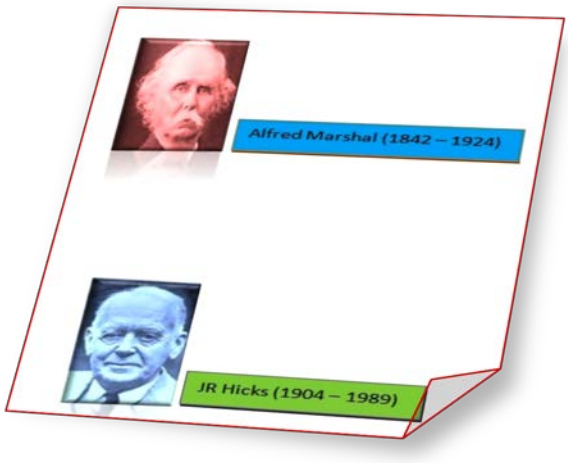
MICROECONOMICS

PAPER THREE, SEMESTER THREE – SECOND YEAR BACHELOR OF ARTS

(As per the prescribed syllabus of University of Mumbai)



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CONTENTS

MICROECONOMICS –II
S.Y.B.A. SEMESTER III (Academic Year 2017-18)

Preamble: The Course is designed to develop the student's understanding of basic tools of microeconomic analysis. It builds on the material covered in semester 1 and is designed to help the student apply microeconomics to the real world.

Module 1: Utility Analysis: (12 lectures)

Preferences-strong ordering-weak ordering – completeness- transitivity-rational preferences-utility as representation of preferences-indifference curves and their properties – budget constraint-utility maximization and consumer's equilibrium-income effect-substitution effect-derivation of demand curves.

Module –II: Production Analysis: (12 lectures)

Production function- Cobb-Douglas production function-short run and long run - returns toScale-Isoquants and their properties –MRTS-iso-cost curves-cost minimization andproducer's equilibrium-derivation of factor demand curves.

Module –III: Costs and revenue: (12 lectures)

Various concepts of costs and their inter-relationship - behavior of costs in the short runand the long run -long run average cost curve and its derivation-implicit and explicit costs, totalrevenue-marginal revenue-average revenue.

Module IV: Competitive Markets: (12 lectures)

Homogenous goods-no barriers to entry-no collusion among sellers-availability of market information – price equals marginal cost in competitive markets- supply curve andderivation in competitive markets- equilibrium of the firm and the industry – consumer'ssurplus-producer's surplus - economic efficiency in competitive markets.

References:

1. N. Gregory Mankiw, Principles of Microeconomics, 7th edition, Cengage Learning, 2015
2. Sen Anindya (2007), Microeconomics: Theory and Applications, Oxford University Press, NewDelhi.
3. Salvatore D. (2003), Microeconomics: Theory and Applications, Oxford University Press, NewDelhi.

MODULE ONE

UTILITY ANALYSIS

PREVIEW.

- Preferences.
- Completeness.
- Transitivity.
- Rational preferences.
- Utility as representation of preferences.
- Preferences-strong ordering-weak ordering.
- Indifference curves and their properties.
- Budget constraint.
- Utility maximization and consumer's equilibrium.
- Income effect, Substitution effect and Derivation of demand curves.

PREFERENCES BASED ON WEAK ORDERING.

The choice made by the consumer depends upon his income, prices of goods and preferences regarding the two goods. The consumer's preferences permit him to choose among different combinations or bundles of two goods: coffee and burgers. The consumer will be indifferent between the two goods if he or she has an equal liking for both the goods. The preferences of a consumer based on his liking can be represented graphically as shown in Figure 1.1. The preferences are represented by a curve called the Indifference Curve (IC). The IC shows the combinations or bundles of consumption of two goods that make the consumer equally happy. The IC is therefore known as equal satisfaction curve or the Iso-utility Curve. In Figure 1.1, there are two representative indifference curves of the consumer. In reality, the consumer may have a set of indifference curves showing his scale of preference. The consumer is indifferent between bundles of two goods represented by various points on a given indifference curve. On IC_1, there are points A, B and C. All these points represent the same level of liking or satisfaction. When the consumer shifts his position from point A to point B, he prefers more of burgers than coffee. A movement from point A to point B reduces the quantity of coffee and increases the quantity of burgers. The level of satisfaction enjoyed by the consumer remains the same because the loss of coffee units is compensated by the gain of burger units.

The slope of the indifference curve at any point equals the rate at which the consumer is willing to sacrifice or substitute one good for the other. This rate of substitution is called the marginal rate of substitution (MRS). In our example of burgers and coffee, the MRS will measure the

number of units of burgers that needs to be compensated for reduction in coffee consumption by one unit. Since the indifference curve is bowed inwards or convex to the origin, the MRS is different at different points of a given IC. The MRS depends upon the amount of goods that a consumer is actually consuming. The rate at which the consumer is willing to trade coffee for burgers depends upon whether he needs more coffee or more burgers. The need for more coffee or more burgers depends upon how much of these two goods the consumer is actually consuming.

