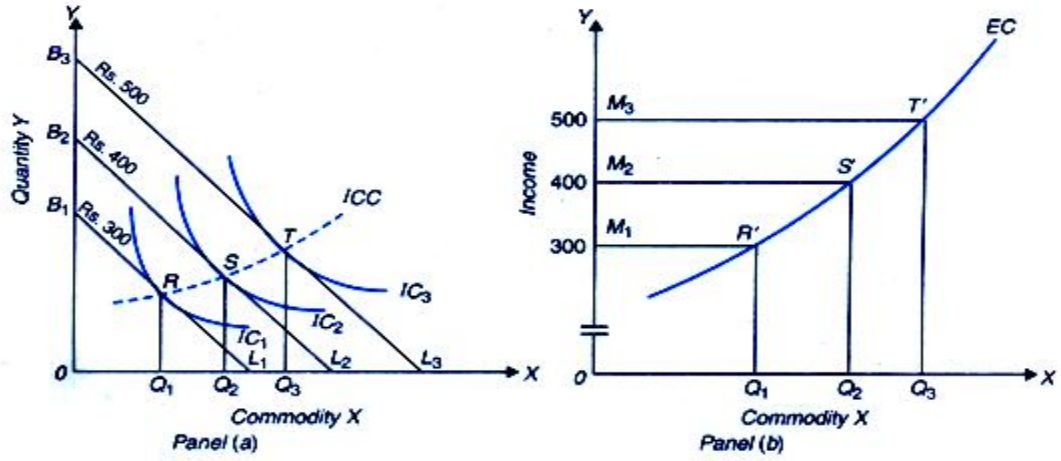

Fig. 1.2.7.1 Derivation of EC from ICC

Thus equilibrium points constituting the income consumption curve in consumer's indifference map have been transformed into Engel curve depicting quantity-income relationship. Each point of an Engel curve corresponds to a relevant point of income consumption curve. Thus R' of the Engel curve EC corresponds to point R on the ICC curve and so on. As seen from panel (b), Engel curve for normal goods is upward-sloping which shows that as income increases, consumer buys more of a commodity.

The slope of Engel curve EC drawn in panel (b) of the Figure is equal to the ratio of change in income to change in quantity demanded of good X and has a positive sign. It shows that the slope of the Engel curve is found increasing as income increases. This indicates that with every equal increase in income (i.e. 300 to 400 to 500), **expansion in quantity purchased of the good successively declines (i.e. $OQ_1 > OQ_2 > OQ_3$). This upward-sloping Engel curve with increasing slope as income rises depicts the case of necessities, consumption of which increases relatively less as income rises.** Thus, in Engel curve drawn in panel (b) of the Figure quantity purchased of the commodity increases with the increase in income but at a decreasing rate. This shape of the Engel curve is obtained for necessities.

Derivation of Engle Curve for Normal goods (in case of Luxury goods)

The Engel curve drawn in the following Figure is upward-sloping but is concave. This implies that slope of the Engel curve is declining with the increase in income. In other words, in the

Engel curve of a commodity, the equal increments in income result in successively larger increases in the quantity purchased of the commodity. Thus, at income of Rs. 300 the consumer purchases OQ_1 quantity of a commodity. The increase in income by Rs. 100 to Rs. 400 results in increase in quantity purchased of the commodity equal to Q_1Q_2. With the further increase in income by the same amount of Rs. 100 to Rs. 500, the quantity purchased increases by Q_2Q_3 which is much larger than Q_1Q_2. This implies that as a consumer becomes richer he purchases relatively more of the commodity. Such commodities are called luxuries.

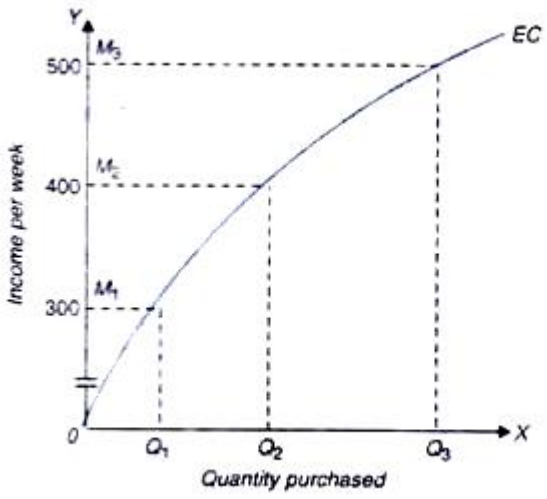

Fig. 1.2.7.1(a) Derivation of EC from ICC for Luxury goods

Derivation of Engle Curve in case of Inferior goods

In case of inferior goods, consumption of the commodity declines as income increases. Engel curve of an inferior good as drawn in the following Figure 1.2.7.2 is backward bending indicating a fall in the quantity purchased of the good as income increases.

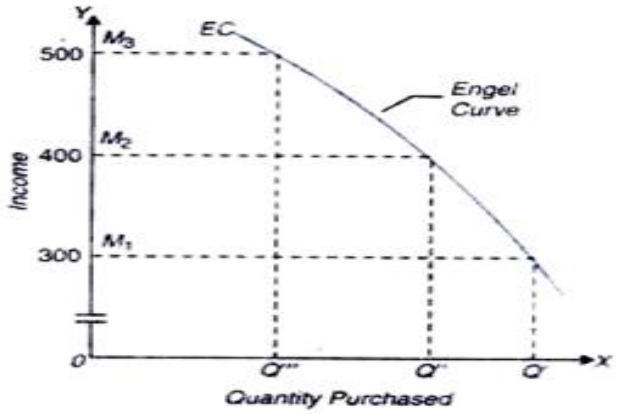

Fig. 1.2.7.2 Derivation of EC from ICC for Inferior goods

Derivation of Engle Curve in case of commodity unresponsive to the increase in income

An extreme case of Engel curve is a vertical straight line as drawn in the following Figure. This represents the case of a neutral commodity which is quite unresponsive to the increase in income. The Engel curve of the shape of a vertical straight line shows that a person goes on consuming the same amount of a commodity whatever the level of his income. For example, the quantity of common salt purchased by a family remains the same, determined as it is by food habits, with the increase in their income.

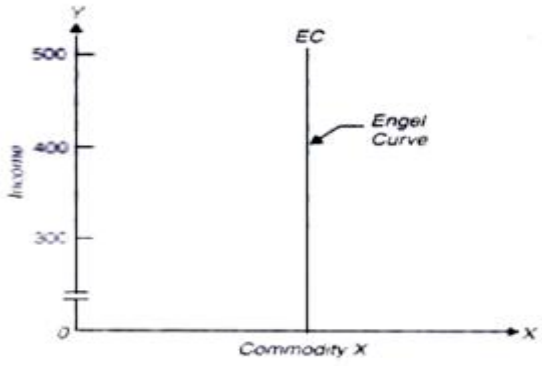

Fig. 1.2.7.3 Derivation of EC from ICC for neutral goods

1.2.8 Price change: Income and Substitution Effects.

Economists often separate the impact of a price change into two Components such as the substitution effect and income effect. The substitution effect involves the substitution of good X good Y or vice versa due to a change in relative prices of the two goods. The income effect results from an increase or decrease in the consumer's real income or purchasing power as a result of the price change. The sum of these two effects is called the price effect.

The consumer's reaction to a change in the price of a commodity (other things remaining constant) is called the price effect. In indifference curve technique the price effect is measured along the Price Consumption Curve (PCC). The PCC is the equilibrium points corresponding to the changing slope of price line due to changes in the relative prices of the two goods, the consumer's money income remaining constant. **The Price effect of a Price change is Negative in case of Normal goods.**

Income effect refers to the change in consumer's purchases of the goods as a result of a change in his money income which is reflected by the Income Consumption Curve (ICC). Thus, the income effect (money income) on the consumer's purchases of the goods is positive for normal goods. But the **income effect of a price change** (i.e. effect of real income) on the consumer's purchases of a good **is negative for normal goods.**

Substitution Effect (SE): By definition, Substitution Effect means the change in the quantity demanded of a commodity resulting from a change in its price relative to the prices of other goods, the consumer's real income or satisfaction level being constant. **The Substitution Effect of a price change is always negative.**

Breaking-up of Price effect into Substitution and Income Effects:

The Price Effect (PE) or Effect of a price change is the sum of the Substitution Effect (SE) and Income Effect (IE) of a price change i.e. PE= SE + IE = (-) ve for normal goods (where SE outweigh IE of a price change in case of normal goods) can be discussed with the help of two approaches such as Hicksian Compensating Variation Method and Slutsky's Cost difference Method as shown below.

Hicksian Compensating Variation Method (for normal goods):

The Price Effect (PE) or Effect of a price change decomposed into the Substitution Effect (SE) and Income Effect (IE) of a price change can be derived through Hicksian Compensating Variation Method as shown in Figure 1.2.8 given below.

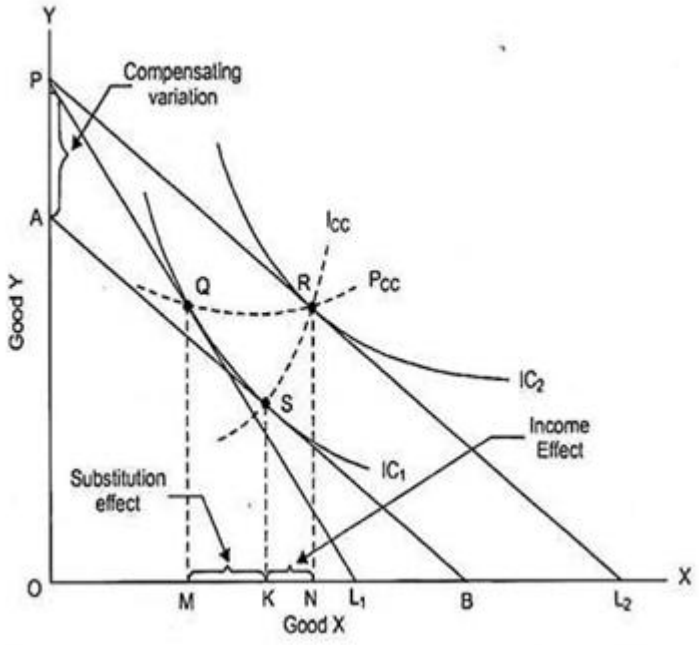

Fig. 1.2.8 Price Effect Split up into Substitution and Income Effects through Compensating Variation Method (for Normal good)

In this method of compensating variation (J.R.Hicks), the income of the consumer is adjusted so as to offset the change in satisfaction and bring back the consumer to his original indifference curve i.e. the initial level of satisfaction which he was obtaining before the change in price occurred. This process is otherwise reflected by splitting up of price effect into substitution and income effect of a price change as shown in the figure 1.2.8.

It can be seen from the figure 1.2.8 that a fall in the price of good X resulted in an increase in quantity demanded from M to N. This is the total price effect (i.e. Price effect is negative) which can be split into two separate effects such as substitution and income effects. The substitution effect is the increase in the quantity bought as the price of a commodity falls, after adjusting income so as to keep the real purchasing power of the consumer the same as before. This adjustment in income is called Compensating Variation and is shown graphically by a parallel

shift of the new budget line (i.e. compensated Budget line AB as shown in figure 1.2.8) until it becomes tangent to the initial Indifference Curve (i.e. IC_1). The budget line AB is tangential to IC_1 at point S which is at the right side of the original tangential point Q as depicted in figure1.2.8. The movement from point Q to S shows the Substitution Effect of the price change implying the fact that the consumer will buy more of good X (X being cheaper due to fall in its price) now by substituting Y for X. However, the compensating variation is a device which enables the isolation of substitution effect, but does not show the new equilibrium of the consumer. This is defined by point R on higher Indifference curve i.e. IC_2. The consumer has in fact a higher purchasing power, and if the commodity is normal, he will spend some moré of his increased real income on good X, thus moving from K to N (as shown in figure 1.2.8).The movement from K to N of point S to R is called as income effect of a price change. The income effect of a price change is negative for normal goods and it reinforces the negative substitution effect. So the total price effect is negative in the case of normal goods.

Decomposing Price Effect: Equivalent Variation in Income (for normal goods): (An Alternative Method)

The price effect can be split up into substitution and income effects through an alternative method of equivalent variation in income. The reduction in price of a commodity increases consumer's satisfaction as it enables him to reach a higher indifference curve. Now, the same increase in satisfaction can be achieved through bringing about an increase in his income, prices remaining constant.

The increase in income of the consumer, prices of goods remaining the same, enables him to move to a higher subsequent indifference curve at which he in fact reaches with reduction in price of a good is called equivalent variation in income because it represents the variation in income that is equivalent in terms of gain in satisfaction to a reduction in price of the good.

Thus, in this equivalent income-variation method substitution effect is shown along the subsequent indifference curve rather than the original one.

How this price effect is decomposed into income and substitution effects through equivalent variation in income is shown in Fig. 1.2.8 (a).

When price of good X falls, the consumer can purchase more of both the goods, that is, the purchasing power of his given money income rises. It means that after the fall in price of X if the consumer buys the same quantities of goods as before, then some amount of money will be left over. In other words, the fall in price of good X will release some amount of money. Money thus released can be spent on purchasing more of both the goods.

It therefore follows that a change in price of the good produces an income effect. When the power to purchase goods rises due to the income effect of the price change, the consumer has to decide how this increase in his purchasing power is to be spread over the two goods he is buying. How he will spread the released purchasing power over the two goods depends upon the nature of his income consumption curve which in turn is determined by his preferences about the two goods.

From above it follows, that, as a result of the increase in his purchasing power (or real income) due to the fall in price, the consumer will move to a higher indifference curve and will become better off than before. It is as if price had remained the same but his money income was increased. In other words, a fall in price of good X does to the consumer what an equivalent rise in money income would have done to him.

As a result of fall in price of X, the consumer can therefore be imagined as moving up to a higher indifference curve along the income consumption curve as if his money income had been increased, prices of X and Y remaining unchanged. Thus, a given change in price can be thought of as an equivalent to an appropriate change in income.

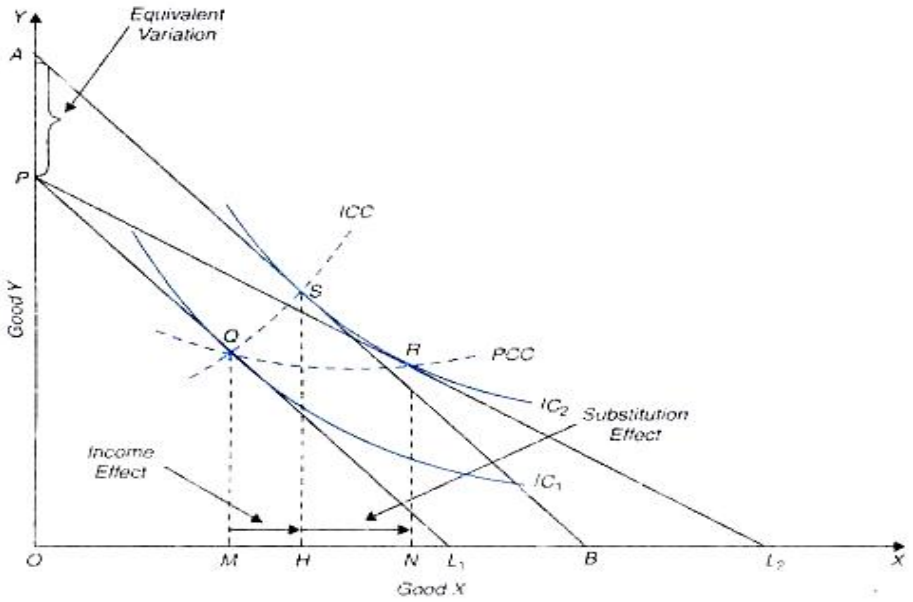

Fig. 1.2.8 (a) Price effect split into Income and Substitution effects through an Equivalent Variation in Income Method

It will be seen from Fig. 8.44 that with price line PL_1, the consumer is in equilibrium at Q on indifference curve IC_1. Suppose price of good X falls, price of Y and his money income remaining unaltered, so that budget line is now PL_2. With budget line PL_2, he is in equilibrium at R on indifference curve IC_2. Now, a line AB is drawn parallel to PL_1 so that it touches the indifference curve IC_2 at S.

It means that the increase in real income or purchasing power of the consumer as a result of the fall in price of X is equal to PA in terms of Y or L_1B in terms of X Movement of the consumer from Q on indifference curve IC_1 to S on the higher indifference curve IC_2 along the income consumption curve is the result of income effect of the price change. But the consumer will not be finally in equilibrium at S.

This is because now that X is relatively cheaper than Y, he will substitute X, which has become relatively cheaper, for good Y, which has become relatively dearer. It will be gainful for the consumer to do so. Thus the consumer will move along the indifference curve IC_2 from S to R. This movement from S to R has taken place because of the change in relative prices alone and therefore represents substitution effect. Thus the price effect can be broken up into income and substitution effects, showing in this case substitution along the subsequent indifference curve. In Fig 1.2.8 (a) the magnitudes of the various effects are:

Price effect (Q to R) = MN

Income effect (Q to S) = MH

Substitution effect (S to R) = HN

So, Price effect = MH + HN = Income Effect + Substitution Effect

The Slutsky's Method (Cost Difference Method) for normal goods

Slutsky's version of substitution and income effects are slightly different from that of the Hicksian one. The Slutsky's method of splitting up price effect into substitution and income effect of a price change is shown in the figure 1.2.8.1. Given the price and income initially the consumer is in equilibrium at point Q **(**tangential point of PL_1 and IC_1). With a fall in price of good X the price line shift to PL_2 from the same origin and hence the consumer achieves the equilibrium at point R on IC_3. The movement from **Q to R** represents Price Effect. Now, in order to find out the substitution effect the money income of the consumer be reduced by such an amount that he could buy, if so desires, the old combination Q. Thus a line AB which is parallel to line PL_2 has been so drawn that it passes through point Q. Now, the consumer can have at Q if he so desires, but actually he will not buy the combination at Q because good X is now relatively cheaper than before. It will pay him to substitute X for Y and hence he will be in equilibrium at point S on IC_2. The movement from **Q** to **S** represents Slutsky's Substitution Effect. Now, if the money income taken away from the consumer is restored, he will move from S on IC_2 to R on IC_3. The movement from **S** to **R** represents Slutsky's Income Effect. Thus the movement from **Q to R** representing Price Effect can be broken up into **Q** to **S** representing Substitution Effect and **S** to **R** representing Income Effect. It may be noted here that unlike Hicksian method, Slutsky's Substitution effect causes movement from a lower indifference curve to a higher one.

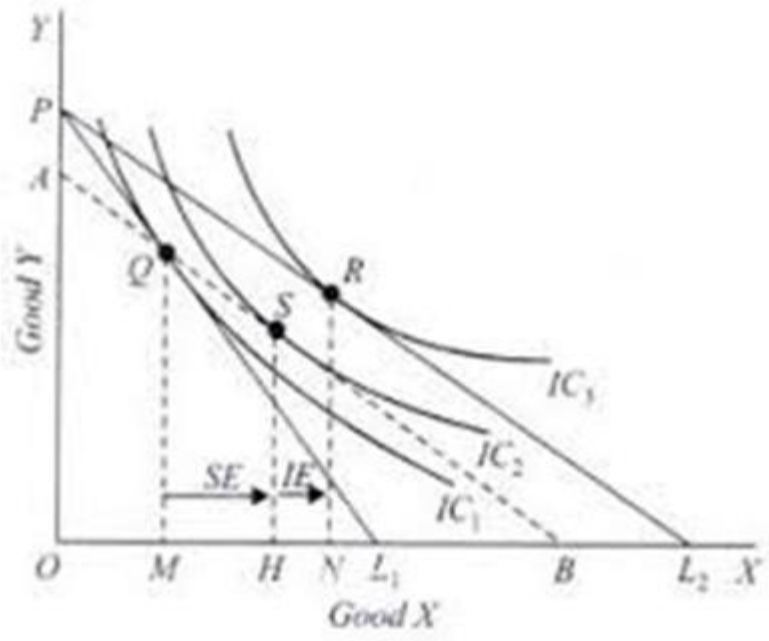

Fig. 1.2.8.1 Price Effect is decomposed into Substitution and Income Effects through Slutsky's Cost Difference Method (for Normal good)

Hicksian Compensating Variation Method (for inferior goods):

The income effect for the inferior commodity is negative. But the income effect of a price change in case of inferior goods is positive. For instance, if good X is an inferior good, the income effect of a fall in the price of good X will be positive because as the real income of the consumer increases, less quantity of X will be demanded. This is so because price and quantity demanded move in the same direction. On the other hand, the negative substitution effect will increase the quantity demanded of good X.

The negative substitution effect is stronger than the positive income effect in case of inferior goods so that the total price effect is negative. It means that when the price of inferior good falls, the consumer purchases more of it due to compensating variation in income. The case of good X as an inferior good is depicted in figure 1.2.8.2. It is observed from the figure that initially the consumer is in equilibrium at point R and with the fall in the price of good X he moves to point T. The movement from point R to T (i.e. from B to E on horizontal axis) is the Price Effect. By compensating variation in income, he is in equilibrium at point H on the new budget line MN along the original indifference curve I_1.The movement from point R to H (i.e. from B to D on

horizontal axis) is the Substitution Effect. To isolate the income effect, return the increased real income to the consumer which was taken from him so that he is again at point T (tangency of PQ_1 and I_2). The movement from point H to T (i.e. from D to E on horizontal axis) is the Income Effect of a fall in price of good X.

The income effect is positive because the fall in the price of inferior good X leads to decrease in the quantity demanded of X by DE via compensating variation in income. However, in case of an inferior good the negative substitution effect is greater than positive income effect so that the total price effect is negative. Thus Price effect (-) BE = (-) BD (substitution effect) + DE (income effect). Thus the slope of demand curve is doward sloping even in the case of inferior good.

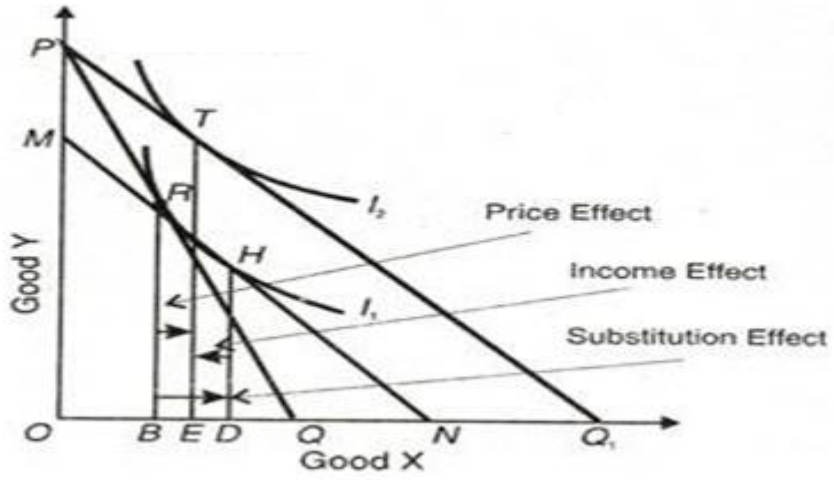

Fig. 12.8.2 Price Effect Split up into Substitution and Income Effects through Compensating Variation Method (for Inferior good)

Hicksian Compensating Variation Method (for Giffen goods):

The good for which law of demand does not operate is called Giffen good. It is after Robert Giffen who found that potatoes were indispensible food items for the poor peasants of Ireland. He observed during the famine of 1848 that, a rise the price of potato leads to an increase in its quantity demanded. Thereafter, a fall the price of potato leads to an decrease in its quantity demanded. This direct relationship between the price and quantity demanded for the essential food item is called Giffen Paradox.

In case of Giffen goods, the positive income effect is stronger than negative substitution effect so that the consumer buys less of it when its price falls. Thus the total price effect is positive as shown in the figure 1.2.8.3. for the Giffen good X. The movement from point R (initial equilibrium) to point T (equilibrium point when price of X falls) is known as Price effect where the consumption of good X is found reduced by BE. To isolate the substitution effect, the increased real income due to fall in the price of good X is withdrawn from the consumer by drawing the budget line MN parallel to PQ_1 and tangent to the original indifference curve I_1 at point H. Thus the movement from point R to H represents Substitution effect which is negative as the consumer buys BD i.e. more of X due to fall in the price of X, real income being constant. To isolate the income effect, when the income that was taken away from the consumer is returned to him, he moves from point H to T so that he reduces the consumption by a large quantity DE. This is the positive income effect because with the fall in the price of Giffen good X, its quantity demanded is reduced by DE via compensating variation in income. Thus, in the case of a Giffen good the positive income effect is stronger than that of negative substitution effect and hence the total price effect is positive. That is why, the demand curve for a Giffen good has positive slope.

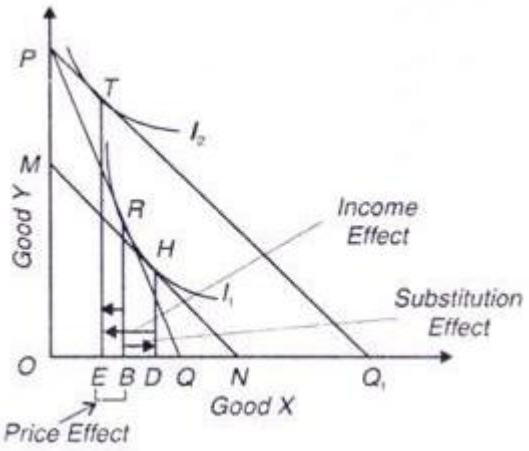

Fig. 12.8.2 Price Effect Split up into Substitution and Income Effects through Compensating Variation Method (for Giffen good)

1.2.9 Indifference Curve Analysis and the Demand Curve:

Indifference curve analysis can be applied to show why the demand curve usually slopes downward. To analyse it let us take commodity X assuming the consumer's income and price of other good remains constant.

The top part of Figure 1.2.9 is a conventional indifference curve diagram. The consumer is in equilibrium at point B_2 on the original budget line AF and indifference curve I_2 consuming OQ_2 of good X. When the price of good X falls, the budget line will move to AF' and the consumer's equilibrium will be able at point B_3 on the higher indifference curve I_3 consuming more of good X (i.e. OQ_3) Similarly, when the price of good X increases the budget line will move to AF'' and the consumer's equilibrium will be able at point B_1 on the lower indifference curve I_1 consuming less of good X (i.e. OQ_1). Thus joining the Points B_1, B_2 and B_3 the price consumption curve (PCC) can be obtained which reveals the change in quantity demanded of good X due to the change in price of good X remaining other things constant. The bottom part of the Fig. 1.2.9 is derived from the top part. In both parts, the horizontal axis shows the quantity of good X which will be bought, but in the bottom part of the diagram, the vertical axis shows the price of good X (whereas the vertical axis of top part of the diagram shows good Y) . This bottom part of the diagram is showing a demand curve derived from the PCC. The point G derived from the point B_2 of PCC (tangential point of price line AF and IC_1 i.e. I_1 in the figure) reveals the quantity demanded of good X i.e. OQ_2 given the price of X i.e. P_2 and other things. When the price of good X falls price line AF' and equilibrium achieves at point B_3 of PCC corresponding to and IC_3 i.e. I_3 in the figure indicating more of quantity purchased of good X when its price falls. The point H in bottom part of the figure is derived corresponding to the point B_3 of PCC indicates increase in the quantity demanded of good X i.e. OQ_3 when its price decreases to P_3. Similarly, when the price of good X increases the price line shifts to AF'' given the other things and consumer gets equilibrium at point B_1 of PCC corresponding to and IC_1 i.e. I_1 in the figure indicating less of quantity purchased of good X when its price increases. The point E in bottom part of the figure is derived corresponding to the point $B_1$of PCC indicates decrease in the quantity demanded of good X i.e. OQ_1 when its price increases to P_1. So joining together these points G, H and E the demand curve for good X, which slopes down to the right, is said to be derived from PCC. The slope of the curve will depend on the consumer's preferences as shown in the top part of the diagram.

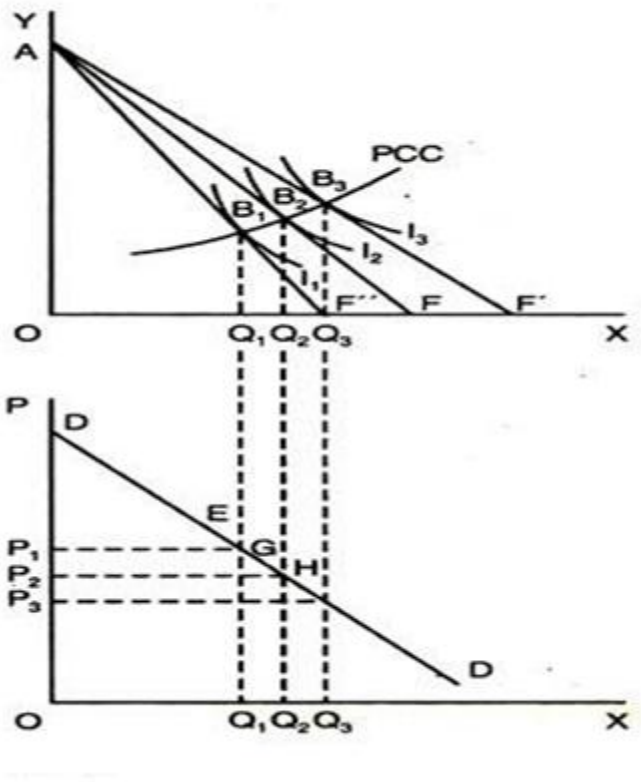

Fig. 1.2.9 Derivation of the Demand Curve

1.2.10 Summary

The indifference curve approach developed by Prof. Hicks discarded the Marshallian assumptions of cardinal measurement of utility and suggested ordinal measurement. An indifference curve (IC) is the locus of various points where each point represents the combination of two goods (e.g. good X and good Y) in such a way that whatever combination the consumer will choose that will give him the same satisfaction. In other words, the consumer is indifference towards the consumption any of the combination of two goods on the same IC. Thus, the IC is slopping downward as some unit of good Y is to be sacrificed to have an additional unit of good X. Hence the slope of IC is also known as Marginal Rate of Substitution of one good for other (e.g. MRS_{xy}). Further IC is convex to the origin (i.e. diminishing MRS_{xy}).Higher IC gives higher Satisfaction and vice versa. Two ICs cannot intersect to each other. IC canot take any other shape other than downward sloping with convexity.

The budget line refers to the consumption of any combination with the given budget. It is also sloping downward and its slpe is represented by the ratio of price of good X to price of good Y. The budget line shift to the right and left from the same origin with the fall and rise in price of good X respectively, given the price of goody and money income. However the budget line shifts paralelly to the right or left with the increase or decrease in the level of income.

Based on the properties of IC and budget line, the consumer will be at equilibrium provided at equilibrium the two conditions (necessary and sufficient conditions) are satisfied i.e. Slope of IC (i.e. MRS_{xy}) = Slope of Budget line (Px/Py) and IC must be convex (i.e. diminishing MRS_{xy}) to the origin at equilibrium point.

The effect of a price change of a commodity on the quantity consumed of that commodity (given the price of other goods and money income) is called Price Effect. So the price effect in case of normal goods is negative and for Giffen goods it is positive. The curve which represents the price effect is called as Price Consumption curve (PCC). The shape or slope of the PCC depends on the price elasticity of demand. In other words, the downward sloping price consumption curve (PCC) for a good means that demand for the good is elastic, upward-sloping PCC means that demand for the good is inelastic and horizontal straight-line PCC means that demand for the good is unitary elastic.

Income effect refers to the change in consumer's purchases of the goods as a result of a change in his money income which is reflected by the Income Consumption Curve (ICC). The shape of ICC for normal goods is positive but it is backward bending for inferior goods.

The change in the pattern of consumption expenditure (that is, decline in the proportion of income spent on food and other necessities and increase in the proportion of income spent on luxuries) with the rise in income of the families has been called Engel's law. Thus, the curve showing the relationship between the levels of income and quantity purchased of particular commodities can be called as Engel curve which can be derived from income consumption curve (ICC). The Engel curve for necessary goods is upward-sloping but for luxury goods it is upward-sloping but concave in shape. The Engel curve for inferior goods is backward bending.

The Substitution effect can be derived from the decomposition of price effect into income and substitution effect by Compensating Variation Method (Hicksian method) or Cost Difference

Method (Slutsky's mehod). The price effect of a price change is negative as income effect of a price change is negative and substitution effect of a price change is negative in case of normal goods. In case of inferior goods the negative substitution effect outweighs the positive income effect of a price change and hence price effect is negative. But in case of Giffen goods the positive income effect of a price outweigh the negative substitution effect and hence price effect is positive.

The law of demand can be established and demand curve can be derived from the Price Consumption Curve.

1.2.11 Self Assessment Questions

2. Define Indifference Curve (IC). Discuss its properties.
3. What is IC? How consumer equilibrium is achieved under IC analysis?
4. Define Price Consumption Curve. Discuss its relationship with price elasticity of demand.
5. Define Income Consumption curve (ICC). Discuss how Engel Curve is derived from ICC.
6. Discuss about the Engel Curve.
7. Define substitution effect. Identify substitution effect from the decomposition 0f price effect under compensating variation method.
8. Discuss the breaking up of Price effect in to income and substitution effect by cost difference method.
9. Discuss the derivation of demand curve from the price effect

UNIT-II

PRODUCTION AND COST

2.1 CHAPTER

PRODUCTION FUNCTION

Objectives
After going through this unit, you should be able to:

- Understand the economics of production
- Discuss the production function
- Understand the set of conditions required for efficient production
- Understand the estimation of production function

Structure

2.1.1 Production function

In economics, a **production function** relates physical output of a production process to physical inputs or factors of production. Production function denotes an efficient combination of inputs and outputs. The production function is of two types such as Short-run and Long run production

functions. In a production function of Q= f (L,K), where Q is output , L is labour input and K is capital input , in short run one factor normally capital (K) is constant (or fixed) and the other i.e. labour is assumed as variable factor. But in long run all the factors of production are variable. The behaviour of short-run production function is explained by Law of Variable Proportion or Law of Diminishing MP_L whereas the behaviour of long-run production function is explained by Law of Returns to scale.

2.1.2 Short-run Production function

The law of variable proportion or law of diminishing marginal product of labour studies the behaviour of short run Production function as discussed below.

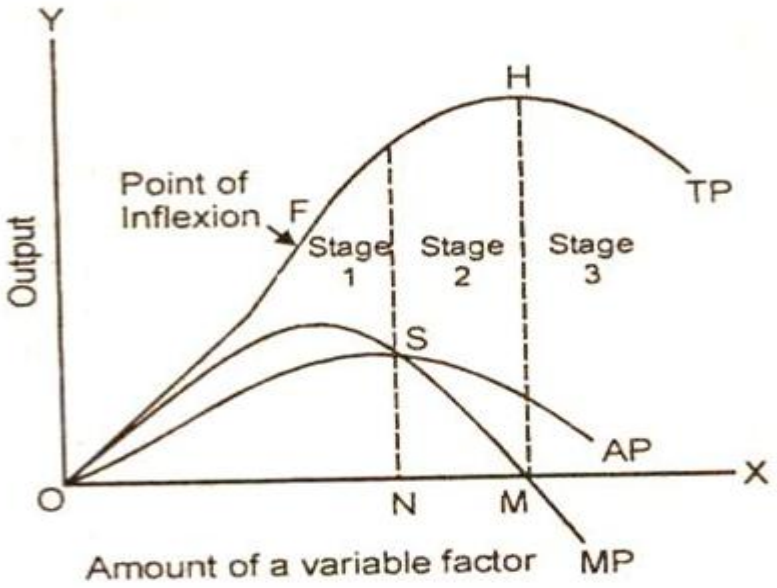

Fig. 2.1.2 Law of Variable Proportion

Stages of production

To simplify the interpretation of a production function, it is common to divide its range into 3 stages. Given the capital, in **Stage 1** the variable input is being used with increasing output per unit. Total product (TP), Average Product (AP) and Marginal Product (MP) of variable input (i.e. Labour) are found increasing in this stage. The point at which TP stops to increase at an increasing rate and start to increase at a diminishing ate is called as Point of inflexion. Stage 1 ends at the point of intersection of MP at the highest point of AP. This stage indicates underutilisation of capital. In **Stage 2**, output increases at a decreasing rate, and the average

and marginal physical product are declining but positive. The optimum input/output combination for the price-taking firm (or rational producer) will be in stage 2. In **Stage 3**, too much variable input is being used relative to the available fixed inputs: variable inputs are over-utilized (MP of Labour is negative) in the sense that their presence on the margin obstructs the production process rather than enhancing it. The TP and AP of variable inputs are found decreasing in this state and MP of variable input (i.e. Labour) is found negative in this stage. At the boundary between stage 2 and stage 3, the highest possible output is being obtained from the fixed input. In other words the second stage is preferred by rational producer as optimum stage. The optimal allocation of resources takes place under short-run production function provided the condition Marginal Revenue Product of Labour (MRP_L) = Wage (W), where MRP_L = Marginal Product of Labour (MPP_L) X Price per unit of output (P) is satisfied.

Stage-1: Increasing Returns to variable proportion

Stage-2: Diminishing Returns to variable proportion

Stage-3: Negative Returns to variable proportion

2.1.3 Isoquant

Isoquant is a curve that shows the varying combinations of factors of production such as labour and capital that can be used to produce a given quantity of a product with a given state of technology (where factor inputs can be substituted for one another in the production process). The slope of isoquant reflects the 'substitutability' of one factor for other in the production process which is called Marginal rate of Technical Substitution (MRTS). The isoquant is sloping downward to the right (as shown in figure 1.2.3) as because the two inputs can be substituted for one another in the production process. Further isoquant is convex to the origin indicating the fact that when the quantities of one factor (such as Labour) is increased, the less of another factor is (such as Capital) will be given up, if output level is to be kept constant. Thus $MRTS_{L\text{-}K}$ declines as we move down any isoquant from left to right.

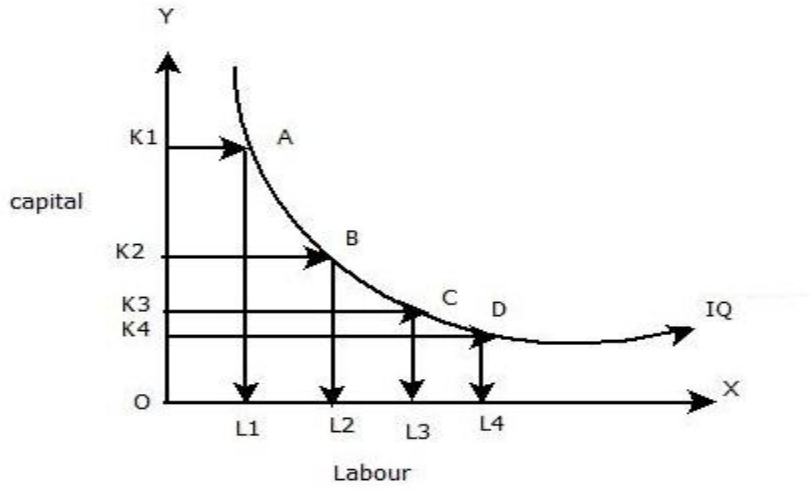

Fig.1.2.3 Isoqant

Properties of Isoquants

- **Isoquants are negatively sloped :** It means when the amount of one factor input is increased that of other input must be decreased in order to maintain a given level of output so that any combination two factors (lying on the same isoquant) chosen will yield the same level of output which is depicted in figure 2.1.3.1.
- **Isoquants are convex to the origin (Diminishing MRTS $_{L\text{-}K}$) :** The convexity of isoquant indicates that MRTS is diminishing which means that as the quantities of one factor (such as Labour) is increased, the less of another factor is (such as Capital) will be given up, if output level is to be kept constant as shown in figure 1.2.3.1. The Elasticity of Factor Substitution (ES) refers to the ratio of the percentage change in the ratio of Capital (K) and labour (L) to the percentage change in MRTS $_{L\text{-}K}$ which can be shown symbolically as follows.

$$ES = \frac{\% \, \Delta \, (K/L)}{\% \, \Delta \, MRTS_{L-K}}$$

- **Higher isoquant represents a higher level of output and vice-versa :** Iso-quant map represents a set of isoquants describing production function of a firm where a higher isoquant represents a larger quantity of output than the lower one as depicted in figure 1.2.3.2.
- **Two isoquants cannot intersect to each other:** by definition each isoquant represents a specific quantum of output. Therefore, if two isoquants intersect to each other it would involve logical

contradiction as a particular isoquant at a time may be representing a small as well as a large quantity of output. Thus two isoquants cannot intersect to each other as shown in figure 1.2.3.3.

- **Isoquant cannot be circular:** Isoquant cannot be circular as it contradicts the convexity condition of an isoquant as shown in figure 1.2.3.4.

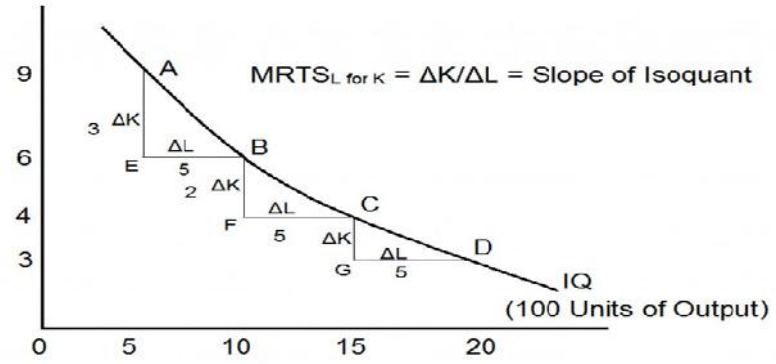

Fig. 1.2.3.1 Isoquant-downward sloping & convex to the origin

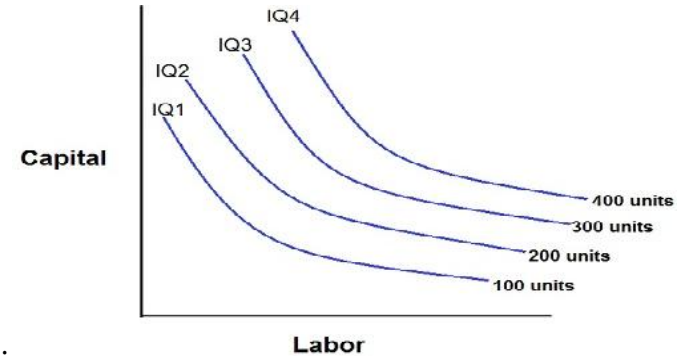

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Fig. 1.2.3.2 Isoquant Map

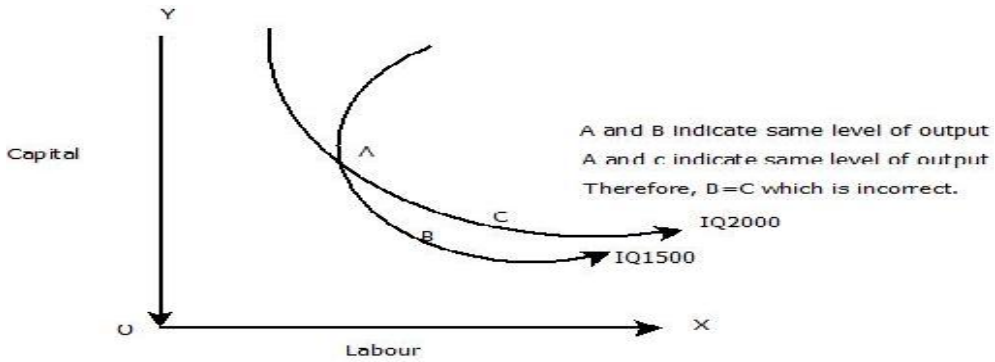

Fig. 1.2.3.3 Intersection of Two Isoquants

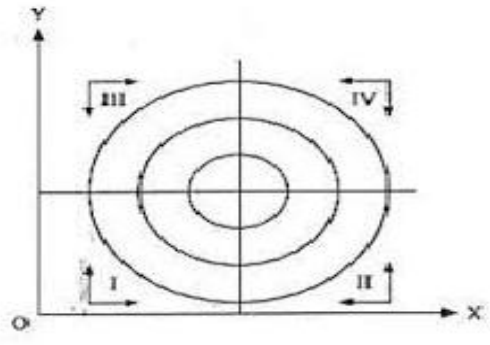

Fig. 1.2.3.4 Circular shape of Isoquant

2.1.4 Isocost line

The **isocost** line is an important component when analyzing producer's behavior. The **isocost** line illustrates all the possible combinations of two factors that can be used at given costs and for a given producer's budget. In simple words, an **isocost** line represents a combination of two inputs that can be purchased for the same total money outlay. Its slope reflects the relative prices of two factors of production (i.e.Ratio of Price of labour to Price of capital= w/r).

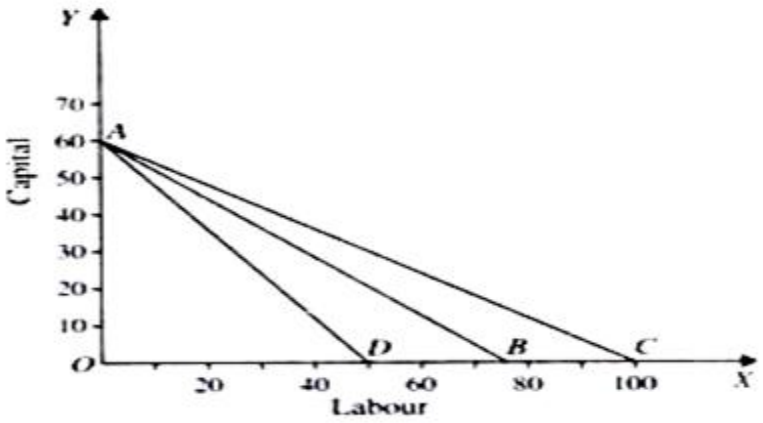

Fig. 2.1.4.Changes in Iso-Cost Line as a Result of Changes in the Price of Labour

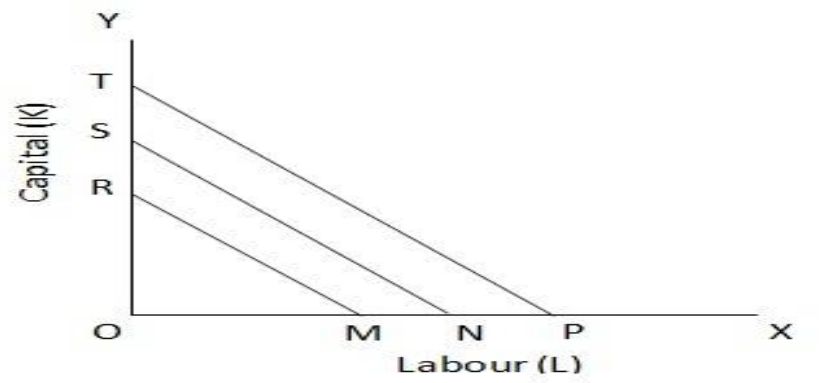

Fig. 2.1.4.Changes in Iso-Cost Line as a Result of Changes in the income

2.1.5 Producer's Equilibrium or Optimisation

Producer's equilibrium or optimisation occurs when he earns maximum profit with optimal combination of factors. A profit maximisation firm faces two choices of optimal combination of factors (inputs).

1. To minimise its cost for a given output; and
2. To maximise its output for a given cost.

Thus the least cost combination of factors refers to a firm producing the largest volume of output from a given cost and producing a given level of output with the minimum cost when the factors are combined in an optimum manner. We study these cases separately.

Cost-Minimisation for a Given Output:

In the theory of production, the profit maximisation firm is in equilibrium when, given the cost-price function, it maximises its profits on the basis of the least cost combination of factors. For this, it will choose that combination which minimizes its cost of production for a given output. This will be the optimal combination for it.

Assumptions:

This analysis is based on the following assumptions:

1. There are two factors, labour and capital.
2. All units of labour and capital are homogeneous.
3. The prices of units of labour (w) and that of capital (r) are given and constant.

4. The cost outlay is given.

5. The firm produces a single product.

6. The price of the product is given and constant.

7. The firm aims at profit maximisation.

8. There is perfect competition in the factor market.

Explanation:

Given these assumptions, the point of least-cost combination of factors for a given level of output is here the isoquant curve is tangent to an iso-cost line. In the Figure 2.1.5.1, the iso-cost line GH is tangent to the isoquant 200 at point M.

The firm employs the combination of OC of capital and OL of labour to produce 200 units of output at point M with the given cost-outlay GH. At this point, the firm is minimising its cost for producing 200 units.