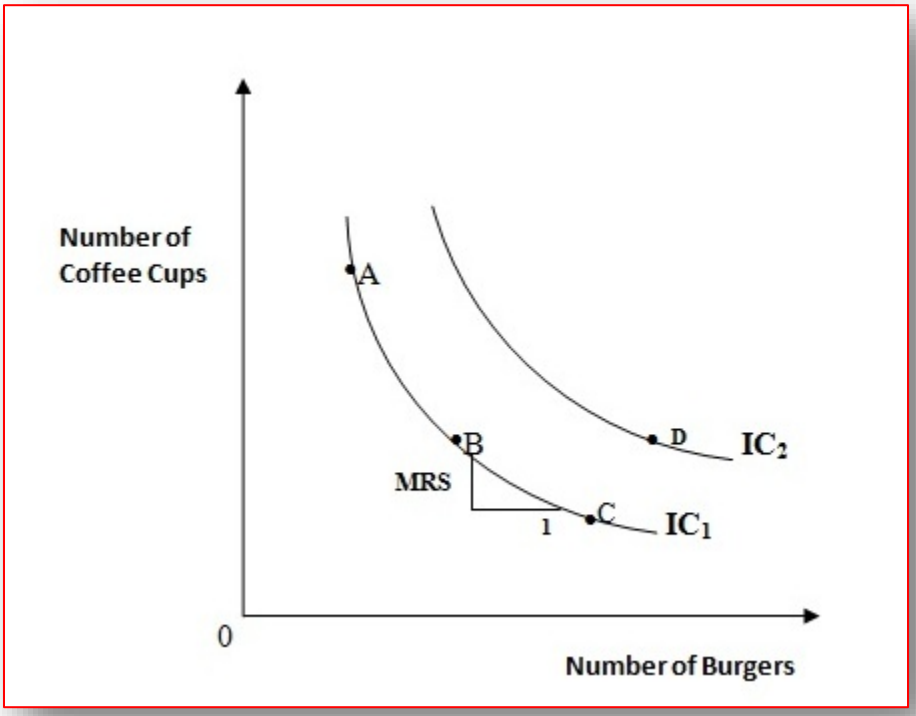


Figure 1.1 – The Consumer's Preferences.

In Figure 1.1, we have two ICs. The consumer will naturally prefer IC_2 to IC_1 because a higher indifference curve represents bigger bundles of two goods, here burgers and coffee. A consumer's set of ICs gives the scale of preference or the ranking of consumer preferences. Figure 1.1 shows that the consumer will prefer point D on IC_2 than any other point on IC_1. Point D on IC_2 indicates a larger bundle of two goods but it shows that the consumer will have fewer cups of coffee than what he had at point A on IC_1. Yet the consumer will prefer point D because it will compensate the consumer with much greater quantity of burgers and the loss of satisfaction due to a lower quantity of coffee will be compensated by a much larger quantity of burgers.

The consumer preferences based on indifference curve analysis is also based on weak ordering that is the consumer is indifferent between various combinations of goods giving him or her the same level of satisfaction. The indifference curve analysis was put forward by JR Hicks.

PREFERENCES BASED ON STRONG ORDERING.

Paul Samuelson put forward the Revealed Preference theory of demand which is based on strong ordering of preferences. Prof. Samuelson's theory is based on behaviorist ordinal utility analysis. John Hicks considered Samuelson's theory as the Direct Consistency Test under strong ordering. The theory analyses consumer's preference for a combination of goods on the basis of observed behavior in the market. According to Samuelson when a consumer is observed to choose basket A out of alternative baskets such as B, C, D etc., then the consumer is revealing his preference for basket A. It means that the consumer considers all other baskets inferior to basket A. Choice reveals preference is the principle of the theory.

The consumer buys basket A because he or she prefers the combination in relation to all other combination of goods or because the chosen combination is relatively cheap or dear. Figure 1.2 shows the revealed preference of the consumer.