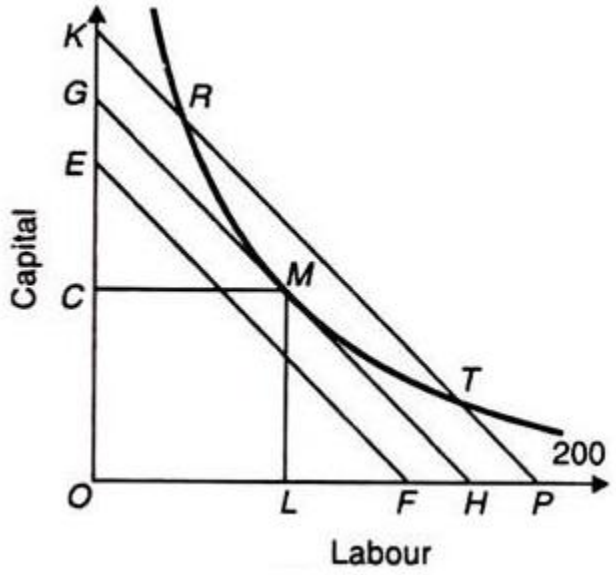

Fig. 2.1.5.1 Cost-Minimisation for a Given Output

Any other combination on the isoquant 200, such as R or T, is on the higher iso-cost line KP which shows higher cost of production. The iso-cost line EF shows lower cost but output 200 cannot be attained with it. Therefore, the firm will choose the minimum cost point M which is the least-cost factor combination for producing 200 units of output.

M is thus the optimal combination for the firm. The point of tangency between the iso-cost line and the isoquant is an important first order condition but not a necessary condition for the producer's equilibrium.

There are two essential or second order conditions for the equilibrium of the firm:

1. The first condition is that the slope of the iso-cost line must equal the slope of the isoquant curve. The slope of the iso-cost line is equal to the ratio of the price of labour (w) to the price of capital (r) i.e. **w / r**. The slope of the isoquant curve is equal to the marginal rate of technical substitution of labour and capital ($MRTS_{L\text{-}K}$) which is, in turn, equal to the ratio of the marginal product of labour to the marginal product of capital (MP_L/MP_K). Thus it can be written as: $\mathbf{W/r = MP_L/MP_K = MRTS_{L\text{-}K}}$.

2. The second condition is that at the point of tangency, the isoquant curve must be convex to the origin. In other words, the marginal rate of technical substitution of labour for capital ($MRTS_{LK}$) must be diminishing at the point of tangency for equilibrium to be stable.

Both the situations are impossibilities because nothing can be produced either with only labour or only capital. Therefore, the firm can produce the same level of output at point M where the isoquant curve IQ is convex to the origin and is tangent to the iso-cost line GH. The analysis assumes that both the isoquants represent equal level of output $IQ = IQ_1 = 200$.

Output-Maximisation for a given Cost:

The firm also maximises its profits by maximising its output, given its cost outlay and the prices of the two factors. This analysis is based on the same assumptions and conditions for the equilibrium of the firm as given above.

The firm is in equilibrium at point P where the isoquant curve 200 is tangent to the iso-cost line CL as shown in the Figure 2.1.5.2. At this point, the firm is maximising its output level of 200 units by employing the optimal combination of OM of capital and ON of labour, given its cost outlay CL. But it cannot be at points E or F on the iso-cost line CL, since both points give a smaller quantity of output, being on the isoquant 100, than on the isoquant 200.

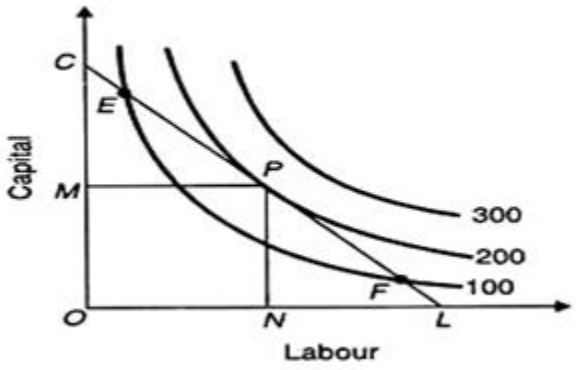

Fig. 2.1.5.2 Output-Maximisation for a given Cost

The firm can reach the optimal factor combination level of maximum output by moving along the iso-cost line CL from either point E or F to point P. This movement involves no extra cost because the firm remains on the same iso-cost line. The firm cannot attain a higher level of output such as isoquant 300 because of the cost constraint. Thus the equilibrium point has to be P with optimal factor combination OM and ON.

At point P, the slope of the isoquant curve 200 is equal to the slope of the iso-cost line CL i.e. $\mathbf{w/r = MRTS_{L\text{-}K.} = MP_L/MP_K}$ and the second condition is that the isoquant curve must be convex to the origin at the point of tangency with the iso-cost line.

2.1.6 Expansion Path:

Expansion path is the locus of various points where each point represents the producer's equilibrium. Suppose, after attaining equilibrium, if a producer is willing to increase its production, then he/she needs to determine the combination that is required to reach a new equilibrium state. Let us consider the following figure in which the producer is willing to produce Q_1 units of outpu and achieves its equilibrium at point R_1. Now, the producer wants to produce Q_2 units of output instead of Q_1 units. In such a case, the equilibrium would be achieved at the point R_2, as shown in the Figure. Similarly, the equilibrium point for producing Q_3 is R_3. When the points R_1, R_2 and R_3 are joined, a straight line is obtained, which is called expansion path or scale line.

This line is termed as scale line because producer needs to adjust its scale of production according to this line to achieve the output he/she desires. On the other hand, this line is also termed as expansion path because the producer needs to expand his/her output by following this path when the prices of factors remain constant. Producers would prefer to move along the scale line to increase the output to get maximum output at least cost with fixed factor prices.

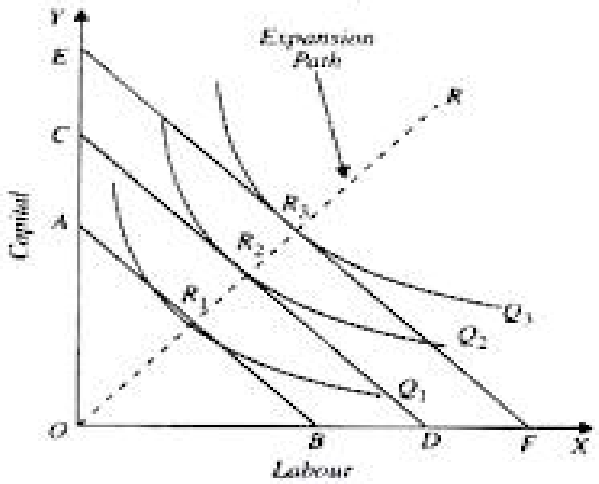

Fig. 2.1.6 Expansion path

2.1.7 Feasible Economic Region of Production

The ridge lines are the locus of points of isoquants where the marginal products (MP) of factors are zero. The upper ridge line implies zero MP of capital and the lower ridge line implies zero MP of labour. Production techniques are only efficient inside the ridge lines. Areas outside the economic region of production mean that at least one of the inputs has negative marginal productivity. This region is marked by what are called ridge lines, which are simply the boundaries beyond which one of the two factors is being overused. The feasible economic region of production is depicted in figure 2.1.7 where A and B are representing upper and lower ridge lines respectively. At each point of A (such as A_1----A_4) Marginal Product of Capital is zero ($MP_K = 0$) and at each point of B(such as B_1----B_4) Marginal Product of Labour is zero ($MP_L = 0$). The Feasible Economic Region of Production lies between the points A_1----A_4 and B_1----B_4.

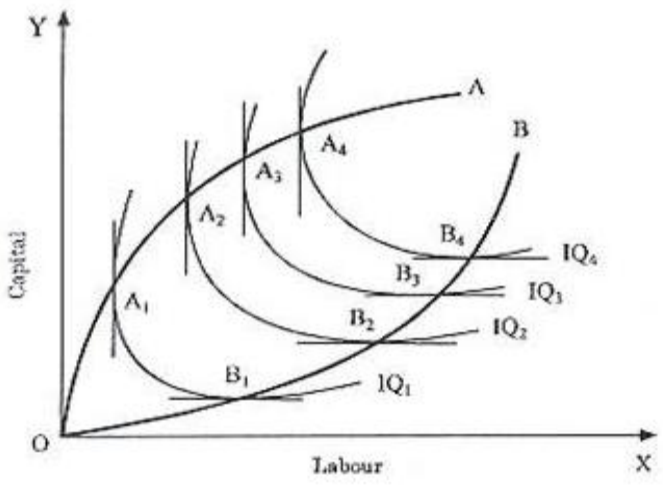

Fig. 2.1.7 Economic Region of Production

2.1.8 Returns to Scale - Concept

The term **returns to scale** arises in the context of a firm's production function. It explains the behaviour of the rate of increase in output (production) relative to the associated increase in the inputs (the factors of production) in the long run. In the long run all factors of production are variable and subject to change due to a given increase in size (scale).

The returns to scale are of the following three types:

- Constant Returns to Scale
- Increasing Returns to Scale, and
- Decreasing Returns to Scale

.

If output increases by that same proportional change as all inputs change then there are **constant returns to scale** (CRS). If output increases by more than that proportional change in inputs, there are **increasing returns to scale** (IRS). If output increases by less than that proportional change in inputs, there are **decreasing returns to scale** (DRS).

Cobb–Douglas production function

The **Cobb-Douglas production function** reflects the relationships between its inputs - namely physical capital and labor - and the amount of output produced. It's a means for calculating the impact of changes in the inputs, the relevant efficiencies, and the yields of a production activity. Here's the basic form of the Cobb-Douglas production function:

$$Q\ L, K\ = AL^{\beta} K^{\alpha}$$

- Q = total production (the real value of all goods produced in a year)
- L = labour input (the total number of person-hours worked in a year)
- K = capital input (the real value of all machinery, equipment, and buildings)
- A = total factor productivity (i.e Constant)
- β and α are the output elasticities of labour and capital respectively.

Output elasticity measures the responsiveness of output to a change in levels of either labor or capital used in production, ceteris paribus. For example, if $\alpha = 0.45$, a 1% increase in capital usage would lead to approximately a 0.45% increase in output.

If, $\alpha + \beta = 1$, Constant Returns to Scale

If, $\alpha + \beta > 1$, Increasing Returns to Scale

If, $\alpha + \beta < 1$, Decreasing Returns to Scale

2.1.9 Returns to scale using Isoquant approach

The return to scale may be shown diagrammatically on an expansion path by the distance between successive 'multiple-level-of –output' isoquants, that is, isoquants that show levels of output which are multiples of some base level of output e.g., 100,200,300 etc.

Constant Returns to Scale: The distance between successive multiple isoquants along the expansion path (OR in the figure) is constant (i.e. OD = DE = EF as shown in the diagram). It means Doubling factor inputs (Labour & Capital) achieves double the level of the initial output; trebling inputs achieves treble output and so on. In this case the Production function is homogeneous of degree one. The constant returns to scale as shown in the figure indicate the facts as follows.

100 units of output require 1(2C + 2L) = 2C + 2L where, C=Capital and L= Labour

200 units of output require 2(2C + 2L) = 4C + 4L

300 units of output require 3(2C + 2L) = 6C + 6L

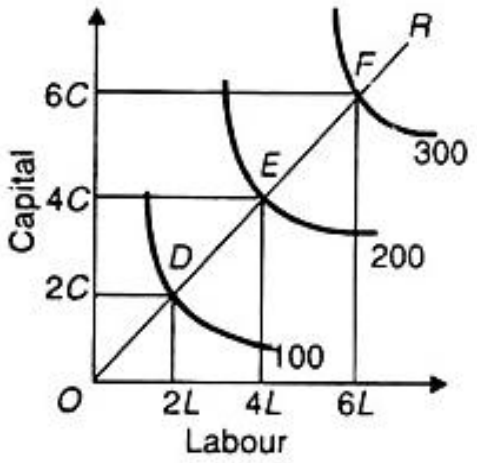

Fig. 2.1.9.1 Constant Returns to Scale

Increasing Returns to Scale: The distance between successive multiple isoquants along the expansion path (OR in the figure) decreases (i.e. OA > AB > BC as shown in the diagram). It means by doubling inputs (Labour & Capital), output is more than doubled. In other words, to get equal increases in output, lesser proportionate increases in both the inputs (labour & Capita) are required. In this case the Production function is homogeneous of degree greater than one. The increasing returns to scale as shown in the figure indicate the facts as follows.

100 units of output require 3C + 3L

200 units of output require 5C + 5L

300 units of output require 6C + 6L

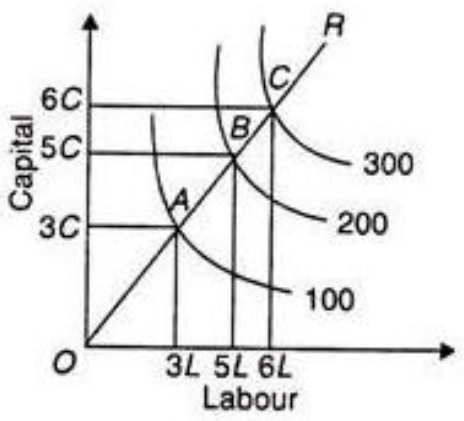

Fig. 2.1.9.2 Increasing Returns to Scale

Decreasing Returns to Scale: The distance between successive multiple isoquants along the expansion path (OR in the figure) increases (i.e. OG < GH < HK as shown in the diagram). It means by doubling inputs (Labour & Capital), output increases by less than twice its original level. In other words, to get equal increases in output, larger proportionate increases in both the inputs (labour & Capita) are required. In this case the Production function is homogeneous of degree less than one. The increasing returns to scale as shown in the figure indicate the facts as follows.

100 units of output require 2C + 2L

200 units of output require 5C + 5L

300 units of output require 9C + 9L

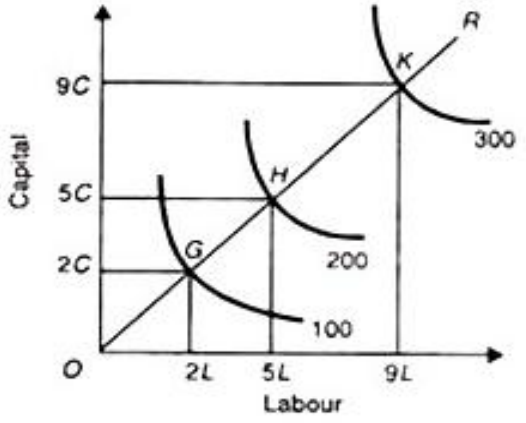

Fig. 2.1.9.2 Decreasing Returns to Scale

2.1.10 Summary

The production function (PF) is of two types such as Short-run and Long-run. The Law of variable proportion explains the behavior of short-run PF whereas Returns to explain the behavior of long-run PF.

The law of variable proportion explains the behavior of TP, MP and AP curve when additional units of labour is employed against the fixed factor (i.e. Capital) with the help of three stages. Ultimately, a rational producer will choose the second stage of production where MP_L is diminishing but positive.

The producer's equilibrium in long-run can be explained using Isoquant and Isocost line. The producer achieves equilibrium level of output corresponding to equilibrium amount of labour and capital used which can be explained under two circumstances such as Minimisation of cost for a Given Output and Maximisation of output for a Given Cost. In both the cases the conditions of equilibrium will be the same such as the necessary condition is Slope of Isoquant i.e. $MRTS_{L-K}$ is equal to Slope of Isocost line i.e.W/r and the sufficient condition is Isoquant must be convex to the origin at equilibrium point. The expansion path explain the producer's equilibrium at its each point. The feasible economic region of production lies between the upper and lower ridge lines.

The returns to scale are of three types such as Constant, Increasing and decreasing returns to scale. If the proportionate change in output is equal to the change in inputs it is called constant returns to scale. If the proportionate change in output is greater than the change in inputs it is called increasing returns to scale. If the proportionate change in output is less than the change in inputs it is called decreasing returns to scale. The returns to scale can be explained with the help of Cob-Douglash PF and with the help of distance between the consecutive Isoquants on the expansion path.

2.1.11 Self Assessment Questions

1. Discuss the Law of Variable Proportion.
2. Discuss the conditions of producer's equilibrium under two variable case.
3. Define Isoquant. State its properties. Discuss producer's equilibrium in Long-run.
4. Write Short notes on
   (a) Returns to Scale
   (b) Iso-cost line
   (c) Expansion path
   (d) Economic Region of Production
   (e) Isoquant

2.2 CHAPTER

COST OF PRODUCTION

Objectives

After completing this chapter, you will be able to :

- Understand the cost of production
- Estimate the short-run cost and cost curve
- Draw and analyze the Long-run Average Cost Curve

Structure:

2.2.1 Private and Social Costs of Production

The distinction between Private and Social costs of production is important to understand for assessing the socially efficient rate of output to be produced in an economy.

Private costs refer to direct costs to the producer for producing the good or service. For instance, Private costs for a producer of a good, service, or activity include the costs the firm pays to purchase capital equipment, hire labor, and buy materials or other inputs. Private costs to firms or individuals do not always equate with the total cost to society (social costs) for a product, service, or activity. The difference between private costs and total costs to society of a product, service, or activity is called an external cost (externalities). The pollution (negative externalities) due to production activities is an example of external cost. External costs are directly associated with producing or delivering a good or service, but they are costs that are not paid directly by the producer. In other words, External costs (or externalities) are not reflected on firms' financial statements as it is paid by the third party i.e. the society. So due to external costs (or Externalities) market failures and economic inefficiencies may result at the local, state, national, and even international level. Thus, the external costs must be included in the social costs to ensure that society operates at a socially efficient rate of output. Hence, Social costs include both the private costs and any other external costs to society arising from the production of a good or service.

Private Costs = Social Costs – External Costs

Social Costs = Private Costs + External Costs

If external costs > 0, then private costs < social costs or social costs > private costs

Implications of Social & Private Costs

A socially efficient output rate in a competitive market is reached when social costs (both private and external costs) are considered in production. The existence of external costs has implications for product prices, output levels, resource usage, and competition. When significant external costs are associated with a good (or service), then the price of the good is too low (because external costs are not being paid) and its output level is too high, relative to the socially efficient

rate of output for the good. Thus bottom line, unless costs and prices include external costs, the market will not produce a socially efficient result as shown in the figure 2.2.1.

In the figure 2.2.1 the intersection of the demand curve and marginal Social cost curve represents the socially efficient rate of production in a competitive market i.e. at point S corresponding to output Os and price Ps. Here the marginal social cost curve equals the marginal private cost curve plus the marginal external cost curve. The comparison of prices and outputs as to how external costs affect resource allocation reveals that if a firm pays only the private costs and avoids paying the external costs associated with their product, then output and prices would be determined at point P where the marginal private cost curve meets the demand curve. At P price equals Pp and output equals Op. From a resource standpoint, the important point of this comparison is that including the marginal external costs of production and allocating resources based on the full social cost results in a higher price for the good (Ps > Pp) and less output (Os < Op) than only including the private costs. Lower output typically would also reduce the amount of pollution generated by the activity.

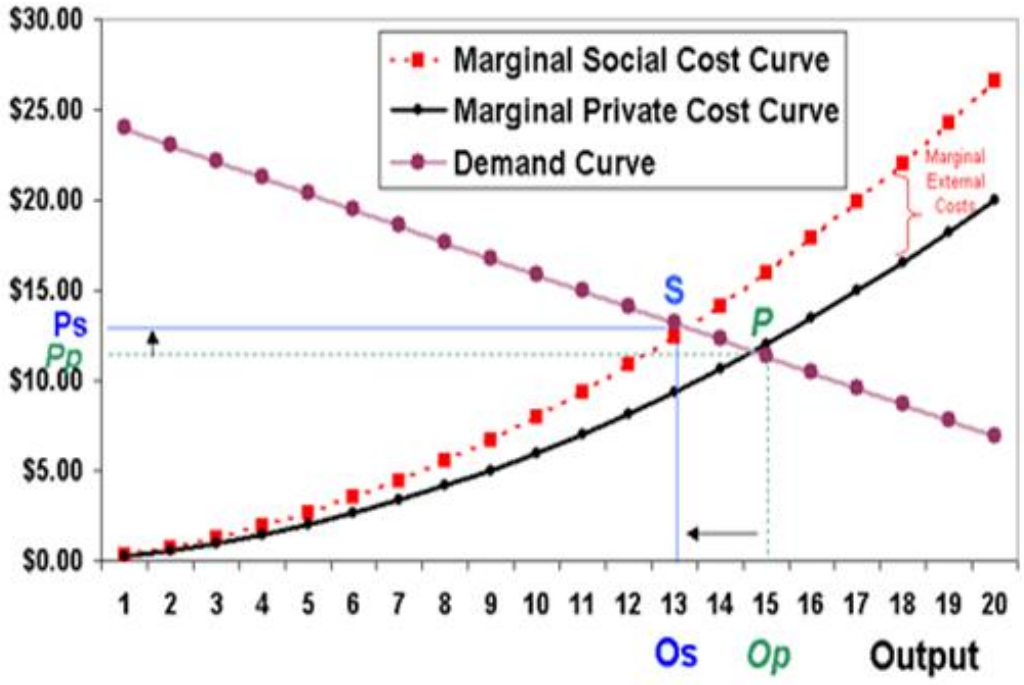

Fig. 2.2.1 Social Costs (Private + external costs) Results in higher price, lower Output and efficient resource use

In economics, the external or indirect costs which lead to inefficiencies in the market and result in a difference between the private costs and the social costs are called externalities. Thus, social costs are the costs pertaining to the transaction costs to the society as a whole. Generally, it is easier to represent social costs in marginal terms i.e. marginal social cost. Marginal social cost refers to the total costs that the society pays for the production of an extra unit of the good or service in question. Symbolically, it can be represented by Marginal Social Cost (MSC) = Marginal Private Cost (MPC) + Marginal External Costs (MEC). The implications of Social costs can be viewed in two ways such as Negative Production Externality and Positive Production Externality as illustred below and depicted in figure 2.2.1.1 and 2.2.1.2 respectively.

Negative Production Externality refers to a situation in which Marginal Social Cost being greater than the Marginal Private Cost i.e. MSC > MPC. It means the production of the firm reduces the well-being of the people in the society who are not compensated for the same indicating a situation of over production. For instance, steel production results in a negative externality because of the marginal damages pertaining to pollution and negative environmental effects. One of the public sector remedies for internalizing externalities is a corrective tax. According to neoclassical economist Arthur Pigou, in order to correct this market failure (or externality) the government should levy a tax which equals to marginal damages per unit. This would effectively increase the firm's private marginal cost so that SMC = PMC. However, the government intervention in correcting an externality has been debated. Economists like Ronald Coase contend that the market can internalize an externality and provide for an external outcome through bargaining among affected parties.

Similarly, positive production externality occurs when the social costs of production are lower than the marginal private costs of production i.e. MSC < MPC. It means the production of the firm increases the well-being of the people in the society who are compensated for the same indicating a situation of under production. For example, the social benefit of research and development not only applies to the profits made by the firm but also helps improve the health of society through better quality of life, lower healthcare costs, etc. In this case, the marginal social cost curve would shift downwards and there would be underproduction. In this case, government intervention would result in a Pigouvian subsidy in order to decrease the firm's private marginal cost so that MPC = SMC.