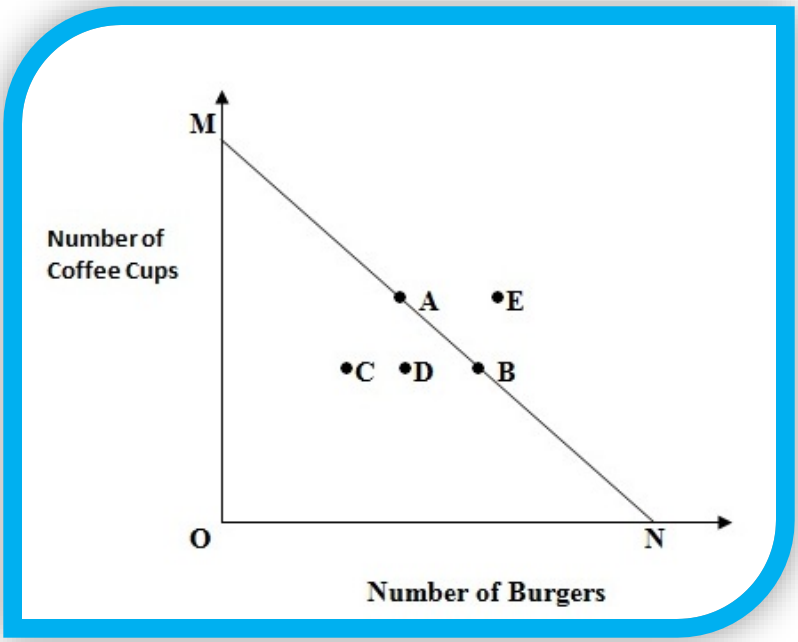


Fig. 1.2 - Revealed Preference of the Consumer.

Given the income of the consumer and the prices of coffee and burgers, MN is the price income line of the consumer. The triangle OMN is the area of choice. The consumer can choose any combination between A and B on the price income line or between C and D below the line. If

the consumer prefers basket A then basket A is revealed preferred to B. Baskets C and D are revealed inferior to A because they are below the price income line MN. Thus basket A is revealed preferred to all other combinations.

According to Prof. John Hicks, when a consumer reveals his or her preference for a definite basket of goods on the basis of observed market behavior, his choice is revealed under strong ordering. Here, when the consumer has revealed his definite preference for basket A within and on the OMN triangle, the consumer has rejected all other baskets such as B, C and D. Therefore, choice A is strongly ordered.

PREFERENCES.

The aim of the individual is to maximize utility. The theory of preferences is based on certain laws or axioms, namely: the law of comparison or completeness, the law of transitivity, the law of non-satiation and the law of indifference.

The Law of Completeness.

The consumer can compare any two baskets A and B of commodities. This comparison will lead to any one of the three following results:

1. The consumer prefers basket A over basket B, or
2. The consumer prefers basket B over basket A, or
3. The consumer is indifferent between A and B baskets.

Preferences are comparable or complete when all consumers can decide whether they prefer basket A over B or basket B over A or that they are indifferent between baskets A and B.

The Law of Transitivity.

There are three baskets of goods A, B & C. If a consumer prefers A to B and also prefers B to C, then the consumer must prefer A to C. Similarly, if the consumer is indifferent between A and B and is also indifferent between B and C, then the consumer must be indifferent between A and C. If the preferences of a consumer are not in the manner stated above, they will be intransitive i.e. they would be contradictory, mutually inconsistent and therefore irrational.

The laws of completeness and transitivity lead to the proposition of rank ordering of preferences or the preference function. When a consumer consistently ranks all baskets of commodities in the order of preference, it is called as **preference function**.

The Law of Non-satiation and Exception to the Laws of Preference.

Suppose there are two goods X and Y measured along either axes and there are four baskets of goods as shown by points A, B, C and D. According to the laws of preference, all four baskets can be ranked in the order of preference and that if the consumer prefer basket A over B and also prefer B over C, then the consumer must also prefer A over C. Among the four combinations

shown in the figure, basket A contains more of X and Y goods and since more is preferred to less, the consumer will definitely prefer basket A over all other baskets. However, **'more is preferred to less'** is not a law of preference. This assertion is not true in the case of commodities that are **bads** such as stink or foul smell, rubbish, smog, risk and tiring labor. The assertion **'more is preferred to less' is not a law but the defining characteristic of a good.** The discussion on the laws of preference leads to defining a good. **A good is defined as a commodity for which more is preferred to less and a bad is a commodity for which less is preferred to more.**

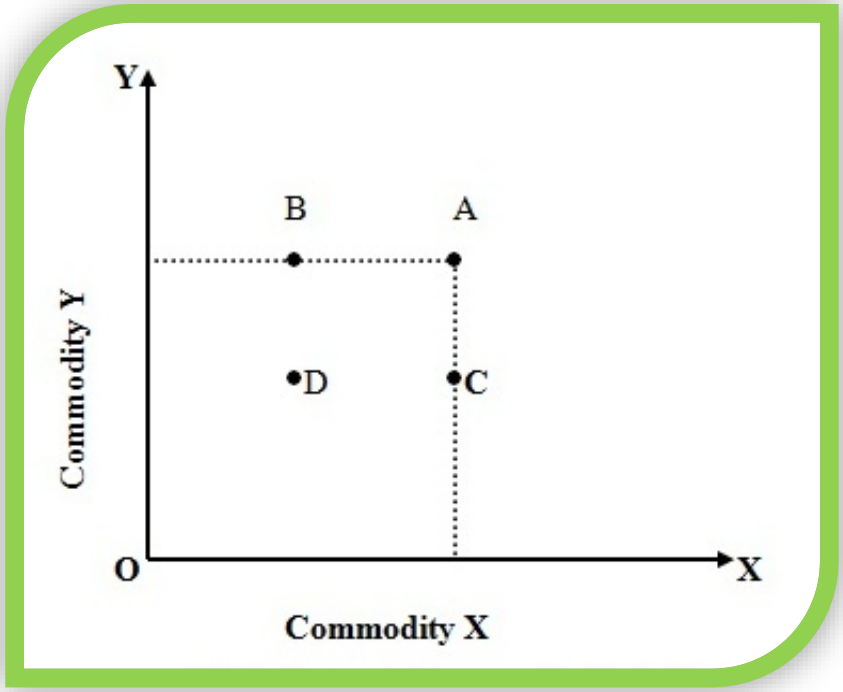


Fig. 1.3 - Alternative Consumption Baskets.

The Law of Indifference.

In the above example, the consumer prefers basket A over all other baskets. However, the consumer can be indifferent between all the baskets if the quantities of any one of the good X and Y is more than the previous combination so that the loss of satiation is compensated. For instance, let us say that basket A contains 5X and 2Y and basket B contains 4X and 4Y then the consumer will be indifferent between baskets A and B because the loss of 1X is compensated by the addition of 2Y.

UTILITY AS REPRESENTATION OF PREFERENCES.

Utility reflects rank ordering of preferences. If a consumer prefers basket A over basket B, it clearly means basket A has a higher utility than basket B. If a consumer is offered a choice between baskets A and B, ceteris paribus, the consumer will choose basket A. If the consumer is observed to choose basket A over basket B, it can be safely concluded that basket A has higher utility for the consumer than basket B. Utility is therefore the determinant of consumer preferences. Utility is the variable whose relative magnitude indicates the direction of preference.

PROPERTIES OF INDIFFERNCE CURVES.

The indifference curves represent the preferences of consumers. The properties that represent consumer's preferences are four in number.

1. **Higher Indifference Curve is preferred to a lower one.** In the absence of prices and budget constraint, the consumer will like to consume a larger bundle of goods than smaller. A higher indifference curve represents a larger bundle of goods than a lower one and hence the consumer will prefer a higher IC to a lower IC. In Figure 1.1, the consumer will prefer IC_2 to IC_1.

2. **Indifference Curves are downward sloping.** The slope of the indifference curve shows the rate at which the consumer is willing to substitute or sacrifice one good for the other. In order to keep the satisfaction level same as before, the consumer will have to be compensated for the loss of consumption when he moves along the indifference curve. Thus if the quantity of burgers increase, the quantity of coffee must decrease.

3. **Indifference curves do not cross each other.** If indifference curves intersect or cross each other they will have common points indicating that the consumer is indifferent between points placed on a higher and lower curve. Such a conclusion will be in contradiction with the assumption that a rational consumer will prefer a larger bundle of goods to a smaller one. The contradiction can be seen in Figure 1.4. Points A and B are on IC_1 indicating that the consumer will get the same level of satisfaction at these two points and hence will be indifferent between them. Similarly points B and C are on IC_2 indicating that both points give equal satisfaction to the consumer. Since IC_2 is a higher indifference curve, a rational consumer must prefer point B to A. Further point C is also on IC_2 and clearly lying above IC_1. The consumer will have to be indifferent between points A and C either. Intersecting indifference curves are therefore a contradiction to the basic assumption of the theory of consumer choice.

4. **Indifference curves are bowed inward or are convex to the origin.** The slope of the indifference curve is the marginal rate of substitution (MRS). The MRS must decrease as the consumer moves from left to right on the indifference curve. The MRS decreases because as the quantity of burgers increase, the quantity of coffee decreases and its relative importance increases. Decreasing or diminishing MRS is possible only when the IC is downward sloping and convex to the origin or bowed inward. Diminishing MRS can be seen in Figure 1.5. Initially, the consumer is willing to give up one burger for four cups of coffee at point A and hence MRS is four. But at point B, the consumer is willing to sacrifice one burger for only one cup of coffee. His MRS falls to one. This is because at point B, the stock of burgers is much larger than at point A and the stock of coffee is much smaller at point B than at point A.