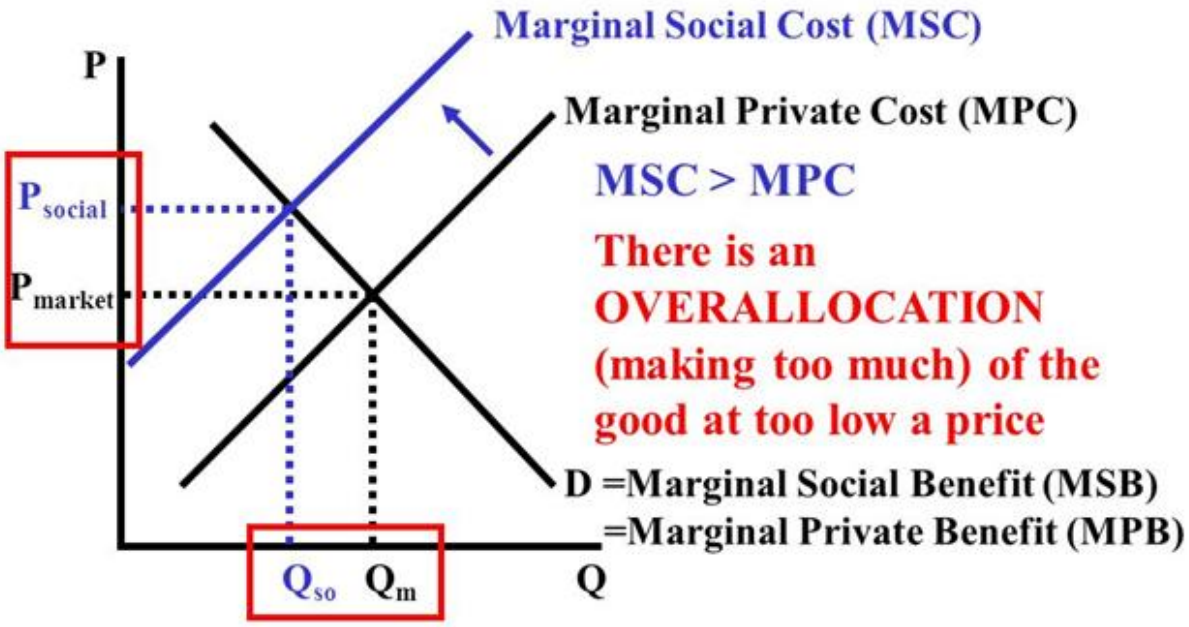

Fig. 2.2.1.1 Resource allocation under Negative Externality

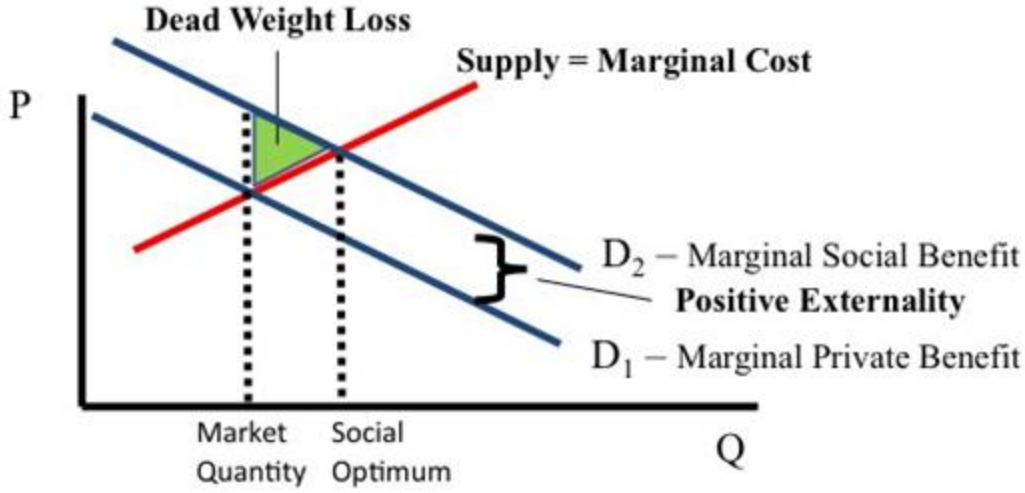

Fig. 2.2.1.2 Resource allocation under Positive Externality

2.2.2 Short-run Cost and Cost Curves

In the theory of firm Total cost (TC) i.e.TC= Average Cost (AC) x No. of Units produced (Q) can be split into two groups such as total fixed cost and total variable cost. Symbolically,

TC= Total Fixed Cost (TFC) + Total Variable Cost (TVC)

Fixed Cost is the cost which is fixed irrespective of the level of output produced, subject to capacity constraint of the plant. Whereas, Variable Cost is the cost that varies with the variation in the level of output produced.

The fixed costs include: salaries of administrative staff, depreciation (wear & tear) of machinery, expenses for building & repairs, expenses for land maintenance &depreciation (if any) and the normal profit, which is lump sum including a percentage return on fixed capita and allowance for risk etc.

The variable costs include: the raw materials, the cost of direct labour and the running expenses of fixed capital, such as fuel, ordinary repairs and routine maintenance etc.

The Marginal Cost (MC) is an addition to total cost by producing an additional unit of output i.e. $MC = \frac{dTC}{dQ}$. So, MC is the slope of TC. The Average Cost (AC) is obtained by dividing the TC by the corresponding level of output $\mathrm{AC} = \frac{\mathrm{TC}}{\mathrm{Q}} = \frac{\mathrm{TFC+TVC}}{\mathrm{Q}} = \mathrm{AFC} + \mathrm{AVC}$ where the Average Variable Cost (AVC) and Average Fixed Cost (AFC) are obtained by dividing the TVC and TFC by the corresponding level of output respectively. Symbolically, $AVC = \frac{TVC}{Q}$ and $AFC = \frac{TFC}{Q}$.

The Total cost (TC) obtained from the sum of Fixed Cost (FC) and variable Cost (VC) can graphically be depicted as follows (Figure 2.2.2). The FC is denoted by the horizontal line and the Variable cost has broadly an inverse-S shape which reflects the law of variable proportion. By adding the FC and VC we obtain the TC of the firm as shown in figure 2.2.2.

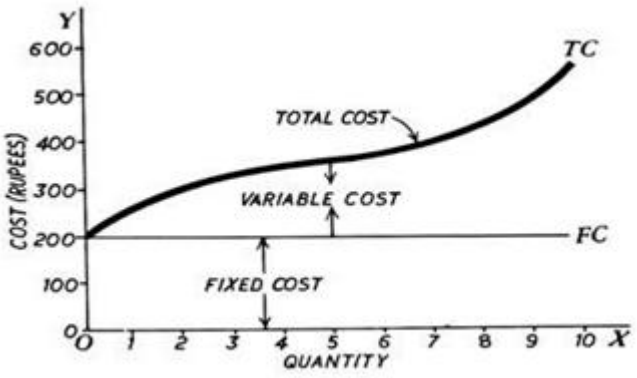

Fig. 2.2.2 Fixed Cost, Variable Cost and Total Cost

The average cost curves such as AFC, AVC and AC besides MC (i.e. slope of TC) obtained from TC can be depicted as follows (figure 2.2.2.1). Graphically, the AFC is rectangular hyperbola, showing at all points the same magnitude, that is , the level of TFC. In short-run the cost curves like AVC, AC and MC are U-shaped, reflecting the law of variable proportions. In the short-run with a fixed plant there is a phase of increasing productivity (falling unit costs) and a decreasing productivity (increasing unit costs) of the variable factor(s). Between these two phases of plant operation there is a single point at which unit costs (average costs) are at minimum. When this point on the AC is reached the plant is utilized optimally, that is, with the optimal combination (proportions) of fixed and variable factors.

The relationship between MC and AC reveals that when MC decreases, AC also decreases. The MC curve reaches its minimum point prior to that of AC. When MC increases AC also increase but the increase in MC is higher than that of AC as shown in figure 2.2.2.1.

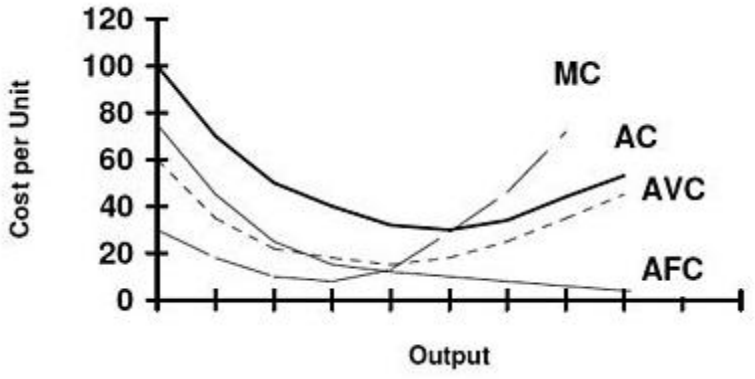

Fig. 2.2.2.1 AFC, AVC, AC & MC

2.2.3 Long Run Average Cost: The 'Envelope' Curve

In the long run all factors are assumed to become variable. Thus the long-run cost curve is said as a planning curve, in the sense that it is a guide to the entrepreneur in his decision to plan the future expansion of his output.

The long-run cost curve is derived from the short-run cost curves. Each point on the LAC corresponds to a point on a short-run cost curve, which is tangent to the LAC at that point.

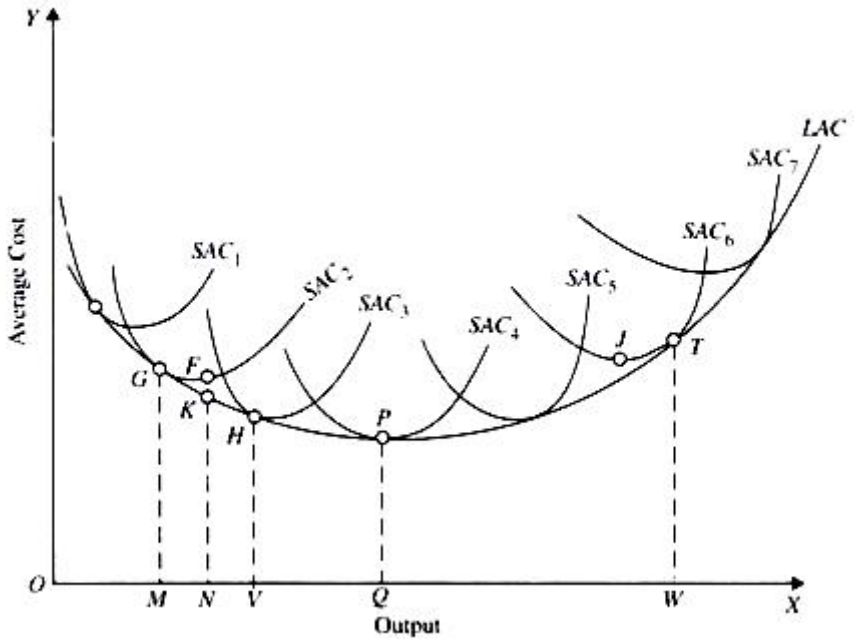

Fig. 2.2.3 Deriving Long-Run Average Cost Curve from Short-Run Average cost Curves

The Long Run Average Cost (LAC) curve of a firm shows the minimum or lowest average total cost at which a firm can produce any given level of output in the long run (when all inputs are variable).

Why is the average cost curve U shaped in the long run?

The long run cost curves are U- shaped (flatter u shaped) for different reasons. It is due to economies of scale and diseconomies of scale. If a firm has high fixed costs, increasing output

will lead to lower average costs. However, after a certain output, a firm may experience diseconomies of scale.

Why is LAC curve known as envelope curve?

In the long-run, the firm can choose among different possible sizes of plant as determined by short run average cost curves such as SAC_1, SAC_2 and SAC_3. The LAC-curve is Flatter U-shaped and it is often called the 'envelope curve' because it 'envelopes' the SAC curves.

Why does LAC fall in the beginning: Economies of Scale

The question is why we first get increasing returns to scale due to which long-run average cost falls and why after a certain point we get decreasing returns to scale due to which long-run average cost rises. In other words, what are the reasons that the firm first enjoys internal economies of scale and then beyond a certain point it has to suffer internal diseconomies of scale? Three main reasons have been given for the economies of scale which accrue to the firm and due to which cost per unit falls in the beginning.

First, as the firm increases its scale of operations, it becomes possible to use more specialized and efficient form of all factors, especially capital equipment and machinery. For producing higher levels of output, there is generally available a more efficient machinery which when employed to produce a large output yields a lower cost per unit of output.

Secondly, when the scale of operations is increased and the amount of labour and other factors becomes larger, introduction of a great degree of division of labour or specialisation becomes possible and as a result the long-run cost per unit declines.

Thus, when the short-run cost decreases (the downward sloping segment of the short-run average cost curve) occur due to the fact that the ratio of the variable input comes nearer to the optimum proportion, decrease in the long-run average cost (downward segment of the long-run average cost curve) take place due to the use of more efficient forms of machinery and other factors and to the introduction of a greater degree of division of labour in the productive process.

Indivisibility of Factors:

Some economists explain economies of scale as arising from the imperfect divisibility of factors. In other words, they think that the economies of scale occur and therefore the long-run average cost falls because of the 'indivisibility' of factors.

They argue that most of the factors are 'lumpy', that is, they are available in large indivisible units and can therefore yield lower cost of production when they are used to produce a larger output. If a small output is produced with these costly indivisible units of the factors, the average cost of production will naturally be high.

If the factors of production were perfectly divisible, then, according to them, suitable adjustment in the factors could be made so that the optimum proportions between the factors were maintained even for producing small amounts of output and hence the average cost of production would not have been higher.

Thus, according to them, if the factors were perfectly divisible, the small-scale production would be as good and efficient as the large-scale production and the economies of scale would be non-existent. Thus, Joan Robinson remarks, "If all the factors were finely divisible, like sand, it would be possible to produce the smallest output of any commodity with all the advantages of large-scale industry."

Why does LAC Rise Eventually: Diseconomies of Scale:

As noted above, beyond a certain point the long-run average cost curve rises which means that the long-run average cost increases as output exceeds beyond a certain point. In other words, beyond a certain point a firm experiences net diseconomies of scale.

There is also divergence of views about the proper explanation for this upward sloping of the long-run average cost curve. The first view as held by Chamberlin and his followers is that when the firm has reached a size large enough to allow the utilisation of almost all the possibilities of division of labour and the employment of more efficient machinery, further increases in the size of the plant will entail higher long-run unit cost because of the difficulties of management. When

the scale of operations exceeds a certain limit, the management may not be as efficient as when the scale of operations is relatively small.

After a certain sufficiently large size these inefficiencies of management more than offset the economies of scale and thereby bring about an increase in the long-run average cost and make the LAC curve upward-sloping after a point.

It should be noted that the above view considers the entrepreneurial or managerial functions to be divisible and variable while explaining the diseconomies of scale or the rising part of the long-run average cost curve as it arises from the mounting difficulties of management (i.e. of supervision and coordination) beyond a certain sufficiently large-scale of operations.

The second view considers the entrepreneur to be a fixed indivisible factor. In this view, though all other factors can be increased, the entrepreneur cannot be. The entrepreneur, his functions of decision-making and ultimate control is indivisible which cannot be increased. Therefore, when a point is reached where the abilities of the fixed and indivisible entrepreneur are best utilised, further increases in the scale of operations by increasing other inputs cause the cost per unit of output to rise.

In other words, there is a certain optimum proportion between an entrepreneur and other inputs and when that optimum proportion is reached, further increases in the other inputs to the fixed entrepreneur means the proportion between the inputs is moved away from the optimum and, therefore, these results in the rise in the long-run average cost.

Thus, in this view, increases in the long-run average cost are explained by the law of variable proportions. Economists who hold this view think that the decreasing returns to scale or rising long-run average cost is actually a special case of variable proportions with entrepreneur as the fixed factor.

Economies of Scale & Economies of Scope

Economies of scale for a firm involve reductions in the average cost (cost per unit) arising from increasing the **scale** of production for a single product type, whereas **economies** of **scope** involve lowering average cost by producing more types of products.

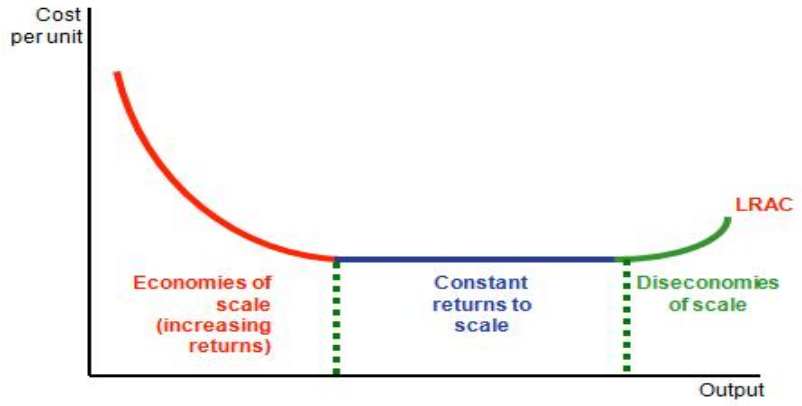

Fig. 2.2.3.1 Implications of Long-Run Average Cost (LRAC) Curve

Economies of Scale

The Economies of scale is an economics term that describes a competitive advantage that large entities have over smaller entities. It means that the larger the business, non-profit or government, the lower its costs. For example, the cost of producing one unit is less when many units are produced at once.

Types of Economies of Scale

There are two main types of economies of scale: **internal and external.**

Internal economies are, as the name implies, internal to the company itself and controllable by management. External economies are supported by external factors. These factors include the industry, geographic location or government.

Economies of Scope

Economies of scope occur when a company branches out into multiple product lines. When companies broaden their scope, they benefit by combining complementary business functions,

product lines or manufacturing processes. For example, most newspapers diversified into similar product lines, such as magazines and online news, to diversify their revenue from declining newspaper sales. They achieved some economies of scope by taking advantage of their advertising sales teams, who could sell advertising in all three product lines.

$$S = \frac{C\ Qa\ +\ C\ Qb\ -\ C(Qa+\ Qb)}{C(Qa+\ Qb)}$$

In the **formula**, C (Q_a) is the cost of producing the quantity q_a of good a separately, and C (Q_b) is the cost of producing the quantity q_b of good b separately. **Economies of scope**, S, measures the percentage cost saving that occurs when the goods *a* and *b* are produced together.

2.2.4 Summary

The Private cost is quite distinct from the social cost as the social cost is the sum of private cost and external cost. The difference between private costs and total costs to society of a product, service, or activity is called an external cost (externalities).If the marginal social cost is greater than marginal social benefit it indicates overproduction and if the marginal social cost is less than marginal social benefit it indicates underproduction as MSC=MSB is social optimal condition for resource utilization and production.

The total cost of production (TC) is the sum of fixed costs and variable costs. The fixed cost is the cost which is fixed irrespective of the level of production whereas variable cost (VC) varies with the level of production. The Marginal cost of production (MC) is an addition to TC by producing an additional unit of output (Q). So MC is the slope of TC. The Average cost (AC) of production is equal to TC/Q. The average variable cost (AVC) is equal to VC/Q. The shape of Short-run Average cost curve is ‘U’ shape as the capital in short-run PF is fixed.

The Long run Average cost (LAC) curve involves many short-run average cost (SAC) curves and hence LAC curve is known as envelop curve having ‘flatter U’ shape. The decreasing portion of LAC (otherwise known as increasing returns to scale) is due to the operation of economies of scale and the increasing portion of LAC (otherwise known as decreasing returns to

scale) is due to the operation of diseconomies of scale. In long-run a rational producer will always try to produce at the minimum point of LAC curve.

2.2.5 Self Assessment Questions

1. Define Social Cost. Discuss its implication for efficient resource allocation.
2. Why LAC curve is known as Envelop Curve? Discuss the causes for the decreasing and increasing portions of LAC curve.
3. Discuss the various concepts of cost and cost curves in short-run.
4. Write short notes on :
   (a) Relationship between SAC and SMC
   (b) Private cost and Social Cost
   (c) Economies of Scale and Diseconomies of Scale
   (d) Economies of Scope

3.1 CHAPTER
PERFECT COMPETITION

Objectives

After completing this chapter, you will be able to:

- Understand the features of perfect competition
- Estimate the demand and supply curve of the perfectly competitive firm and industry
- Understand the Short-run and Long-run equilibrium of the firm and industry under perfect competition
- Measure producer surplus under perfect competition

Structure:

3.1.1 Perfect Competition

Perfect competition is a market structure characterised by a complete absence of rivalry among the individual firms. Thus, in theory, perfect competition implies no rivalry among firms. If we will see from the close we will find that in real life **"Perfect Competition is a pure myth."**

A market is said to be perfectly competitive provided the following characteristics is observed.

Characteristics (or Assumptions) of Perfect Competition:

1. Large Number of Buyers and Sellers
2. Homogeneity of the Product
3. Free Entry and Exit of Firms
4. No Government intervention
5. Perfect Mobility of the Factors of Production
6. Perfect Knowledge of the Market
7. Absence of Transaction Cost

3.1.2 Demand Curve of a firm

The demand curve of a firm is horizontal in shape due to the existence of large number of buyers and sellers and homogeneity of the product. The industry is price maker but the firm is price taker as shown in the following figures.

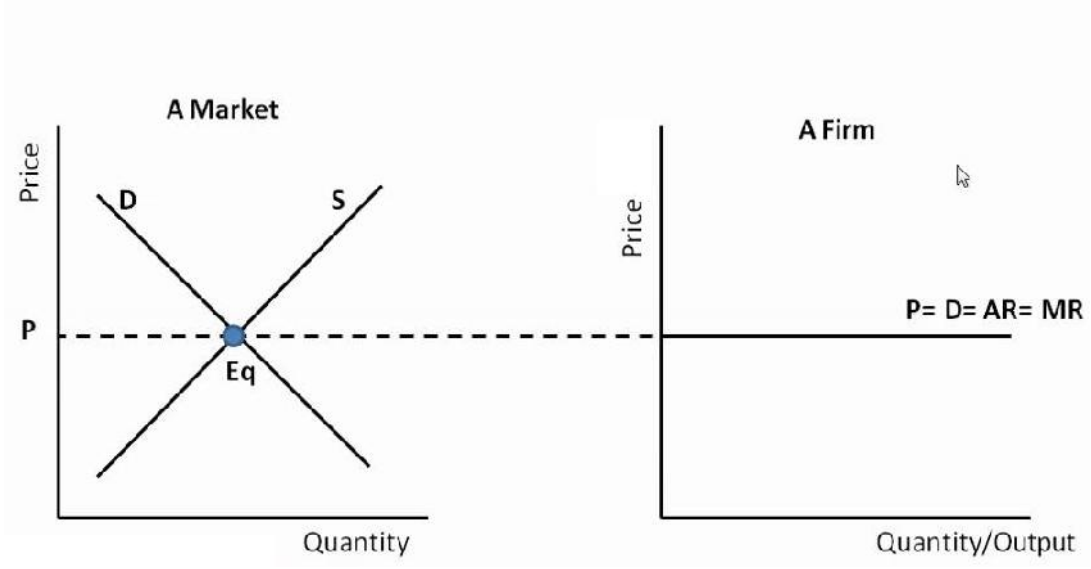

Fig. 3.1.2 Demand Curve of a Firm

3.1.3 Supply Curve of a firm and an Industry in short-run

The upward slopping portion of the Marginal Cost Curve (i.e. the portion of Marginal Cost Curve that lies above the Average Variable Cost) in short-run is called as the supply curve

of a firm as depicted in figure 3.1.3 whereas the horizontal summation of the supply curves of the firms constitute supply curve of an industry which is also upward slopping as shown in the figure 3.1.3.1(b).

In short-run a firm will not supply at a price below its minimum average variable cost as because in short-run a firm must try to cover its variable cost at least. Hence, short run supply curve of a firm coincides with that potion of short run Marginal Cost curve which lies above the minimum point of Average Variable Cost (AVC) curve in short run. The supply curve of the industry is the horizontal summation of the supply curves of the firms. Thus the industry supply curve is also upward sloping derived from the upward portion of the MC curves lying above the minimum point of AVC as shown in figure 3,1,3,1. It is observed from the figure 3.1.3 and 3.1.3.1 that the upward portion of the MC curves lying above the minimum point of AVC shows a direct relation between the price and quantity supplied. Nothing will be supplied below the price P_0 or below the minimum point of Short run Average Variable cost (SAVC)

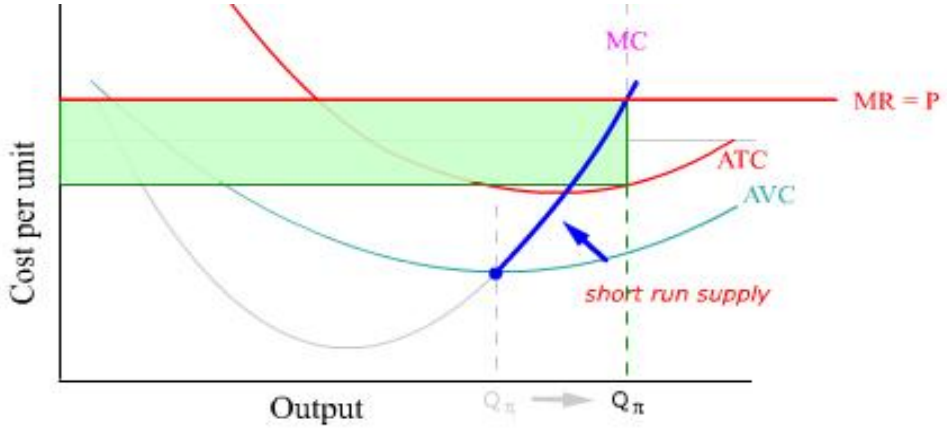

Fig. 3.1.3 Supply Curve of a Firm in Short - run

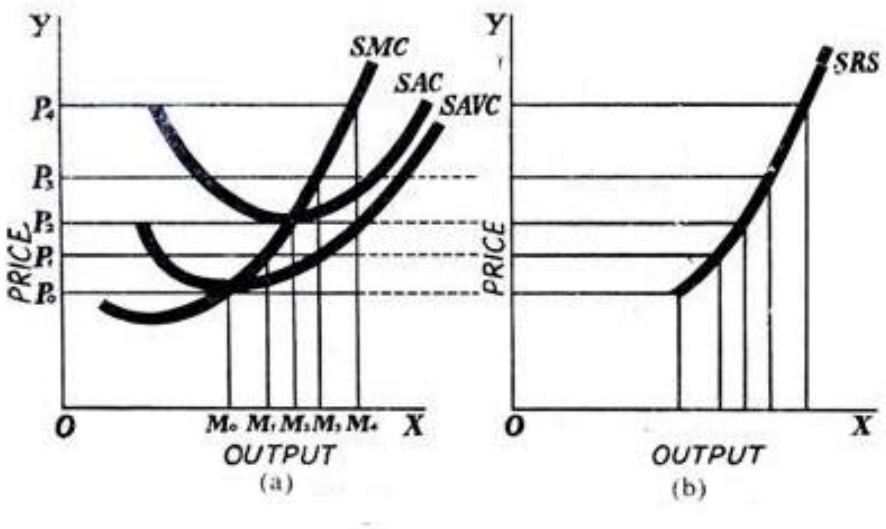

Fig. 3.1.3.1 Deriving Short run Supply Curve of an Industry

Long run Supply Curve of a Firm

The portion of upward sloping Marginal Cost (MC) curve that lies above the minimum point of Average Cost (AC) curve forms the Supply Curve of a firm in long run as at equilibrium point of a firm (as shown in figure 3.1.3.2) Price (P) = MC = AC corresponding to the equilibrium level of output Q. Thus the long-run supply curve of a firm is upward sloping. In long-run the industry will be in equilibrium when all firms in the industry are making normal profit i.e. P = MC = AC. However, the supply curve of the industry in long run takes different shape depending upon the returns to scale in operation as discussed subsequently.