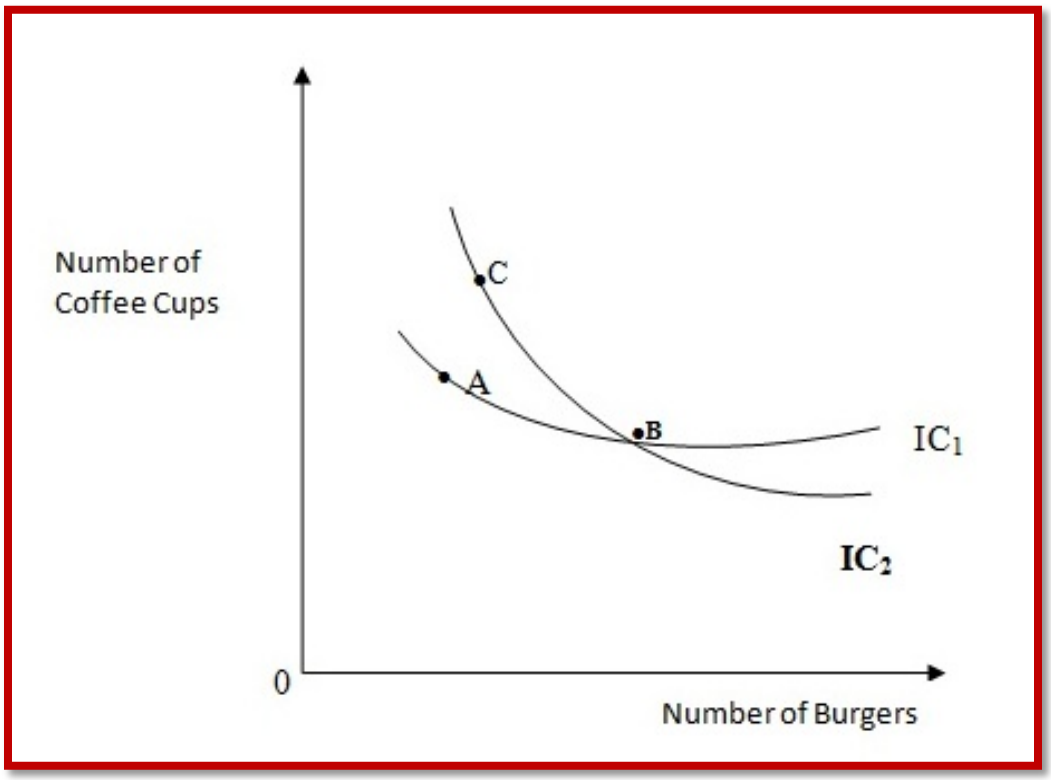


Figure 1.4 – The Consumer's Preferences.

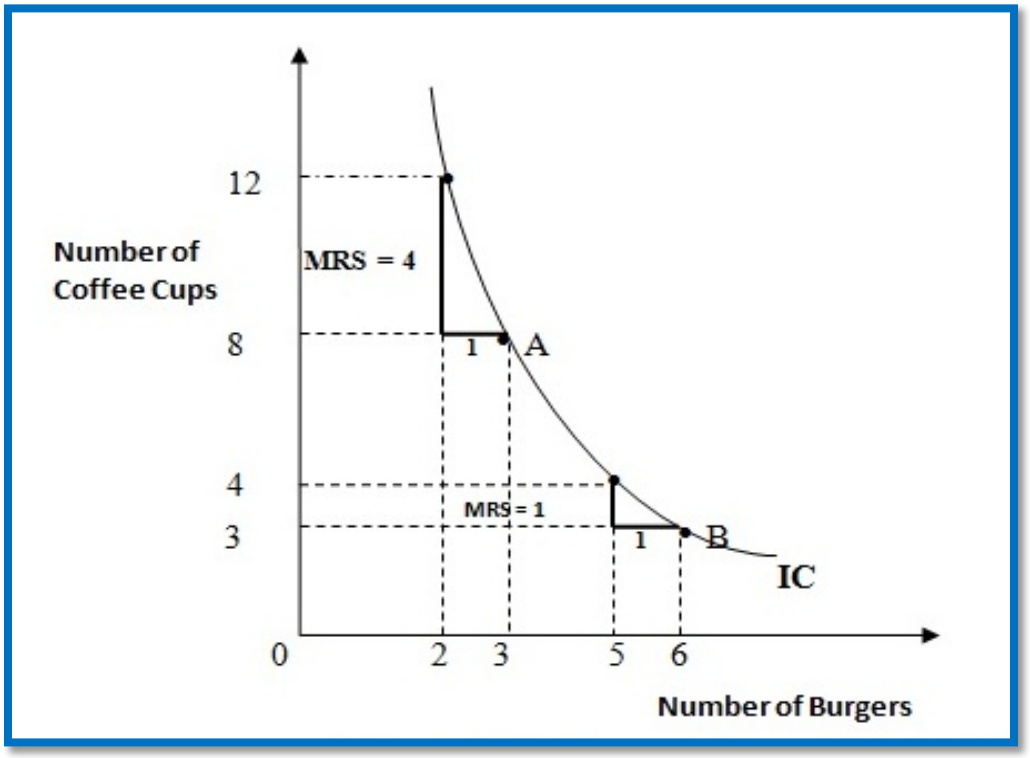


Figure 1.5 – Convex or Inwardly Bowed IC.

THE THEORY OF CONSUMER CHOICE.

The theory of consumer choice provides a better understanding of demand. It examines the trade-offs that people face as consumers. When a consumer buys one commodity, he sacrifices another commodity. There is always a trade-off in every transaction that a consumer undertakes. The cause of the trade-off is the budget constraint and the prices of goods that the consumer wishes to buy. The theory of consumer choice examines how consumers facing trade-offs make decisions and how they respond to changes in their environment.

THE BUDGET CONSTRAINT – WHAT THE CONSUMER CAN BUY GIVEN HIS INCOME AND PRICES OF GOODS.

People attempt to satisfy more than one need at a time. In order to satisfy simultaneous wants, one has to allocate one's budget given the prices of goods that one wants to buy. Eating out every week end and go for a long drive can be a combination of want that a family wants to satisfy. Buying consumer utilities like Fridge, TV, Air-conditioner, Washing machine etc and spending on Diwali celebrations or Id celebrations. In the ordinary course of life, everybody is

confronted with multiple requirements. Budgeting is required to allocate income to satisfy various requirements. Budgeting means spending less than what one desires. Budgeting also explains the link between income, prices and expenditure.
Budget constraint can be explained with an example in which a consumer wants to buy two goods: Burgers and Coffee. The consumer's income is Rs.600 per month. The price of burger is Rs.100 and the price of Coffee is Rs.50. Given his income of Rs.600, the consumer can purchase various combinations of burgers and coffee as shown in Table 1.1.

Table 1.1 – The Consumer's Budget Constraint

Number of Coffee Cups	Number of Burgers	Expenditure On Coffee	Expenditure On Burgers	Total Expenditure
0	6	0	600	600
2	5	100	500	600
4	4	200	400	600
6	3	300	300	600
8	2	400	200	600
10	1	500	100	600
12	0	600	0	600

The first row in Table 1.1 shows that when the consumer purchases six burgers, he spends Rs.600 on burgers and hence he is not able to spend any money on coffee. The other extreme choice available before the consumer is 12 cups of coffee and zero burgers. The consumer may choose any other combination of burgers and coffee between these two extreme limits of the budget. The cost of each choice made in Table 1.1 is Rs.600. Figure 1.6 shows the consumption bundles that the consumer can choose. The vertical axis measures the number of coffee cups and the horizontal axis measures the number of burgers. All the combinations of burgers and coffee can be represented in the figure and the consumer can make any one choice. There are three points marked on the budget line. This budget line may also be called as the price line or the income line. At point A, the consumer buys zero burgers and 12 cups of coffee. At point B, the consumer buys six burgers and no coffee. At point C, the consumer spends an equal amount on Coffee and Burgers. He buys six cups of coffee and three burgers. The budget line is called the budget constraint because given his income and the prices of two goods, the consumer will have to be on the budget line. He cannot step out of the budget line and hence the budget line is the constraining factor on the consumer's choice. The budget constraint also shows the trade-off between burgers and coffee or the opportunity cost of making any one choice.

The slope of the budget constraint measures the rate at which the consumer can trade one coffee for burgers. The slope between two points is calculated as the change in the vertical distance divided by the change in the horizontal distance i.e. rise over run. Front point A to point B, the vertical distance is 12 cups of coffee and the horizontal distance is six burgers. Thus the slope is two cups of coffee per burger. Each time the consumer makes a choice of buying one more burger, he will have to sacrifice two cups of coffee. The slope of the budget constraint equals the

relative price of the two goods i.e. the price of one commodity as compared to the other commodity (100 ÷ 50). The budget constraint slope of 2 shows the trade-off the market is offering the consumer: one burger for two cups of coffee.