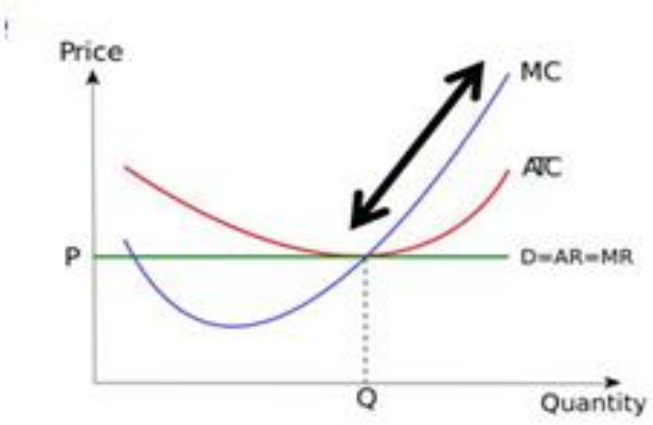

Fig. 3.1.3.2 Supply Curve of a Firm in Long - run

Supply Curve of Industry in Long-run

The short-run supply curve of the industry always slopes upward to the right. But the shape or slope of Supply Curve of the industry (Horizontal of Upward or Downward) in Long-run will depend on whether the industry is subject to the law of Constant Return (i.e. Constant Cost Industry) or to Diminishing Return (i.e. Increasing Cost Industry) or Increasing Return (i.e. Decreasing cost Industry). However, the long run upward sloping supply curve is more typical in the real world situation.

Supply Curve of Constant Cost Industry

The figure 3.1.3.3 (a) relates to a firm in long run which shows corresponding to equilibrium point R, at the output OM, P=LMC=LAC (normal profit). The figure 3.1.3.3 (b) shows the Long-run supply curve (i.e. horizontal in shape) of a constant cost industry corresponding to price OP. In constant cost industry the cost of production does not change (the economies and diseconomies of scale cancel out) despite the change in output. Thus the industry can supply any amount of output at a given price OP earning normal profits (i.e. P=LMC=LAC as all firms have identical cost conditions). Hence, in case of a constant cost industry, the Long-run Supply Curve (LSC) as shown in figure 3.1.3.3 (b) is Horizontal to OX axis (Perfectly elastic) at the price OP, which is equal to the minimum average cost. It means that whatever the output supplied, the price would remain the same.

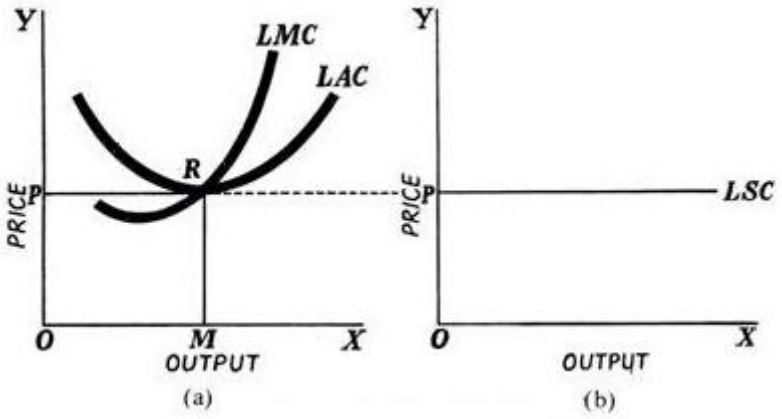

Fig. 3.1.3.3 Long-run Supply Curve of a Constant Cost Industry

Supply Curve of Increasing Cost Industry

The figure 3.1.3.4 (a) shows the position of individual firms in long run which shows the shift in equilibrium position due to shift in Price at different level of output and corresponding to each of the price level Price=LMC=LAC (normal profit). The figure 3.1.3.4 (b) shows the Long-run supply curve (i.e. Upward in shape) of an increasing cost industry where it is observed that more quantity is supplied with higher price (i.e. output ON_1 at price OP_1 > output ON at price OP). Hence, for an increasing cost industry, the Long-run Supply Curve (LSC) as shown in figure 3.1.3.4 (b) is upward sloping.

In case of increasing cost industry the cost of production increases (the external diseconomies outweight the external economies of scale) with the increase in output. The increase in the production (may be to meet the growing demand) results in the increase in cost of factors of production and hence the price of output. So, more will be supplied at higher prices. Thus the Supply curve is Upward sloping in this case.

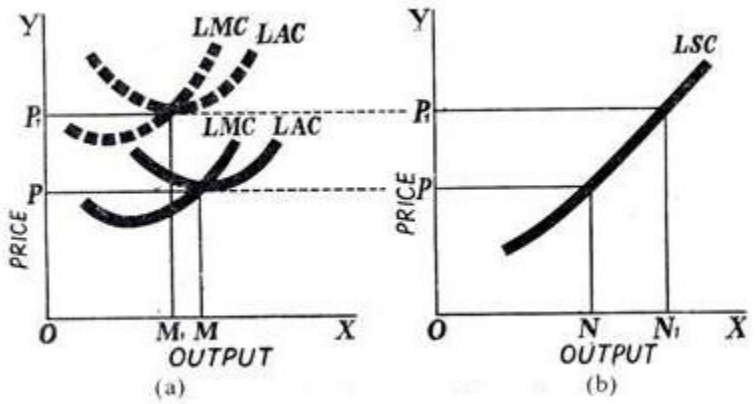

Fig. 3.1.3.4 Long-run Supply Curve of a Increasing Cost Industry

Supply Curve of Decreasing Cost Industry

The figure 3.1.3.5 (a) shows the position of individual firms in long run which shows the shift in equilibrium position due to shift in Price at different level of output and corresponding to each of the price level Price=LMC=LAC (normal profit). The figure 3.1.3.4 (b) shows the Long-run supply curve (i.e. Downward in shape) of a decreasing cost industry where it is observed that more quantity is supplied with lower price (i.e. output ON_1 at price OP_1 > output ON at price OP). It means when price decreases from OP to OP_1, the output supplied increases from ON to ON_1. Hence, for a decreasing cost industry, the Long-run Supply Curve (LSC) as shown in figure 3.1.3.5 (b) is downward sloping.

In case of decreasing cost industry the cost of production decreases (the economies of scale out-weight the diseconomies of scale) with the increase in output. If the supply of factors of production is plentiful for increasing the production, the cost of production decreases and hence the price of output also decreases. So, more will be supplied at lower prices. Thus the Supply curve is Downward sloping in this case.

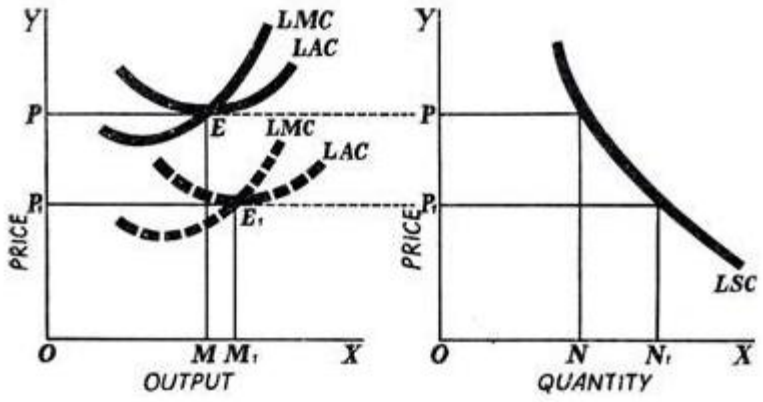

Fig. 3.1.3.5 Long-run Supply Curve of a Decreasing Cost Industry

3.1.4 Equilibrium of a Firm in Short-run:

The equilibrium price (P) and output (M) of a firm is determined at the point of equilibrium E. A point is said to be an equilibrium point of a perfectly competitive (PC) firm provided the two conditions are satisfied such as **1. MC = MR and 2. MC cut MR from below (i.e. slope of MC > slope of MR).** The profit or loss of a firm corresponding to equilibrium point depends on the positioning of short-run Average cost curves as shown in the figures 3.1.4 (a) and 3.1.4 (b). The profit (PHFE) = OMEP (Total Revenue) – OMFH (Total Cost) as shown in fig. 3.1.4 (a) and in the same way loss (P'E'F'H') is shown in fig. 3.1.4 (b). Further, corresponding to equilibrium point and under situation of loss, a firm is may shut-down its operation at a point where the revenue is just sufficient to cover its AVC (Average Variable cost) as shown in the figure 3.1.4 (c).

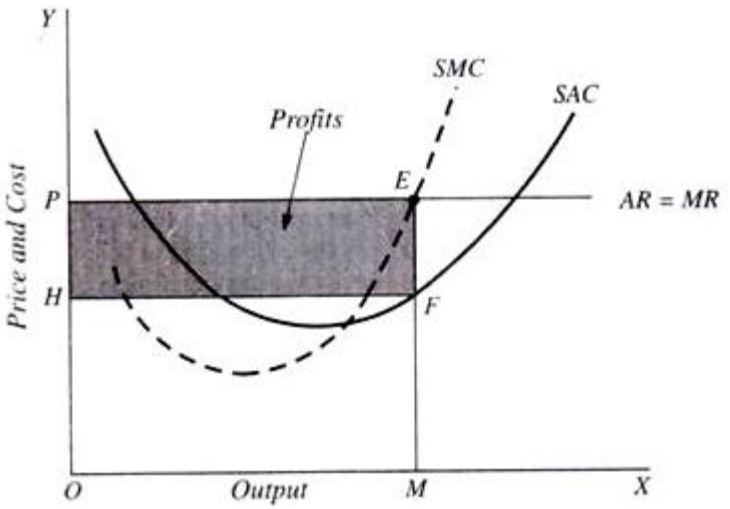

Fig. 3.1.4 (a) Short-run Equilibrium of a firm with Profit

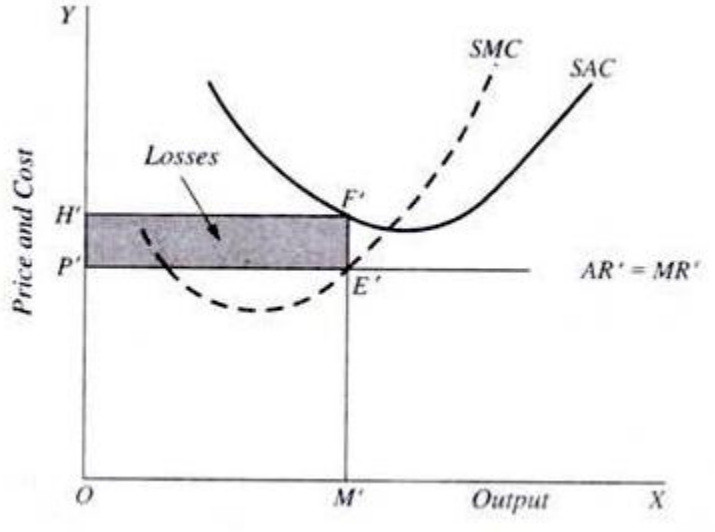

Fig. 3.1.4 (b) Short-run Equilibrium of a firm with Loss

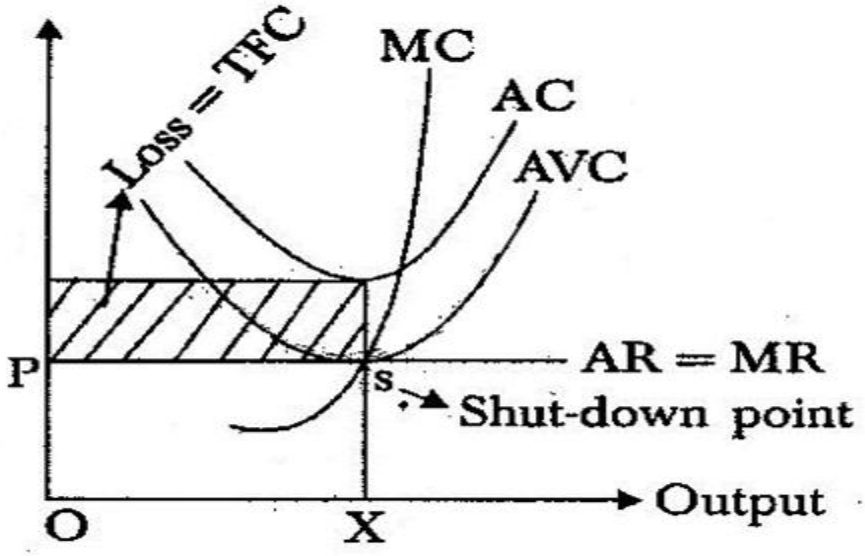

Fig. 3.1.4 (C) Shut-down point of a firm with Loss

3.1.5 Equilibrium of the Industry in Short-Run

Given the market demand and the market supply the industry is in equilibrium at that price which clears the market i.e. at the price at which quantity demanded is equal to quantity supplied. In the figure 3.1.5 the industry is in equilibrium at price P, at which the quantity demanded and supplied is Q. However, this will be a short-run equilibrium, if at the prevailing price firms are making excess profit (panel B of fig. 3.1.5) or losses (Panel C of fig. 3.1.5). In the long-run, firms that make losses and cannot readjust their plant will close down. Those that make excess profit will expand their capacity, while excess profits will also attract new firms into the industry. Entry, exit and readjustment of the remaining firms in the industry will lead to a long-run equilibrium in which firms will just be earning normal profits and there will be no entry or exit from the industry.

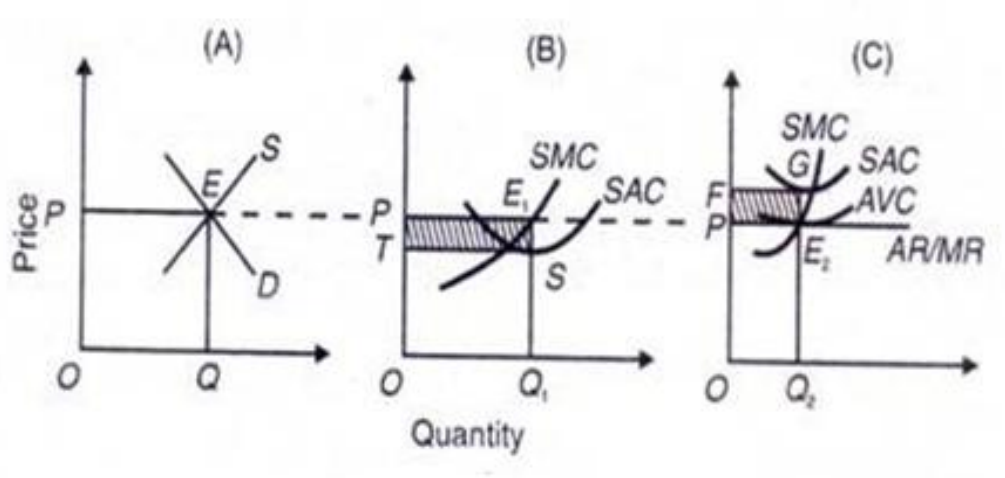

Fig. 3.1.5 Short-run Equilibrium of the Industry

3.1.6 Equilibrium of the Perfectly Competitive Firm in Long-Run

In the long run firms are in equilibrium when they have adjusted their plant so as to produce at the minimum point of their Long-run Average Cost (LAC) curve, which is tangent (at equilibrium point) to the demand curve defined by the market price. In the long run the firms will be earning just normal profits, which are included in the LAC.

If they are making excess profits new firms will be attracted in the industry; this will lead to a fall in price (a down- ward shift in the individual demand curves) and an upward shift of the cost curves due to the increase of the prices of factors as the industry expands.

These changes will continue until the LAC is tangent to the demand curve defined by the market price. If the firms make losses in the long run they will leave the industry, price will rise and costs may fall as the industry contracts, until the remaining firms in the industry cover their total costs inclusive of the normal rate of profit.

In figure 3.1.6 (a) it is shown how firms adjust to their long-run equilibrium position. If the price is P, the firm is making excess profits working with the plant whose cost is denoted by SAC_1. It will therefore have an incentive to build new capacity and it will move along its LAC. At the same time new firms will be entering the industry attracted by the excess profits.

As the quantity supplied in the market increases (by the increased production of expanding old firms and by the newly established ones) the supply curve in the market will shift to the right and price will fall until it reaches the level of P_1 as shown in figure 3.1.6 (b) at which the firms and the industry are in long-run equilibrium. The LAC in figure 3.1.6 (a) is the final-cost curve including any increase in the prices of factors that may have taken place as the industry expanded.

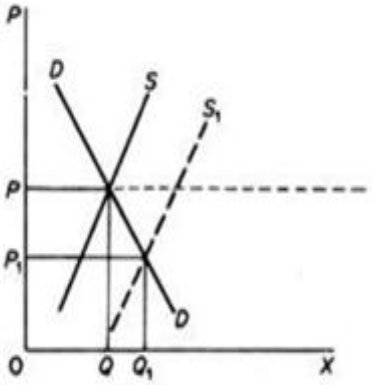

Fig. 3.1.6 (b)

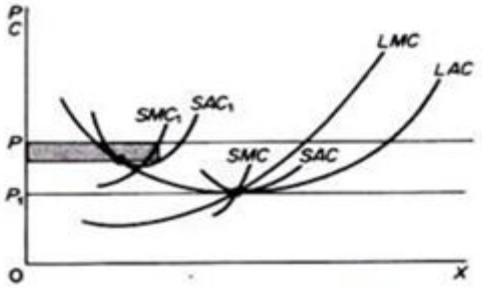

Fig. 3.1.6 (a)

The condition for the long-run equilibrium of the firm is that the marginal cost be equal to the price and to the long-run average cost i.e. LMC = LAC = P.

The firm adjusts its plant size so as to produce that level of output at which the LAC is the minimum possible, given the technology and the prices of factors of production. At equilibrium the short-run marginal cost is equal to the long-run marginal cost and the short-run average cost is equal to the long-run average cost. Thus, given the above equilibrium condition, we have SMC = LMC = LAC = LMC = P = MR.

This implies that at the minimum point of the LAC the corresponding (short-run) plant is worked at its optimal capacity, so that the minima of the LAC and SAC coincide. On the other hand, the LMC cuts the LAC at its minimum point and the SMC cuts the SAC at its minimum point. Thus at the minimum point of the LAC the above equality between short-run and long-run costs is satisfied.

3.1.7 Equilibrium of the industry in the long run:

The industry is in long-run equilibrium when a price is reached at which all firms are in equilibrium (producing at the minimum point of their LAC curve and making just normal profits). Under these conditions there is no further entry or exit of firms in the industry, given the technology and factor prices. The long-run equilibrium of the industry is shown in figure 3.1.7. At the market price, P, the firms produce at their minimum cost, earning just normal profits. The firm is in equilibrium because at the level of output X, LMC = SMC = P = MR. This equality ensures that the firm maximizes its profit. At the price P the industry is in equilibrium because profits are normal and all costs are covered so that there is no incentive for entry or exit. That the firms earn just normal profit (neither excess profits nor losses) is shown by the equality LAC = SAC = P, which is observed at the minimum point of the LAC curve. With all firms in the industry being in equilibrium and with no entry or exit, the industry supply remains stable, and, given the market demand (DD' in figure 3.1.7), the price P is a long-run equilibrium price.

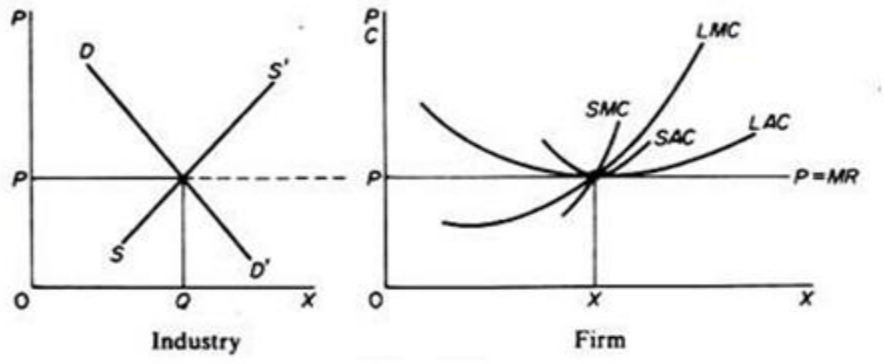

Fig. 3.1.7 Long-run Equilibrium of the Industry

Since the price in the market is unique, this implies that all firms in the industry have the same minimum long-run average cost. This, however, does not mean that all firms are of the same size or have the same efficiency, despite the fact that their LAC is the same in equilibrium.

3.1.8 Measuring producer surplus under perfect competition

Producer's surplus is the difference between the market price at which producers sell the quantity of a commodity and the minimum price at which they would be willing to supply it. In other words **Producer surplus** (PS) is defined as the difference between the actual amount a producer

receives (at market price) by selling a given quantity of a commodity and the minimum amount that he expects to receive for the same quantity of a commodity (indicated by the marginal cost of production) to cover the cost of production. It means it is the excess of money receipts of a producer over the minimum supply price at which he is willing to sell rather than forgo the sale. It is given by area above the supply curve and below the market price as shown in figure 3.1.8. As per definition, Producer Surplus= Revenue- Variable Cost., which is different from profit as Profit = Revenue – (Fixed cost + Variable cost) = Producer Surplus – Fixed Cost. Thus Producer surplus is always greater than profit.

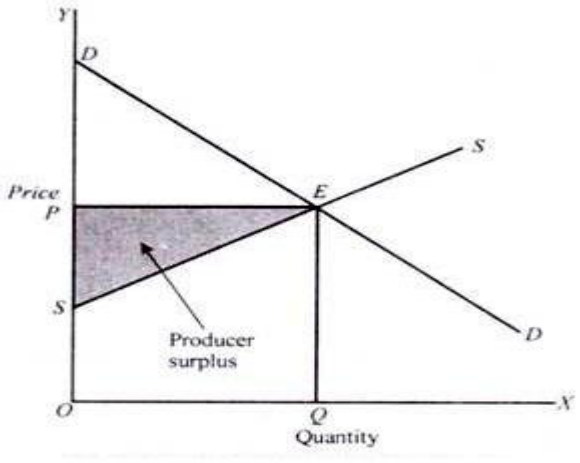

Fig. 3.1.8 The Concept of Producer Surplus

In Figure 3.1.8 where demand curve DD and supply curve SS of a commodity intersect at point E and determine OP as the market price and OQ as the quantity sold and bought. However, as is indicated by the supply curve SS the producers will be ready to supply the earlier successive units at much less than the market price OP. The area OSEQ below the supply curve is indicator of the aggregate supply price of OQ units of the commodity produced and supplied by the producers. On the other hand, the total revenue earned by the producer is equal to the area OPEQ (market price OP x quantity OQ sold). Thus, the producers earn revenue equal to the shaded area SEP more than the aggregate supply price. The excess amount SEP over the aggregate supply price is the aggregate producer surplus earned by the producers. The producer surplus earned by the producers is the measure of benefits obtained by them for producing and exchanging the commodity.

Producer Surplus for a Firm

The following figure 3.1.8.1 shows producer surplus of a perfectly competitive firm. The profit maximizing output is q*, where P = MC (P is the Demand Curve of a perfectly competitive firm i.e. P=AR=MR). The Producer Surplus is given by the area ABCD i.e. the area above the MC (supply) curve and below the firm's demand curve , from zero output to the profit maximizing output q*. The Producer Surplus can also be defined as the difference between the firm's revenue (OAB q*) and its total variable cost (ODC q*). Thus, it can be represented as ABCD = OAB q* - ODC q* as shown in fig. 3.1.8.1.

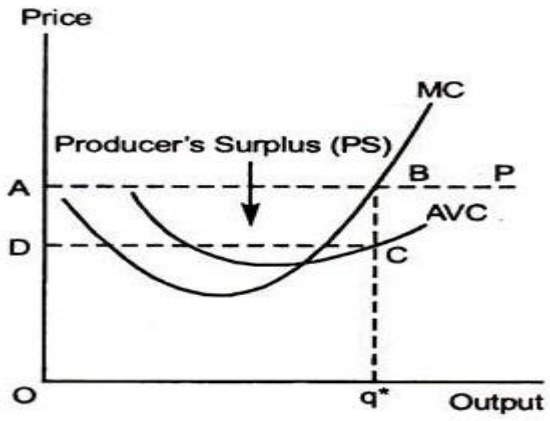

Fig. 3.1.8.1 Producer Surplus of a firm

Producer Surplus for a Market

Producer Surplus for a Market is obtained by summing up the Producer Surplus of all the firms as shown in fig. 3.1.8.2. by the shaded area (APE) . Here, higher cost firms have less producer surplus and lower cost firms have more. When price falls below the minimum of the most efficient firm (the one having the lowest minimum of AVC), no output will be supplied in the market.

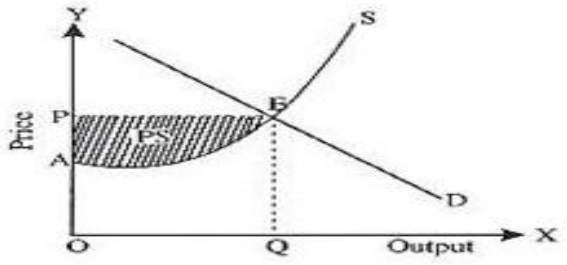

Fig. 3.1.8.2 Producer Surplus of a Market

3.1.9 Summary

Perfect competition is a market structure characterised by a complete absence of rivalry among the individual firms. A market is said to be perfectly competitive provided it has the characteristics like Large Number of Buyers and Sellers, Homogeneity of the Product, Free Entry and Exit of Firms, No Government intervention, Perfect Mobility of the Factors of Production, Perfect Knowledge of the Market, Absence of Transaction Cost.

The demand curve of perfectly competitive firm is horizontal to OX axis as it is a price taker. The firm takes the price determined by the market. Because of the large number of buyers and Sellers and homogeneity of the Product, no single buyer or seller can influence the market price.

The supply curve of the firm in short-run is the increasing portion of its MC curve (upward sloping having positive slope). The horizontal summation of the supply curve of the firms constitutes the industry's supply curve in short-run. However, in long r-run the supply curve horizontal, upward sloping and downward sloping for constant, increasing and decreasing cost industry respectively.

The firm in short-run achieves its equilibrium (price & output decision) at a point where MC=MR and MC curve cut MR curve from below. Corresponding to the equilibrium price and output, the profit and loss of the firm depends on the positioning of its Average Cost curve. If the short-run average cost curve positioned below the average revenue, the firm will earn profit whereas if the short-run average cost curve positioned above the average revenue, the firm will incur loss. Further, under loss situation, if the AVC=AR (or TVC=TR), the firm will shut-down its operation. Given the market demand and the market supply the industry is in equilibrium in

short-run at that price which clears the market i.e. at the price at which quantity demanded is equal to quantity supplied.

In the long run firms are in equilibrium when they have adjusted their plant so as to produce at the minimum point of their Long-run Average Cost (LAC) curve, which is tangent (at equilibrium point) to the demand curve defined by the market price. In the long run the firms will be earning just normal profits, which are included in the LAC. The industry is in long-run equilibrium when a price is reached at which all firms are in equilibrium (producing at the minimum point of their LAC curve and making just normal profits). Under these conditions there is no further entry or exit of firms in the industry, given the technology and factor prices.

Producer's surplus is the difference between the market price at which producers sell the quantity of a commodity and the minimum price at which they would be willing to supply it

The producer surplus of a perfectly competitive firm is given by the area above the MC (supply) curve and below the firm's demand curve i.e. from zero output to the profit maximizing output. The Producer Surplus can also be defined as the difference between the firm's revenue and its total variable cost. The Producer Surplus for a Market is obtained by summing up the Producer Surplus of all the firms. The higher cost firms have less producer surplus and lower cost firms have more.

3.1.10 Self assessment Questions

1. Define Perfect Competition. Discuss the short-run equilibrium of a firm under perfectly competition.

2. Discuss the long-run equilibrium of a firm and industry under perfect competition.

3. Explain the derivation of the supply curve of a perfectly competitive firm and industry in short-run and long-run

4. Discuss the concept producer's surplus of a perfectly competitive firm and market.

5. Write short notes on:

A. Perfect competition

B. Supply Curve of a firm and Industry in Short-run

C. Demand Curve of a perfectly competitive firm

D. Producer's Surplus under Perfect Competition

UNIT-IV

MONOPOLY

4.1 CHAPTER

MONOPOLY

Objectives

After completing this chapter, you will be able to:

- Understand the features of Monopoly
- Understand the Short-run and Long-run equilibrium under Monopoly
- Understand the nature of Supply Curve of Monopoly
- Understand the effect of change in demand and cost on Monopoly equilibrium
- Measure Monopoly Power through various indices
- Understand the concepts of Horizontal and Vertical integration of firms
- Distinguish between Perfect competition and Monopoly

Structure:

4.1.1 Monopoly: Concept
4.1.2 Short-Run Equilibrium under Monopoly
4.1.3 Long-Run Equilibrium under Monopoly
4.1.4 Absence of the Supply Curve in Monopoly
4.1.5 Effect of Shifts in the demand curve in Monopoly
4.1.6 Effect of the change in cost
4.1.7 Measurement of monopoly power and the rule of thumb for pricing,
4.1.8 Horizontal and vertical integration of firms

4.1.1 Monopoly

A Monopoly market has the following features.

1. Single seller but large number of buyers
2. No close substitute of the monopolist's products is available
3. Entry and Exit are restricted.

The Monopolist, unlike perfect competition, is a price maker and hence its demand curve is downward slopping. The price (P) and output (q) gets determined at the point of equilibrium where the two conditions are satisfied such as **1. MC = MR and 2. MC cut MR from below (i.e. slope of MC > slope of MR).** The profit or loss of a firm corresponding to equilibrium point depends on the positioning of short-run Average cost curves as shown in the figures below.

4.1.2 Short-Run Equilibrium under Monopoly

Short-run refers to that period in which the monopolist has to work with given existing plant i.e. fixed factor and hence output can be changed by changing the variable factors. In short-run, the monopolist can enjoy Super Normal Profits (figure-4.1.2), Normal Profits (figure 4.1.2.1) and sustain Losses (figure 4.1.2.2). At equilibrium point the two conditions are satisfied such as **1. MC = MR and 2. MC cut MR from below (i.e. slope of MC > slope of MR).** The profit or loss of a firm corresponding to equilibrium point depends on the positioning of short-run Average cost curves.

Corresponding to equilibrium point E , if the price determined by the monopolist is more than Average Cost (AC), he will get Super Normal Profits at OQ_1 level of output. Thus corresponding to the equilibrium price OA and output OQ_1, the Total Revenue is OQ_1CA and Total Cost is OQ_1DB.Hence, the Profit is BDCA as shown in figure 4.1.2.

Similarly, if the price (AR) determined by the monopolist is is equal to AC, he will get Normal profits corresponding to equilibrium point E (where the equilibrium price is OP output is OM) as shown in figure 4.1.2.1.

It is depicted in figure 4.1.2.2 that the monopolist in short-run may have to incur losses ($PNAP_1$) by the magnitude of difference between total cost (OMNP) and total revenue ($OMAP_1$) corresponding to equilibrium point E where equilibrium price is OP_1 and output is OM. However, in short-run, if the price determined by the monopolist falls (due to depression or fall in demand etc.) below the Average Variable Cost, he will stop production. In other words, the monopolist will continue to produce as long as price covers the variable cost and hence he has to bear the minimum loss equal to fixed costs. Thus, the equilibrium price (P_1) is here equal to average variable cost (AVC) at point A as shown in fig. 4.1.2.2. If the price falls below P_1 he will stop production otherwise he will bear the entire loss of $PNAP_1$.

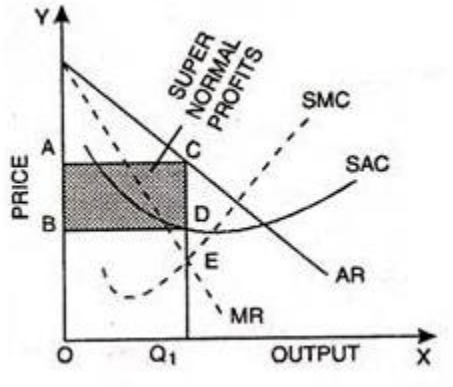

Fig. 4.1.2

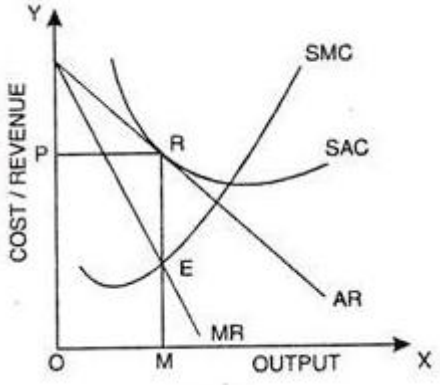

Fig. 4.1.2.1

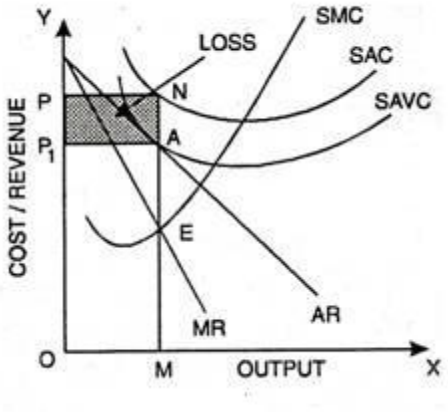

Fig. 4.1.2.2

4.1.3 Long-Run Equilibrium under Monopoly

In the long-run monopoly has the time to expand or adjust his existing plant size at any level which will maximize his profit.

There is no any such guarantee that he will use his existing plant at optimum capacity. What is certain is that the monopolist will not stay in business if he makes losses in the long-run. He will most probably continue to earn supernormal profits even in long-run, given that entry is barred. However, the size of his plant and the degree of utilization of any given plant size depend entirely on the 'market demand'. The monopolist may reach the optimal scale (minimum point of LAC) or remain at sub-optimal scale (falling part of his LAC) or surpass the optimal scale (expand beyond the minimum LAC) depending on the market conditions.

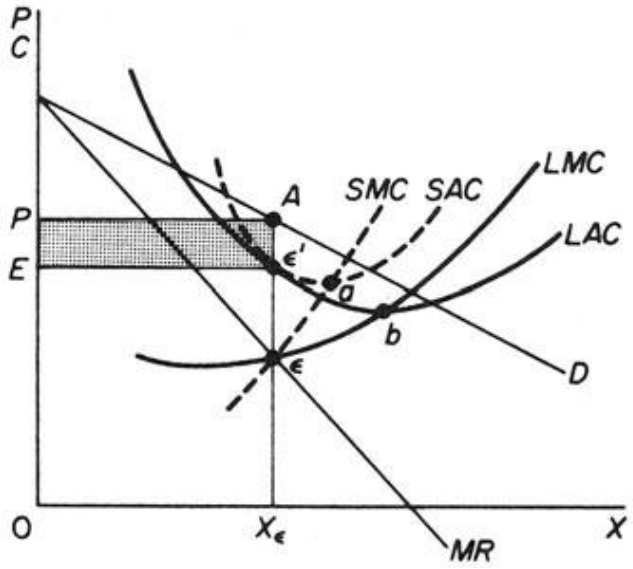

Fig. 4.1.3 Monopolist with suboptimal plant and excess capacity

The figure-4.1.3 depicts the case in which the market size does not permit the monopolist to expand to the minimum point of LAC. In this case not only his plant is of sub-optimal size (in the sense that the full economies of scale are not exhausted) but also the existing plant is underutilized. This is because to the left of the minimum point of LAC the SAC is tangent to the LAC at its falling portion and also because the SMC must be equal to LMC. This occurs at point €., while the minimum LAC is at b and the optimal use of the existing plant is at point a, since it is at the level $€^1$, there is 'excess capacity'.

The following figure 4.13.1 depicts the case where the size of the market is so large that the monopolist, in order to maximize his output, must build a plant larger than the optimal and overutilised it. This is because to the right of the minimum point of LAC the SAC and the LAC are tangent at a point of their positive slope and also because SMC must be equal to LAC. Thus, the plant that maximizes the monopolist's profits leads to higher costs for two reasons such as firstly, because it is larger than the optimal size and secondly, because it is overutilised. This is often the case with public utility companies operating at national level.

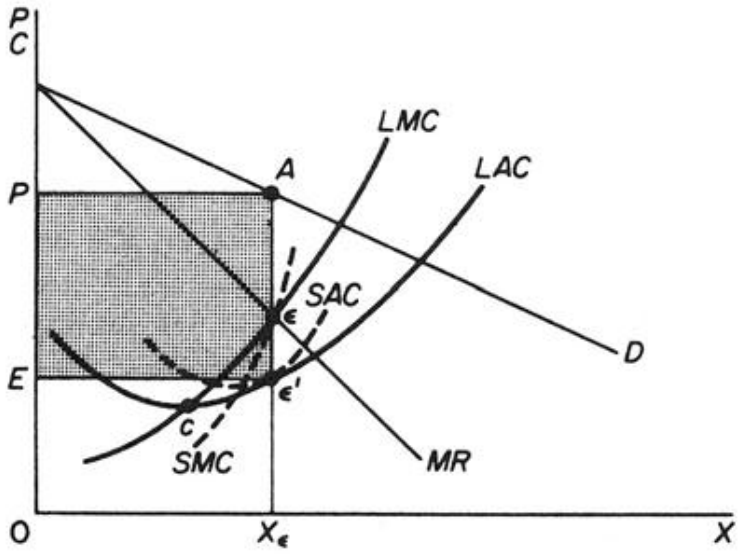

Fig. 4.1.3.1 Monopolist operating in a large market: his plant is larger than the optimal (€) and it is being overutilised (at€[1]).

The following figure 4.13.2 shows the case in which the market size is just large enough to permit the monopolist to build the optimal plant and use it at full capacity.

It should be clear that the emergence of any of the above situations depends on the size of the market (given the technology of the monopolist). There is no certainty that in the long-run the monopolist will reach the optimal scale, as is the case in a purely competitive market. In monopoly there is no market forces similar to those of in pure competition which lead the firms to operate at optimum plant size (and utilize at its full capacity) in the long-run.

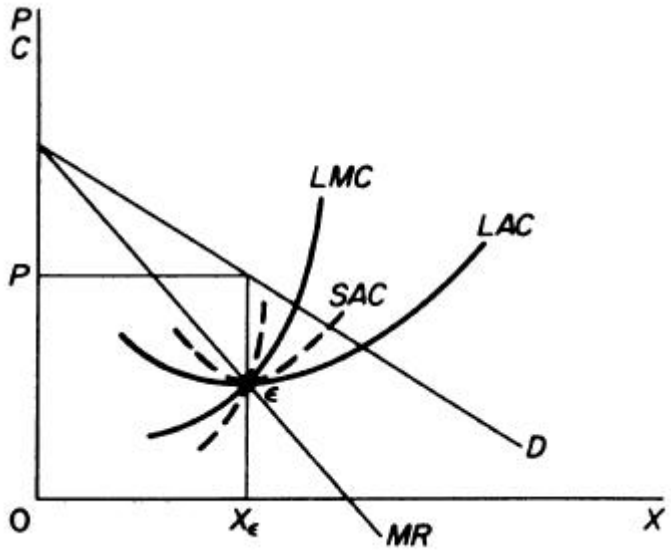

Fig. 4.1.3.2 Optimal use of Plant Size (at point €).

4.1.4 Absence of Supply Curve in Monopoly

1. There is no unique supply curve for the monopolist derived from MC, the same quantity may be offered at different prices depending on the price elasticity of demand as given below:

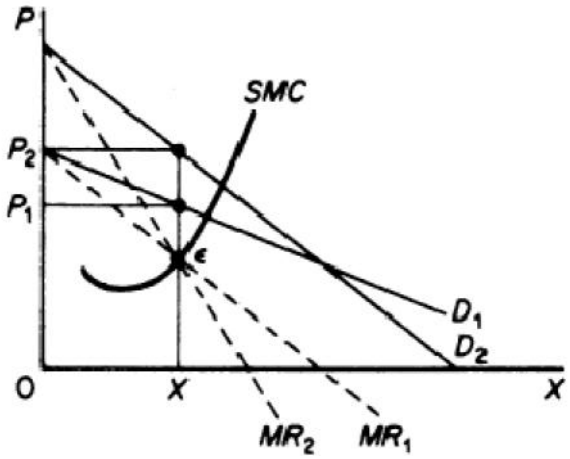

Fig. 4.1.4 Same quantity supplied at different prices

Figure 4.1.4 shows that the same quantity (i.e. OX) is sold or supplied at two different prices (P_1 and P_2) on two different demand (D_1 and D_2) respectively. Thus, there is no unique relationship between price and quantity supplied.

2. Similarly, given the MC of the monopolist, various quantities may be supplied at one price, depending on the market demand and the corresponding MR curve.

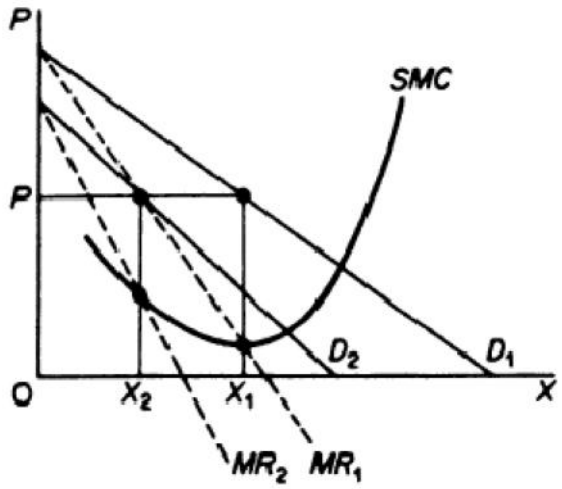

Fig. 4.1.4.1 Different quantities supplied at same prices

Figure 4.1,4,1 shows that given the costs of the monopolist, he would supply OX_1 if the market demand is D_1, while at the same price P, he would supply only OX_2 if the market demand is D_2. Thus, there is no unique relationship between price and quantity supplied.

4.1.5 Effect of Shift in the Demand in Monopoly

An upward shift of the market demand will result in a new equilibrium in which the quantity produced will be larger, but the price may increase, remain constant or decrease. Let us examine the possibilities.

1. In the new equilibrium the price may remain constant while the quantity supplied increases.

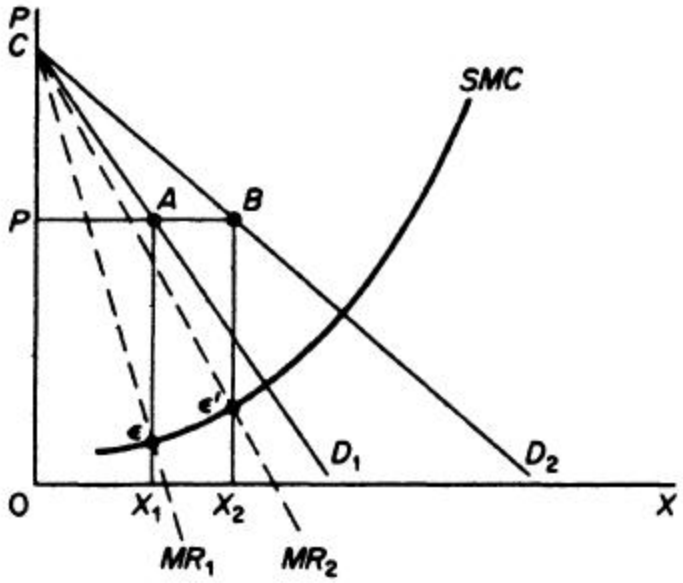

Fig. 4.1.5 Quantity produced is larger but the price remains constant

Figure 4.1.5 shows that assuming D_2 is the new demand curve shifted to the right of D_1, the corresponding MR curve MR_1 and MR_2 also shifted accordingly. Hence, given the MC curve of the monopolist, the new equilibrium position is $€^1$ where the price is the same as before (i.e. P), but the quantity produced is larger ($OX_2 > OX_1$).

As a result of the increase in quantity produced and demanded, the total revenue is found increasing ($OPBX_2 > OPAX_1$) and hence his profit will be larger (PK'MB > PKCA) as the monopolist's SATC will be decreasing over the range between X_1 and X_2 as depicted in figure 4.1.5.1 . Hence, the total excess profit of the monopolist increases if the price remains constant while his demand increases (D_1 to D_2) as shown in the following figure 4.1.5.1.

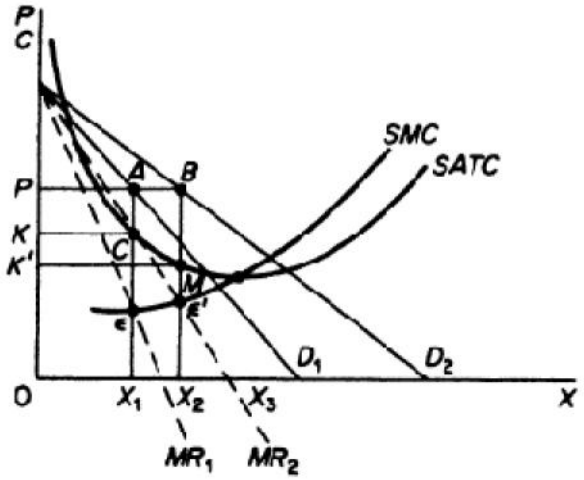

Fig. 4.1.5.1 Profit increases when Demand increases even if price remains constant

2. In the new equilibrium both the quantity and the price of the monopolist may be greater as compared to the initial equilibrium.

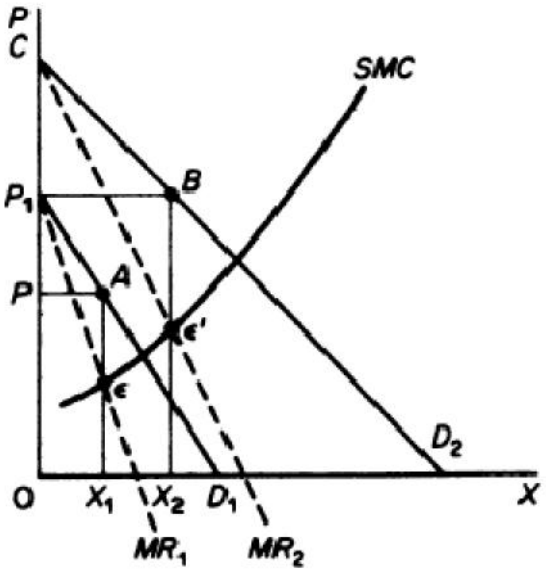

Fig. 4.1.5.2 both the quantity and price are greater than the initial equilibrium.

Figure 4.1.5.2 shows that if the demand shifts to D_2 from D_1 the new equilibrium will be at €[1], at which the price as well as quantity supplied by the monopolist are greater than that of the initial equilibrium i.e. at € as depicted in this figure i.e. $P_2 > P_1$ and $OX2 > OX_1$.