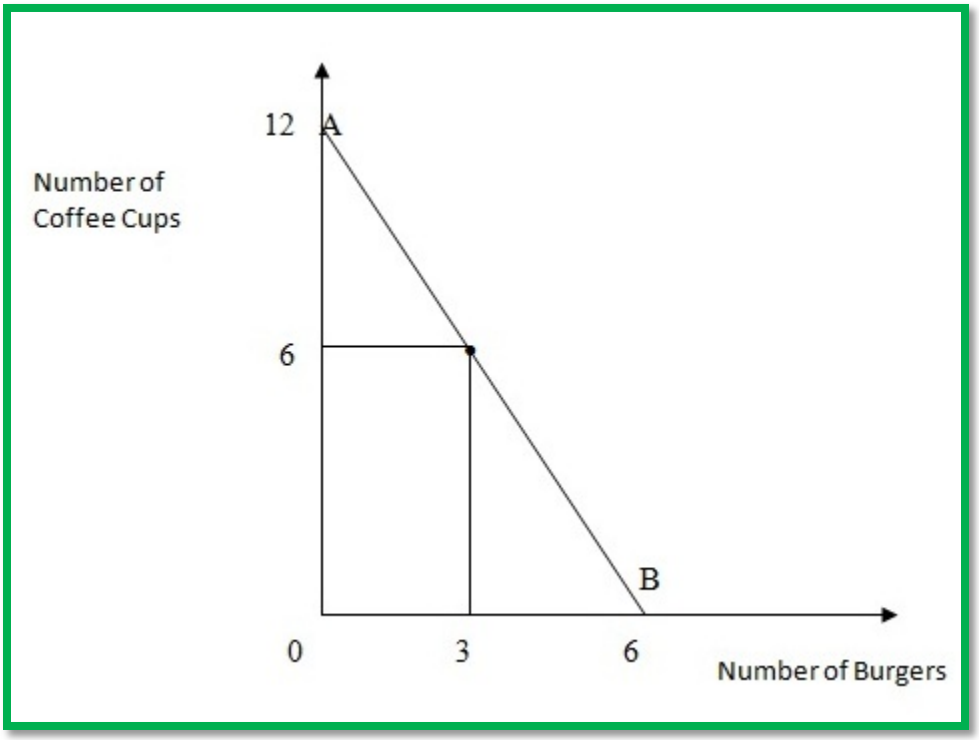


Figure 1.6 – The Consumer's Budget Constraint.

UTILITY MAXIMIZATION AND CONSUMER EQUILIBRIUM.

Given the number of indifference curves, the consumer would like to prefer the highest indifference curve because it has the largest bundle of two goods. But the budget constraint is the limit within which consumer can make a choice of his bundle of two goods. The budget constraint is a function of the income of the consumer and the prices of two goods that the consumer is willing to consume. The consumer's optimum choice or his equilibrium is shown in Figure 1.7. The highest indifference curve that the consumer can reach given his budget constraint is IC_2 which touches the budget line or is tangent to the budget line at point B. Point C is on IC_3. The consumer cannot choose IC_3 because it is lying above the budget line. IC_1 is lying below the budget line and the consumer can afford IC_1 but it will give a lower level of satisfaction. Point B is the optimum choice because it represents the best combination of consumption of coffee and burgers. At point B, the slope of the budget line and that of IC_2 are equal. The slope of the IC shows the MRS between coffee and burgers and the slope of the budget line shows the relative price or the price ratio of coffee and burgers. The consumer chooses the combination of coffee and burgers in such a manner that the MRS is equal to the price ratio or the relative prices of two goods. The price ratio is the rate at which the market

trades one good for another. In our example of coffee and burgers, one burger is traded for two cups of coffee. The MRS is the rate at which the consumer is willing to trade one good for another. At the optimum point B, the consumer's valuation of the two goods equals the valuation by the market. Due to consumer optimization, market prices of different goods show the value that consumers place on the combination of two goods.

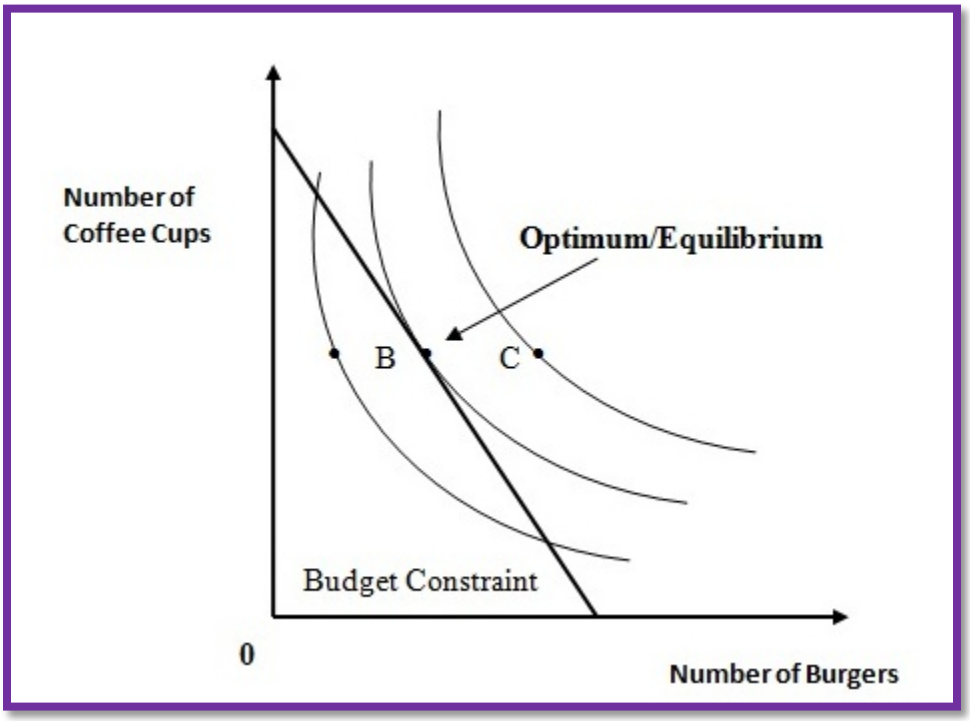


Figure 1.7 – The Consumer's Optimum or Equilibrium.