3. In the new equilibrium the price may be lower than the initial while the quantity is larger.

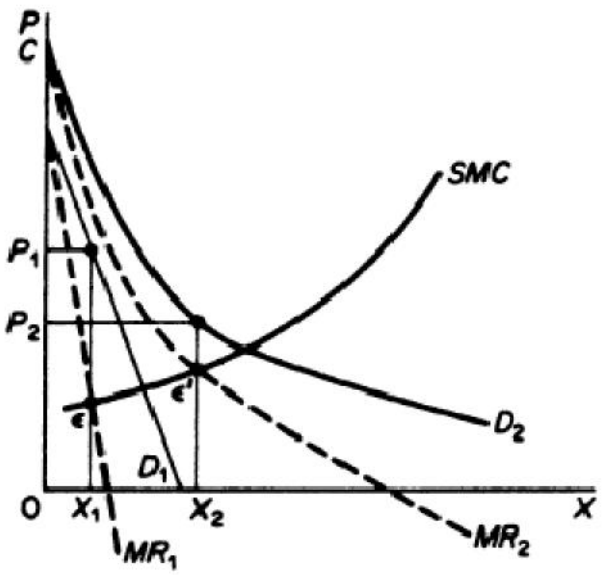

Fig. 4.1.5.3 Price is lower and quantity is larger than the initial equilibrium.

Figure 4.1.5.3 shows that if the demand shifts to D_2 from D_1 the new equilibrium will be at €[1] where the quantity is larger than the quantity at initial equilibrium point € i.e. $OX2 > OX_1$ and further OX2 will be sold at lower price P_2 as compared to initial price i.e. $P_2 < P_1$.

4.1.6 Effect of a Change in Cost

If the fixed costs of the monopolist increase, his short-run equilibrium will not be affected, since his demand is given and his SMC is not affected by changes in fixed costs.

But if the Variable Costs increase, the MC curve of the monopolist will shift upwards to the left with the consequence of a reduction in the output and an increase in the price as depicted in the following figure 4.1.6 where it is observed that due to change in cost (i.e.MC_1 to MC_2) output reduces from X_1 to X_2 and price increases from P_1 to P_2.

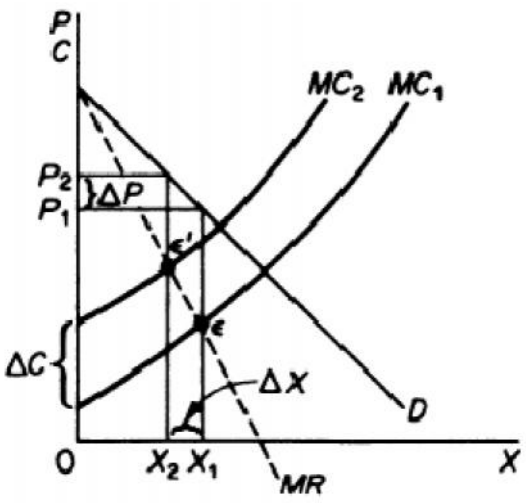

Fig. 4.1.5.3 Quantity reduces and Price increases as Cost increases

4.1.7 Measurement of monopoly power and the rule of thumb for pricing

Monopoly Power-Meaning

The Monopolist is the only seller in the market of his product. As the only seller, he possesses a monopolistic dominance or monopoly power in the market. But the degree of monopoly power is not the same in the case of all monopolies. The monopoly power could be measured by the extent to which price is greater than MC for each firm**. Generally speaking, the less elastic is the demand for a monopolist's product, the more would be his degree of monopoly power, and vice-versa. In other words, a higher degree of monopoly power would be obtained at a smaller value of price elasticity of demand (*e*) and a lower degree of monopoly power at a larger value of *e*. This idea is supported by Prof. A. P. Lerner (1903-82) for measuring the degree of monopoly power.**

Lerner's Index (LI) for measuring Monopoly Power

According to Prof. Lerner, degree of monopoly power in perfect competition is zero as at equilibrium point of a competitive firm P=AR=MR=MC or P = MC or P – MC=0. On the other hand, at the equilibrium point of a monopoly firm P = AR > MR= MC, or, P > MC, or, P – MC= Positive. Thus, according to Prof. Lerner, the larger the positive value of P – MC as a proportion of P, the larger would be the degree of monopoly Power. In other words, the larger the value of **Lerner's Index** (between 0 and 1) the greater the monopoly

power. **Thus, his formula for measuring the degree of monopoly power is called as Lerner's Index arithmetically shown below**

Lerner's Index of Monopoly Power = $\frac{P-MC}{P}$

From the above formula it is observed that under perfect competition, the value of this index is zero as P – MC= 0 whereas in Monopoly, the value of this index is Positive as P > MC.

Let us find the relationship between Lerner's Index and the price –elasticity of demand for the product.

Lerner's Index = $\frac{P-MC}{P} = \frac{P-MR}{P}$ **(as MR = MC at equilibrium)**

$$= \frac{P-MR}{P} = \frac{P-P(1-\frac{1}{e})}{P} \quad [\text{as MR} = P(1-\frac{1}{e})]$$

$$= \frac{P-P(1-\frac{1}{e})}{P} = \frac{P[1-1+\frac{1}{e}]}{P} = \frac{1}{e}$$

Thus, the Lerner's Index of Monopoly Power is equal to the reciprocal of the numerical value of price elasticity of demand (e) for the product of a firm, which shows that the less elastic the demand for the product, the more would be the degree of monopoly power and vice-versa. In other words, the smaller the price-elasticity of demand (i.e. the value of e), smaller would be the response of demand for the product in response to a change in its price and the larger would be the power of the monopolist to charge a price in excess of MC, i.e. the larger would be the value P – MC and hence the higher will be the value of Lerner's Index.

Rule of Thumb for Pricing

It aims at translating the condition MR=MC into a rule of thumb that can be more easily applied in practice. The rule of thumb for pricing can be derived as follows.

MR = $\frac{\Delta R}{\Delta Q} = \frac{\Delta(PQ)}{\Delta Q}$ ---------- (1) where, R=Total revenue, P=Price per unit, Q= quantity sold

Producing one more unit of out brings in the revenue as (1)(P)=P. With downward sloping demand, producing and selling one more unit results in small drop in price i.e. $\frac{\Delta P}{\Delta Q}$, which will reduce revenue (from all units sold) and hence the change in revenue will be Q ($\frac{\Delta P}{\Delta Q}$). Thus,

MR= P + $Q\frac{\Delta P}{\Delta Q}$ = P + P ($\frac{Q}{P}$)($\frac{\Delta P}{\Delta Q}$) ---------- (2)

Price elasticity of demand (e)= ($\frac{P}{Q}$)($\frac{\Delta Q}{\Delta P}$) ---------- (3)

Thus, ($\frac{Q}{P}$)($\frac{\Delta P}{\Delta Q}$) =$\frac{1}{e}$ ---------- (4)

MR= P + P ($\frac{Q}{P}$)($\frac{\Delta P}{\Delta Q}$) = P + P ($\frac{1}{e}$) ---------- (5)

The profit (®) maximization condition reveals that ® **is maximized where MR=MC. Thus,**

P + P ($\frac{1}{e}$) = MC

$\Rightarrow$ $\frac{\mathrm{P-MC}}{\mathrm{P}} = \frac{1}{e}$

$\Rightarrow$ $\mathbf{P} = \frac{MC}{1+(\frac{1}{e})}$ ---------- **(6)**

It refers to the Pricing for any firm with monopoly power where the Markup is small if price elasticity of demand (e) is large and the Markup is large if price elasticity of demand (e) is small which can be accessed from equation (6).

$\frac{\mathrm{P-MC}}{\mathrm{P}}$ is the markup over MC as a percentage of price. The markup should equal the inverse of the elasticity of demand. As a matter of the rule of thumb, Price (P) is expressed directly as the markup over Marginal Cost (MC) i.e. $\mathbf{P} = \frac{MC}{1+(\frac{1}{e})}$.

For example, Assuming e = - 4, MC= 9, $\mathbf{P} = \frac{MC}{1+(\frac{1}{e})} = \frac{9}{1+(\frac{1}{-4})} = \frac{9}{0.75}$ **= Rs.12**

In Monopoly, P> MC and the price is larger than MC by an amount that depends inversely on the elasticity of demand. If demand is very elastic, there is little benefit to being a

monopolist whereas if demand is inelastic monopolist can increase revenue by decreasing quantity and increasing price.

Monopoly power, however, does not guarantee profits as Profit **(®)** depends on average cost relative to price: ® = Q (P - AC) and hence a firm may have more monopoly power but lower profits due to high average costs

Sources of Monopoly Power

Some firms have considerable monopoly power whereas others have little or none as the monopoly power is determined by ability to set price higher than marginal cost. A firm's monopoly power, therefore, is determined by the firm's elasticity of demand. The less elastic the demand curve, the more will be the monopoly power a firm. However, the degree of monopoly power determined by the following three sources:

1) Elasticity of market demand
2) Number of firms in market
3) The interaction among firms

Elasticity of Market Demand

In pure monopoly (with one firm) there is no difference between the elasticity of firm's demand and the elasticity of market demand. Therefore, in this case, the degree of monopoly power of the firm is determined completely by elasticity of market demand for his product. However, in real world situation pure monopoly is found rare. Thus, with more firms (producing close substitute products), individual demand may differ from market demand. The demand for a firm's product is more elastic than the market elasticity of demand.

Number of Firms

The number of firms producing the product is a determinant of the elasticity of demand for a firm's product and the elasticity of demand in turn determines the degree of its monopoly power. The monopoly power of a firm falls as the number of firms increases. The more important are the number of firms with significant market share. The market is highly concentrated if only a few

firms account for most of the sales. Thus, firms would like to create barriers to entry to keep new firms out of market so as to gain more monopoly power.

Interaction among firms

If there are several firms producing the close substitute products, then the monopoly power enjoyed by each of them would depend upon the interactions among them. If the firms compete aggressively, then they would undercut one another's prices in order to increase their respective market shares. Such aggressive competition among firms may reduce the prices of the products nearly top the level of competitive price. Hence, in this case, the degree of monopoly power of the firms would be relatively small. On the other hand, the firms might decide not to compete among themselves, rather they might collude. In this case, collusion among the firms would restrict their outputs and increase their prices. Thus, here, the degree of their monopoly power would also be high. The collusion may behave almost like one firm (giving rise to multi-plant monopoly). In such a case, the degree of monopoly power would be to the highest possible extent.

It can thus be concluded that the monopoly power arises from the three sources such as Elasticity of market demand, Number of firms in market and The interaction among firms.

Difficulties in obtaining the Lerner Index

a) The price elasticity of demand of a firm is equal to that of market in pure monopoly and hence if the number of firms is more it is very difficult to define elasticity rather elasticity can be inferred for each firm and hence monopoly power may not be measured accurately.
b) It is difficult to obtain the accurate information on MC and hence it can only be inferred which may not be helpful to measure monopoly power accurately.
c) It is difficult to measure the monopoly power of a firm who is a monopolist at home and perfect competitor abroad.

Concentration Ratios (CR) as Measures of Monopoly Power:

In a industry there exist some smaller firms and some larger firms in the sense that the smaller firms have relatively smaller shares in the total industry sales (or profits or assets), and the larger firms have relatively larger shares. The sales (or profits or assets) may be more concentrated in a few firms of the industry or such concentration may be less. Thus, the size of largest firm's share or the size of smallest firm's share in total industry sales is known as the Concentration Ratio. The value of Concentration Ratio (CR) ranges from 0 to 1 (0 being lowest and 1 being highest).

In perfect competition, the concentration of sales is absent. But in monopoly the sales tend to concentrate on a few large firms and in case of pure monopoly sales concentrate to only one firm.

The cumulative percentage share of sales of the firms if plotted in a figure against the number of firms from largest to smallest, we obtain the concentration curve which reveals the magnitude of concentration of sales of firms in total.

However, the comparison of the concentration ratio of one firm with others possesses certain difficulty and hen determination of monopoly power is ambiguous. Further the concentration ratio calculated based on one parameter may not reflect the monopoly power of a firm if the firm is having more concentration on other parameters. The concentration ratio estimation does not take into account the number of firms in the industry while estimating the CR for different industries. The concentration ratio considers the domestic sector not the foreign sector even though the domestic sector often affected by policies of foreign sector.

Herfindahl Index (HI) for Measuring Monopoly Power:

The Herfindahl Index (named after Orris C. Herfindahl) corrects some of the major problems Concentration Ratio (CR) method for measuring monopoly power. The HI measures the market concentration in a way that gives a great deal of weight to the share of the largest one or two firms in the market. It does so by squaring the percentage market share of each firm in the market. The HI is represented as follows:

HI= $S_1^2 + S_2^2 + S_3^2 + \text{-------} + S_n^2 = \sum_{i=1}^{n} S_i^2$

Where S_i = Share of i th firm (i=1, 2, 3,------n) in the industry

If HI= 1 $\Rightarrow$ The market is a Pure Monopoly (single seller)

If HI= 0 ⇒ The market is Perfectly Competitive

If there are n firms in an industry having equal shares, the share of each firm would be $\frac{1}{n}$ and hence in this case HI= $\frac{1}{n}$ i.e. HI is the reciprocal of the number of firms.

The HI can be represented as HI= $n\delta^2 + \frac{1}{n}$

Thus, HI depends on two things viz. the variance of the market shares and the number of firms. If the market share is equally distributed among the firms (i.e. δ^2=0), the measure of monopoly power which is given by the HI, would assume the value $\frac{1}{n}$ and this is also the minimum value of the HI for a given *n*. If *n* is large and δ^2=0, the value of HI is small. On the other hand if *n* =1 and δ^2=0, the value of HI=1 (maximum value of HI) found in the case of pure monopoly. Thus the value of HI lies between $\frac{1}{n}$ and 1 ($\frac{1}{n} \leq$ HI ≤ 1) and a larger value of HI indicates a greater monopoly power.

4.1.8 Horizontal and Vertical integration of Firms

Horizontal integration is the process of a company increasing production of goods or services at the same part of the supply chain. Horizontal integration contrasts with Vertical integration, where companies integrate multiple stages of production of a small number of production units.

Difference between Horizontal and Vertical Integration

Growth and expansion are the two needs of every firm, irrespective of its size and nature. Firms can grow and expand themselves by way of integration. There are two major forms of integration, i.e. Horizontal Integration and Vertical Integration. **Horizontal Integration** is a kind of business expansion strategy, wherein the company acquires same business line or at the same level of value chain so as to eliminate competition to a greater extent. Conversely, **Vertical Integration** is used to rule over the entire industry by covering the supply chain. It implies the integration of various entities engaged in different stages of the distribution chain.

Comparison between Horizontal and Vertical Integration

Basis for Comparison	Horizontal Integration	Vertical Integration
Meaning	When two firms combine, whose products and production level is same, then this is known as	Vertical Integration is when a firm takes over another firm or firms that

	Horizontal Integration.	are at different stage on the same production path.
Objective	Increasing the size of the business	Strengthening the supply chain
Consequence	Elimination of competition and achieving maximum market share	Reduction of cost and wastage
Capital requirement	Higher	Lower
Self- Sufficiency	NO	Yes
Strategy used to exercise control over	Market	Industry

Horizontal Integration

The merger of two or more firms, which are engaged in the same line of business and their activity level, is also same; then this is known as Horizontal Integration. The Product may include complementary product, by-product or any other related product, competitive product or entering into the product's repairs, services and maintenance section.

Horizontal Integration reduces competition between firms in the market; as if the producers of the product get combined they can create a Monopoly. However, it can also create an oligopoly if there are still some independent manufacturers in the market.

It is a tactic used by most of the companies to expand its size and achieve economies of scale due to increased production level. This will help the company to approach new customers and market. Moreover, the company can also diversify its products and services.

Some of the examples of horizontal integration are the acquisition of Instagram by Facebook and Burger King by McDonald's and Integration of Exxon and Mobil, Oil companies to increase market dominance is also an example of horizontal integration.

Vertical Integration

Vertical Integration is between two firms that are carrying on business for the same product but at different levels of the production process. The firm opts to continue the business, on the same product line as it was done before integration. It is an expansion strategy used to gain control over the entire industry. There are two forms vertical integration such as Forward Integration and

Backward Integration. Forward Integration: If the company acquires control over distributors, then it is downstream or forward integration. Backward Integration: When the company acquires control over its supplier, then it is upstream or backward integration.

The cause of integration is to strengthen the production-distribution chain and to minimize the cost and wastage of products at various levels. The integration also enables the company to keep upstream and downstream profits and eliminates intermediaries.

Apple is the best example of Vertical integration; it is the biggest and a renowned manufacturer of Smart phones, laptops and so on. It controls the whole production and distribution process itself, from the beginning to the end. Another example of this is Alibaba, a Chinese e-commerce company that owns the entire system of payment, delivery, search engine and much more. Firms like Mafatlal, National Textile Corporation etc. have opened up retail stores owned by them, in order to have an effective control over distribution activities are also some of the examples of vertical integration.

Thus from the above discussion it can be understood that Integration strategy is used by the firms to increase market share, become more diversified, eliminating the cost of developing new product and introducing it to the market, minimizing competition by taking over competitor's business etc.

4.1.9 Differences between Monopoly and Perfect Competition

Similarities

- In both the markets the firm has a single goal, that is Profit Maximization.
- In both the markets the owner of the firms is also the manager-entrepreneur.
- In both markets the cost conditions are such as to give rise to U-shaped cost curves both in the short-run and long-run.
- In both the markets decisions are taken by applying the marginalistic rule i.e. MC=MR.

Differences

- In perfect Competition, products are homogeneous but in monopoly it may not be homogeneous.

- In perfect competition there is large number of sellers but in monopoly there is a Single seller.
- The demand curve of a firm in perfect competition is perfectly elastic (horizontal), showing that the firm is price taker. But in monopoly the demand curve of the firm (which is also the demand curve of the industry) is downward sloping showing that the firm is price maker.
- In perfect competition there is free entry and exit, but in monopoly entry is restricted by definition.
- The only decision (or policy variable) of the firm in perfect competition is the determination of its output. But the monopolist can determine either his output or price, not both, since once one of this policy variable is decided the other is simultaneously determined.
- Under perfect competition price equals marginal cost (P=MC=MR) at the equilibrium output, but in monopoly equilibrium price is greater than marginal cost (P>MC). Thus, in a perfectly competitive market as price equals marginal cost, firms earn an economic profit of zero. But in a monopoly, the price is set above marginal cost and hence the firm earns a positive economic profit. Perfect competition produces an equilibrium in which the price and quantity of a good is economically efficient.
- The price elasticity of demand in equilibrium may assume any value in a perfectly competitive market. In monopoly the price elasticity (e) must be greater than unity (e >1) in equilibrium, because if e < 1, the monopolist can increase his revenue by increasing his price.
- While an individual firm under perfect competition can attain equilibrium only under increasing cost conditions, under monopoly it can attain equilibrium under any cost condition.

While in perfect competition, equilibrium is possible only when marginal cost is rising at the point of equilibrium, in Monopoly, equilibrium can be realized whether marginal cost is rising, remaining constant or falling at the equilibrium output. This is so because the second order condition of equilibrium.i.e.MC curve should cut MR curve from below at equilibrium point can be satisfied in monopoly in all the three cases, whereas in perfect

competition the second order condition is fulfilled only when MC curve is rising at equilibrium.

The following figure 4.1.9 shows the equilibrium position of a perfectly competitive firm at point E where MC is rising and MR is horizontal to OX axis. It earns PEFG profits by selling OQ output at OP price.

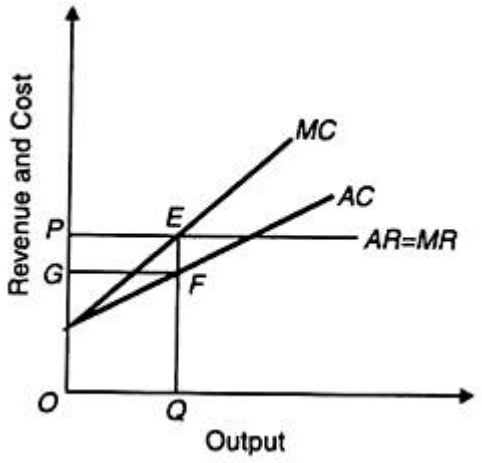

Fig 4.1.9 Equilibrium of a perfectly competitive firm with rising MC

Under Monopoly, the firm can be in equilibrium with rising, falling or constant MC curve as shown in Panel (A), (B) and (C) of the figure 4.1.9.1 respectively.

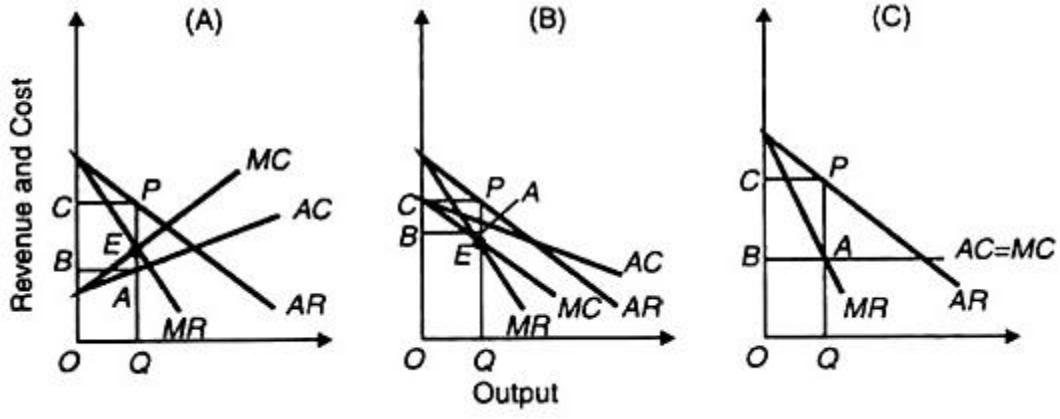

Fig 4.1.9.1 Equilibrium under Monopoly with rising, falling and constant MC

The three equilibrium situations are depicted in figure 4.1.9.1. Panel (A) shows monopoly equilibrium under increasing cost condition where the rising MC curve cuts the MR curve fro below at point E. In panel (B) a downward slopping MC curve cuts MR curve from below at point E, while in Panel (C) a horizontal MC (=AC) curve cuts MR curve from below at point A. In these three situations Op is determined at which OQ output is sold. But the output OQ and profits PABC are different in each situation from the other.

- In Monopoly equilibrium price is higher and output is lower than that of under perfect competition.

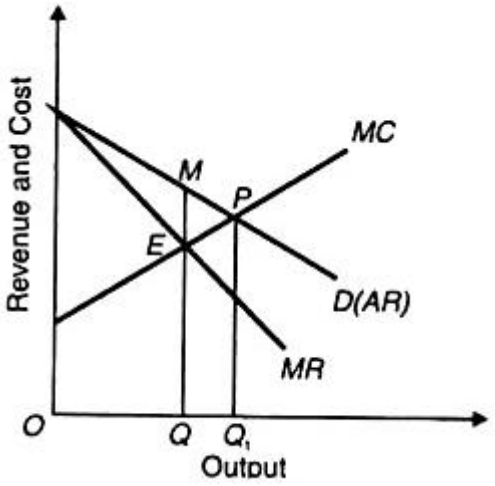

Fig 4.1.9.2 Price & Output under Monopoly and Perfect competition

Figure 4.1.9.2 shows that Monopoly equilibrium achieves at point E where OQ and OM are the equilibrium output and price respectively. Similarly, under perfect competition equilibrium achieves at point P where OQ_1 and OP are the equilibrium output and price respectively. It is observed that the monopoly output is less than perfect competition i.e. $OQ_1 > OQ$ and Price in monopoly is higher than perfect completion i.e. $Q_1P < OM$.

- The firm in perfect competition produces at optimum cost in long-run equilibrium that is at the minimum point of the LAC curve, there are neither unexhausted economies of scale nor diseconomies of large scale production. But in monopoly there is no certainty

that the monopolist will produce at minimum LAC. He may never reach the lowest point of the LAC or he may overshoot it, depending on the market size.

- The supply curve of a purely competitive firm is uniquely determined i.e. the increasing portion of its MC curve laying above the minimum point of its AVC curve. But in monopoly the supply curve is not uniquely determined as the same quantity may be offered at different prices or the same price may be charged for different quantities, depending on the demand in the market. Thus, the monopolist's MC curve is not its supply curve.
- In perfect competition there are no abnormal (or supernormal) profits in long-run. But in Monopoly abnormal or supernormal profits are usually earned both in short-run and long-run.
- Monopolist can practice price discrimination to maximize profits but a perfectly competitive firm cannot do so.

4.1.10 Summary

A Monopoly market has the features of Single seller but large number of buyers, No close substitute of the monopolist's products is available and Entry and Exit are restricted. The Monopolist, unlike perfect competition, is a price maker and hence its demand curve is downward slopping.

The price and output gets determined at the point of equilibrium where the two conditions are satisfied such as MC = MR and MC cut MR from below (i.e. slope of MC > slope of MR). The profit or loss of a firm corresponding to equilibrium point depends on the positioning of short-run Average cost curves.

In the long-run monopoly has the time to expand or adjust his existing plant size at any level which will maximize his profit. There is no any such guarantee that he will use his existing plant at optimum capacity. What is certain is that the monopolist will not stay in business if he makes losses in the long-run. He will most probably continue to earn supernormal profits even in long-run, given that entry is barred. However, the size of his plant and the degree of utilization of any given plant size depend entirely on the 'market demand'.

There is no unique supply curve for the monopolist derived from MC, the same quantity may be offered at different prices depending on the price elasticity of demand. Similarly, given the MC of the monopolist, various quantities may be supplied at one price, depending on the market demand and the corresponding MR curve.

An upward shift of the market demand will result in a new equilibrium in which the quantity produced will be larger, but the price may increase, remain constant or decrease in the new equilibrium compared to the initial equilibrium.

If the fixed costs of the monopolist increase, his short-run equilibrium will not be affected, since his demand is given and his SMC is not affected by changes in fixed costs. But if the Variable Costs increase, the MC curve of the monopolist will shift upwards to the left with the consequence of a reduction in the output and an increase in the price.

The Monopolist is the only seller in the market of his product. As the only seller, he possesses a monopolistic dominance or monopoly power in the market. But the degree of monopoly power is not the same in the case of all monopolies. The monopoly power could be measured by the extent to which price is greater than MC for each firm**. Generally speaking, the less elastic is the demand for a monopolist's product, the more would be his degree of monopoly power, and vice-versa. This idea is supported by Prof. A. P. Lerner (1903-82) for measuring the degree of monopoly power. According to Lerner's Index (LI) the larger the positive value of P – MC as a proportion of P, the larger would be the degree of monopoly Power. In other words, t**he larger the value of **Lerner's Index** (between 0 and 1) the greater the monopoly power**.**

The degree of monopoly power determined by the three sources such as Elasticity of market demand, Number of firms in market and the interaction among firms

The monopoly power can also be measured by Concentration Ratio (CR) and Herfindahl Index (HI). The size of largest firm's share or the size of smallest firm's share in total industry sales is known as the Concentration Ratio. The value of Concentration Ratio (CR) ranges from 0 to 1 (0 being lowest and 1 being highest). The Herfindahl Index (HI) corrects some of the major problems Concentration Ratio (CR) method for measuring monopoly power. The HI measures

the market concentration in a way that gives a great deal of weight to the share of the largest one or two firms in the market. It does so by squaring the percentage market share of each firm in the market. A larger value of HI indicates a greater monopoly power. The value of HI=1 (maximum value of HI) found in the case of pure monopoly.

There are two major forms of integration, i.e. Horizontal Integration and Vertical Integration. Horizontal Integration is a kind of business expansion strategy, wherein the company acquires same business line or at the same level of value chain so as to eliminate competition to a greater extent. Conversely, Vertical Integration is used to rule over the entire industry by covering the supply chain. It implies the integration of various entities engaged in different stages of the distribution chain.

There exist certain similarities and differences between perfect completion and Monopoly. However, amongst many differences, one of the important differences is that in Monopoly equilibrium price is higher and output is lower than that of under perfect competition

4.1.11 Self Assessment Questions

1. Define Monopoly. Discuss the conditions of short-run equilibrium under monopoly.
2. Discuss the Long-run equilibrium mechanism under monopoly.
3. Do you think there is absence of supply curve in monopoly? Justify.
4. Discuss the effect of Shift in demand on the initial equilibrium of monopoly.
5. Define Monopoly Power. Discuss different methods of its measurement.
6. Distinguish Between horizontal and vertical integration of firms.
7. Distinguish between perfect competition and Monopoly.
8. Write short notes on:
    A. Monopoly
    B. Effect of change in Cost on initial monopoly equilibrium
    C. **Lerner's Index**
    D. Concentration Ratio (CR)
    E. Herfindahl Index
    F. Horizontal Integration and Vertical Integration of firms

UNIT-V

IMPERFECT COMPETITION

5.1 CHAPTER

MONOPOLISTIC COMPETITION

Objectives

After completing this chapter, you will be able to:

- Understand the features of Monopolistic Competition
- Understand the Short-run equilibrium of the firm under Monopolistic Competition
- Understand the Group or Long-run equilibrium and economic efficiency under Monopolistic Competition

Structure:

5.1.1 Imperfect Competition

Imperfect competition refers to those market structures that fall between perfect competition and pure monopoly. Imperfect competition includes industries in which firms have competitors but do not face so much competition. Broadly there are two types of Imperfectly Competitive Markets such as Oligopoly (Only a few sellers, each offering a similar or identical product to the others) and Monopolistic Competition (Many firms selling products that are similar but not identical. This chapter deals with the Monopolistic Competition

5.1.2 Monopolistic Competition

The Monopolistic competition is regarded as a happy blending of perfect competition and monopoly. In other words, monopolistic competition includes certain feature of perfect competition and certain feature monopoly. The concept of monopolistic completion has been

introduced in the literature by Prof. Chamberlin in his famous book "The Theory of Monopolistic Competition". The basic assumptions of monopolistic competition have resemblance with those of perfect completion with the exception of product homogeneity. Product differentiation is the important aspect of monopolistic competition.

Characteristics

The monopolistic competition is a form of market that characterizes a number of firms/groups that are familiar to consumers in their day-to-day lives. Monopolistic competition characterizes an industry (i.e. Group) in which many firms offer products or services that are differentiated but close substitutes. Barriers to entry and exit in the industry are low, and the decisions of any one firm do not directly affect those of its competitors. All firms have the same, relatively low degree of market power; they are all price makers. In the long run, demand is highly elastic, meaning that it is sensitive to price changes. In the short run, economic profit is positive, but it approaches zero in the long run. Firms in monopolistic competition tend to advertise (a component of selling cost) heavily. Monopolistic competition has a downward sloping demand curve. Thus, just as for a pure monopoly, its marginal revenue will always be less than the market price because it can only increase demand by lowering prices, but by doing so, it must lower the prices of all units of its product. Hence, monopolistically competitive firms maximize profits or minimize losses by producing that quantity where marginal revenue equals marginal cost, both over the short run and the long run.

Assumptions

The conditions or assumptions which prevail in a monopolistically competitive market can be summarized as follows:

i) There are large number of sellers and buyers in the group
ii) The products of the sellers are differentiated, yet they are close substitute of one another
iii) Flexibility in the entry and exit of firms in the group
iv) The goal of the firm is profit maximization, both in the short-run and long-run
v) The prices of factors and technology are given

vi) The firm is assumed to behave as if it knew its demand and cost curves with certainty

vii) The firms in the market do not consider the reactions of their rivals when choosing their product prices or annual sales targets

viii) Neither the opportunity nor the incentive exists for the firms in the market to cooperate in ways that decrease competition

Each firm may be thought of as being a monopolist producing a good which is not produced by others. But this monopolist faces competition from others producing a good which is a close substitute of his product. The monopolistic competition can therefore be regarded as a situation where different monopolists are competing with one another. Since each firm is selling a differentiated product, each firm informs the consumers about the distinctive features or the special characteristics of his own product. As a result, selling cost or advertising expenditure is necessary in monopolistic competition.

The monopolistic competition has a fundamental feature of product differentiation. Due to the existence of product differentiation, economic rivalry typically takes place in the forms of non-price competition such as product quality, services associated to a product, location and advertising & packaging etc..

The equilibrium (price and output decision) conditions of a firm (short-run) and of the group (long-run) under monopolistic competition can be discussed as follows:

5.1.3 Equilibrium of a monopolistically competitive firm in Short-run

The equilibrium of a firm under monopolistic competition in short run has a resemblance with that of a monopolist. In the short run, a monopolistically competitive firm maximizes profit or minimizes losses by producing that quantity that corresponds to when marginal revenue equals marginal cost. If average total cost is below the market price, then the firm will earn an economic profit and vice-versa as follows.

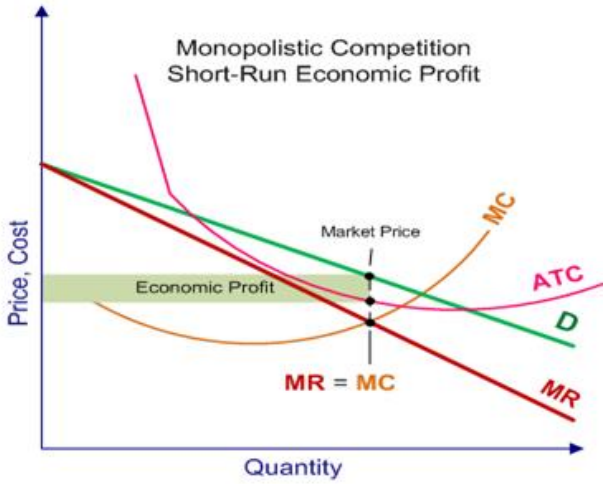

Fig. 5.1.3 Monopolistic Competition- Short-run Economic Profit

- D = Market Demand (AR)
- ATC = Average Total Cost (AC)
- MR = Marginal Revenue
- MC = Marginal Cost

Figure 5.1.3 shows that the market price charged by the monopolistic competitive firm is equal to the point on the demand curve where MR = MC. Thus, Short-Run Profit = (Price - ATC) x Quantity. If the ATC is above the market price, then the firm will incur losses (shown in fig.5.1.3.1) which can be estimated as Short-Run Loss = (ATC - Price) x Quantity. It will still minimize losses by producing that quantity where marginal revenue equals marginal cost, but eventually the firm will either have to reverse the losses, or it will have to exit the industry.

Fig. 5.1.3.1 Monopolistic Competition- Short-run Loss

5.1.4 Group Equilibrium (Long-run) under monopolistic competition & efficiency

In the case of group equilibrium, the MC=MR is not sufficient condition for profit maximization though it is a necessary condition for equilibrium. The group or industry equilibrium in long run is possible when each firm is earning only normal profits, that is, the point where AR=AC for each firm. This is so because, if the existing firms earn more than normal profits, new firms will enter into the industry. This will reduce the volume of profits of the existing firms. Entry will continue until all firms earn only normal profits. The situation of group equilibrium can be analyzed with the help of the figure 5.1.4 given below.

Figure 5.1.4 shows that the firm is in equilibrium where AR (D) = ATC and MR=MC. It means the equilibrium of firms is attained prior to the minimum point of ATC even though on the falling portion of ATC. This property of equilibrium under monopolistic competition is known as the **excess capacity** as depicted figure 5.1.4. This means that under monopolistic competition excess capacity remains in each firm in the sense that more output can be produced at a lower cost. Thus excess capacity remains under monopolistic competition which can be utilized if some firms eliminated from the group or industry.

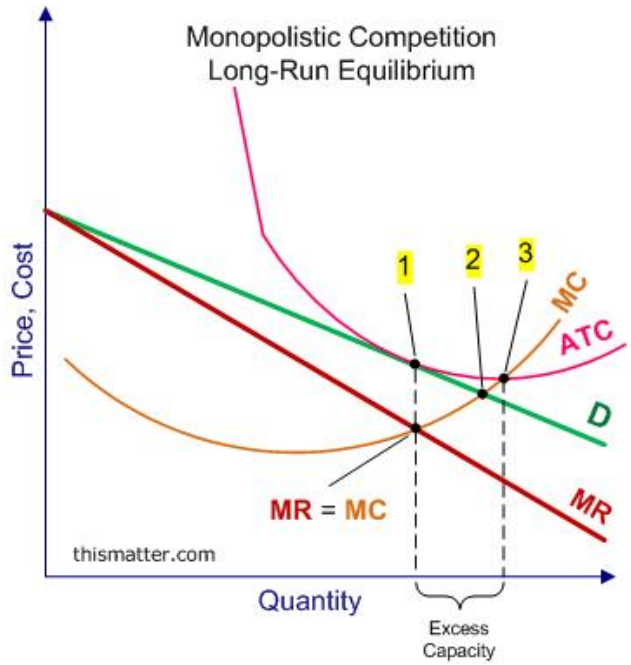

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Fig.5.1.4 Group equilibrium with Excess capacity & inefficiency

It is observed from the figure 5.1.4 that where MC rises above MR, the firm would incur greater costs than it would receive in additional revenue, which is why the firm maximizes its profit by producing only that quantity where MR = MC, and charging the price at point 1, at point 2 Market price= Marginal cost= Allocative Efficiency, at point 3 Productive Efficiency= Minimum ATC.

Excess Capacity (point 1 to point 3) = Quantity Produced at Minimum ATC - Quantity that yields the greatest profit (MR = MC). Because monopolistically competitive firms do not operate at their minimum average total cost, they, therefore, operate with excess capacity.

5.1.5 Summary

The Monopolistic competition is regarded as a happy blending of perfect competition and monopoly. In other words, monopolistic competition includes certain feature of perfect competition and certain feature monopoly.

The monopolistic competition is characterized by a large number sellers and buyers; product differentiation (close substitutes), barriers to entry and exit are low, importance of group equilibrium, importance of selling cost.

In the short run, a monopolistically competitive firm maximizes profit or minimizes losses by producing that quantity that corresponds to when marginal revenue equals marginal cost. If average total cost is below the market price, then the firm will earn an economic profit and vice-versa as follows.

In the case of group equilibrium, the MC=MR is not sufficient condition for profit maximization though it is a necessary condition for equilibrium. The group or industry equilibrium in long run is possible when each firm is earning only normal profits, that is, the point where AR=AC for each firm.

The equilibrium of firms is attained prior to the minimum point of ATC even though on the falling portion of ATC. This property of equilibrium under monopolistic competition is known as the **excess capacity.** In monopolistic competition excess capacity remains in each firm in the sense that more output can be produced at a lower cost and also it can be utilized if some firms eliminated from the group or industry. The firms in the group under monopolistic competition also suffer from productive and allocative inefficiency. Because monopolistically competitive firms do not operate at their minimum average total cost, they, therefore, operate with excess capacity.

5.1.6 Self Assessment Questions

1. Discuss the characteristics of Monopolistic Competition.
2. Discuss the Short run Equilibrium of a firm under Monopolistic Competition.
3. Discuss the Group or long run equilibrium under monopolistic competition with excess capacity and economic efficiency.

5.2 CHAPTER

OLIGOPOLY

Objectives

After completing this chapter, you will be able to:

- Understand the features of Oligopoly
- Analyze the Interdependency of firms in price and output determination under oligopoly
- Understand the basic concept of Game theory

Structure:

5.2.1 Oligopoly:
5.2.2 Oligopoly and Interdependence (Kinked Demand Curve)
5.2.3 Basic concept of Game Theory

5.2.1 Oligopoly:

Oligopoly is an important form of imperfect competition. Oligopoly is said to prevail when there are few firms or sellers in the market producing or selling a product. In other words when there are two or more than two, but not many, producers or sellers of a product, oligopoly is said to exist. Oligopoly is also referred to as “competition among the few”. The simplest case of oligopoly is duopoly which prevails when there are only two producers or sellers of a product.

Although there is no borderline between few and many but when the number of seller of a product are two to ten (as observed from some of the literature in this regard), oligopoly is said to exist. When products of a few sellers are homogeneous, we talk of oligopoly without product differentiation or Pure Oligopoly. On the other hand, When products of a few sellers or firms instead of being homogeneous, are differentiated but close substitute but each other, oligopoly with product differentiation or differentiated (or imperfect) oligopoly is said to prevail. Further, the price and output determination under oligopoly can be categories into Collusive Oligopoly and Non Collusive Oligopoly.

Characteristics of Oligopoly

The main features or characteristics of oligopoly are:

- Few sellers and large number of buyers
- Interdependence of firms (firms will be affected by how other firms set price and output) in decision making.
- Indeterminateness of equilibrium price and output (unlike perfect competition or monopoly or monopolistic competition there is no determined conditions equilibrium in oligopoly)
- Significant importance of advertising and selling cost (due to differentiated oligopoly)
- Dependency on group behavior for decision making.

- Depends on Strategic Behaviour , a unique feature of an oligopolist, refers to a situation when an oligopolist takes its price output decision considering the possible reaction of its rival firms in this regard.
- Indeterminateness of demand curve facing an oligopolist (unlike perfect competition or monopoly or monopolistic competition there is no determined shape or slope of demand curve in oligopoly)

5.2.2 Oligopoly and Interdependence

The distinctive feature of an oligopoly is interdependence. Oligopolies are typically composed of a few large firms. Each firm is so large that its actions affect market conditions. Therefore, the competing firms will be aware of a firm's market actions and will respond appropriately.

The interdependency in Oligopoly has been explained by various models of non-collusive oligopoly such as Stackelberg's duopoly model (in this model, the firms move sequentially), Cournot's duopoly model (in this model, the firms simultaneously choose quantities), Bertrand's Oligopoly model (in this model, the firms simultaneously choose prices) and Kinked Demand Curve model (in this model, interdependency of firms revealed price rigidity). However, the Kinked Demand Curve model (developed by Paul Sweezy) is one of the better-known models explaining interdependency in oligopoly. Let us discuss the kinked demand curve model.

Kinked Demand Curve Model

Many explanations have been given for the price rigidity under oligopoly and most popular explanation is the so-called kinked demand curve hypothesis.

The kinked demand curve dD with a kink at point E. Thus, the prevailing price level determined at the point of kink is OP and the output sold by the firm at this price is OX. The upper segment of the demand curve dD is relatively elastic and lower segment ED is relatively inelastic. This difference in elasticities is due to the particular competitive reaction pattern assumed by kinked demand curve hypothesis.

The competitive reaction pattern assumed by the kinked demand curve theory of oligopoly is as follows:-

Ecah oligopolist believes that if he lowers the price below the prevailing level, his competitors will follow him and will accordingly lower their prices, whereas if he raises the price above the prevailing level, his competitors will not follow the increase in price.

In otherwords, each oligopolist firm believes that though its rival firms will not match his increase in price, above the prevailing level, they will indeed match its price cut. These two different types of reaction of the competitors to the increase in price on the one hand and to the reduction in price on the other hand that makes the portion of the demand curve above the prevailing price level relatively elastic and the portion of the demand curve below it relatively inelastic.

If the oligopolist reduces its price level below the prevailing price level OP, due to the reaction of the competitors to it, he will gain in sales only very little. Very small increase in sales of an oligopolist following his reduction in price below the prevailing level means that the demand for him is inelastic below the prevailing price. Thus, the segment ED of the demand curve in the figure which lies below the prevailing price OP is inelastic showing that very little increase in sales can be obtained by a reduction in price by an oligopolist.

Similarly, if an oligopolist raises his price above the prevailing level, there will be a substantial reduction in his sales. So, large reduction in sales following an increase in price above the existing one is highly elastic. Thus, in the figure the segment dE of the demand curve which lies above the prevailing price level Op is elastic showing a large fall in sales if a producer raises his price.

Why Price Rigidity:-

Since the oligopolist will not gain any large share of the market by reducing his price below the prevailing level, and there will be a substantial reduction in his sales if he increases his price above the prevailing level, he will be extremely reluctant to change the prevailing price. In other words, each duopolist will adhere to the prevailing price seeing no gain in changing it. Thus rigid prices are explained according to the kinked demand curve theory.

Profit Maximizing Condition:-

For finding the profit maximizing price-output combination, marginal revenue curve MR corresponding to the kinked demand curve dD has been drawn. The marginal revenue curve associated with a kinked demand curve is discontinuous or in other words, it has a broken vertical portion. The length of the discontinuity depends upon the relative elasticities of two segments dE and ED of the demand at point E. Now if the marginal cost curve of the oligopolist is such that it passes anywhere through the discontinuous portion AB of the marginal revenue curve, as shown in the figure the oligopolist will be maximizing his profits at the prevailing price level OP. Since the oligopolist is in equilibrium or in other words maximizing his profit at the prevailing price level, it will have no incentive to change the price. Further, even if there are changes in costs, the price will remain stable so long as the marginal cost curves passes through the gap AB in the marginal revenue curve as shown in the figure.

Criticism:-

- This model does not explain the price and output decision of the firms.
- It does not define the level at which price will be set in order to maximize profits.
- The kink is the consequence (manifestation) of the uncertainty of the oligopolists and of their expectations that competitors will match price cuts, but not price increases. However, it does not explain the level of the price at which the kink will occur.

Hence, it is not a theory of pricing rather a tool for explaining why the price, once determined in one way or another, will tend to remain fixed.

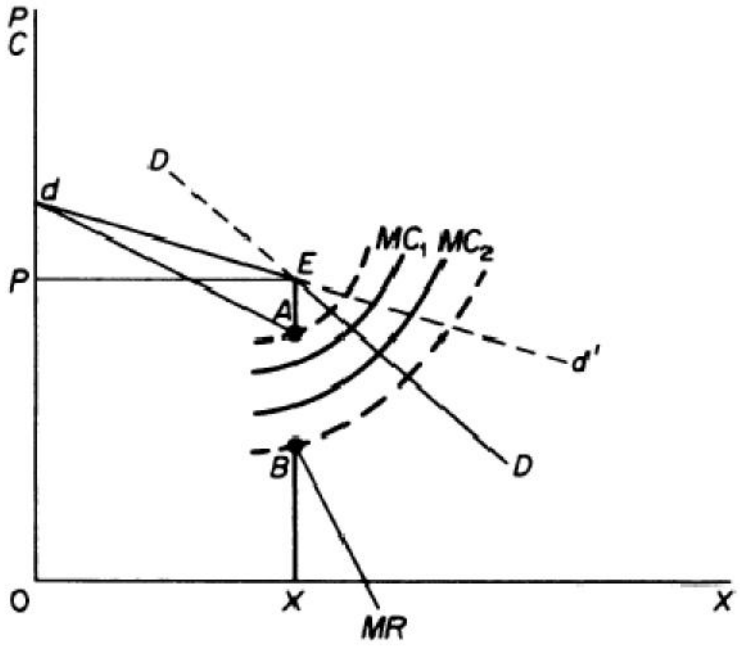

Fig. 5.2.2 Kinked Demand Curve

5.2.3 Basic Concept of Game theory

In an oligopoly, firms are interdependent; they are affected not only by their own decisions regarding how much to produce, but by the decisions of other firms in the market as well. Game theory offers a useful framework for thinking about how firms may act in the context of this interdependence. So, Oligopoly theory often makes use of game theory to model the behavior of oligopolies

In an oligopoly, firms are affected not only by their own production decisions, but by the production decisions of other firms in the market as well. The prisoner's dilemma is a type of game that illustrates why cooperation is difficult to maintain for oligopolists even when it is mutually beneficial.

Important Concepts associated with Game Theory

Cooperative Outcome	An equilibrium in a game where players agree to cooperative
Dominant Strategy	A dominant strategy is one where a single strategy is best for a player regardless of what strategy other players in the game decide to use
Nash equilibrium	Any situation where all participants in a game are pursuing their best possible strategy given the strategies of all of the other participants
Tactic Collusion	Where firms undertake actions that are likely to minimize competitive response, e.g. avoiding price-cutting or not attacking each other's market
Whistle Blowing	When one or more agents in a collusive agreement report it to the authorities.
Zero-Sum Game	An economic transaction in which whatever is gained by one party must be lost by the other

5.2.4 Summary

Oligopoly is an important form of imperfect competition. Oligopoly is said to prevail when there are few firms or sellers in the market producing or selling a product. Firms in an oligopoly face a kinked demand curve. If they raise price above P the demand curve is relatively elastic as people will switch to buying substitute products from competitors. If they drop price below P they face an inelastic demand curve as other firms will also cut prices so few gains in quantity demanded occur. Game theory looks at the players in a game or firms in a market In making decisions each player has a number of choices. Each player is influenced by their own actions and the actions of other players. Game theory can be used to illustrate the interdependence of firms in an oligopoly.

5.2.5 Self Assessment Questions

1. Define Oligopoly. Discuss its features.

2. What is Kinked Demand Curve?

3. Explain the reasons for Price Rigidity in Oligopoly.

4. Explain the Profit maximizing condition with the help of kinked demand curve.

5. Discuss the basic concepts of Game theory.