THE LAW OF EQUI-MARGINAL UTILITY.

The law of equi-marginal utility is an extension of the law of diminishing marginal utility to two or more commodities. The law of EMU is also known as the Law of Substitution, the Law of Maximum Satisfaction, the Law of Indifference, the Proportionate Rule and the Gossen's Second Law.

According to Lipsey, the law of EMU can be stated as follows:

"The household maximizing the utility will so allocate the expenditure between commodities that the utility of the last penny spent on each item is equal".

The condition of consumer equilibrium in case of a single commodity is the equality between the price paid for the unit of the commodity and the marginal utility derived from that unit. Symbolically, the condition of consumer equilibrium for one commodity can be stated as follows:

$MU_x = P_x$

Consumer satisfaction is maximized when the marginal utility of the nth unit of the commodity is equal to the price of nth unit. However, in reality, a consumer will buy more than one commodity at a time. A rational consumer in order to get maximum satisfaction from his limited income compares not only the utility of a particular commodity and the price but also the utility of the other commodities which he can buy with his limited income. If he finds that a particular expenditure in buying one commodity is yielding less utility than that of other, he will transfer a unit of expenditure from the commodity yielding less marginal utility to the one which yields more utility. The consumer will reach his equilibrium position when it will not be possible for him to increase the total utility by opting for any other combination of goods. The equilibrium will be reached when the marginal utility of each good is in proportion to its price and the ratio of the prices of all goods is equal to the ratio of their marginal utilities.

The consumer will maximize total utility from his income when the utility from the last rupee spent on each good is the same. Algebraically, this is:

$$MU_a / P_a = MU_b / P_b$$

Here, MU_a & MU_b are the marginal utilities of goods (a) and (b) and P_a & P_b are the prices of two goods (a) and (b).

Assumptions of Law of Equi-Marginal Utility.

The assumptions of the law of equi-marginal utility are as follows:

1. **Independent utilities.** The marginal utilities of different commodities are independent of each other and diminish with more and more purchases.

2. **Constant marginal utility of money.** The marginal utility of money remains constant to the consumer as he spends more and more of it on the purchase of goods.

3. **Utility is cardinally measurable.** Utility derived from every unit of consumption can be measured or quantified in terms of numbers. Utility is measured in terms of 'utils' such as a unit of apple has 10utils and that of a banana has 5utils. It means that the utility of apple is two times that of a banana or one apple is equal to two bananas.

4. The consumer behavior is rational i.e. the aim of the consumer is to maximize satisfaction.

Explanation of Law of Equi-Marginal Utility.

A person has Rs. 120 with him and he wishes to spend his income on two commodities; Apples and Bananas. The price of Apple is Rs.20 per unit and that of banana is Rs.10 per unit. The marginal utility derived from both these commodities is given in the MU Schedule at Table 1.2

Table 1.2 - Marginal Utility Schedule of Apples and Bananas.

Units of Commodities	MU of Apples (A)	MU of Bananas (B)
1	100	80
2	80	60
3	60	40
4	40	20
5	20	10
6	10	05

A rational consumer would like to get maximum satisfaction from Rs.120. The first condition of consumer equilibrium is that the ratio of marginal utilities of two commodities must be equal to the ratio of their prices. This condition is satisfied when the consumer buys 4 units of apples and 4 units of bananas as highlighted in the utility schedule. Thus,

$$\mathbf{MU_A/P_A = 40/20 = MU_B/P_B = 20/10 = 2/1 = 2.}$$

The combination of four applies and four bananas yields maximum satisfaction. However, if the consumer decides to purchase five units of apples and only two units of bananas, he will be spending Rs.120 but ratio of marginal utilities of the two goods will not be equal to the price ratio. Thus,

$$\mathbf{20/20 \neq 60/10}$$

The second condition of consumer equilibrium is that the consumer must spend his entire income on the purchase of two commodities. Thus,

$$\mathbf{Y = P_A \times A + P_B \times B}$$

Where Y is the income P is the price and A and B are units of applies and bananas. The second condition is fulfilled when the consumer spends Rs.80 on applies (Rs.20 × 4 = Rs.80) and Rs.40 on bananas (Rs.10 × 4 = Rs.40) i.e. Rs.80 + Rs.40 = Rs.120.

The third condition is that the consumer must get maximum total satisfaction from the consumption of two goods in comparison to any other combination. Thus,

Total Utility derived from four units of Apples = 100 + 80 + 60 + 40 = 280.
Total Utility derived from four units of Bananas = 80 + 60 + 40 + 20 = 200.
Total Utility of A&B = 280 + 200 = 480.

The proportionality rule of consumer equilibrium can be diagrammatically explained as in Figure 1.8 where the ratio of marginal utilities of the two goods and their prices is measured on the vertical axis and the units of apples and bananas consumed are measured on the horizontal axis.

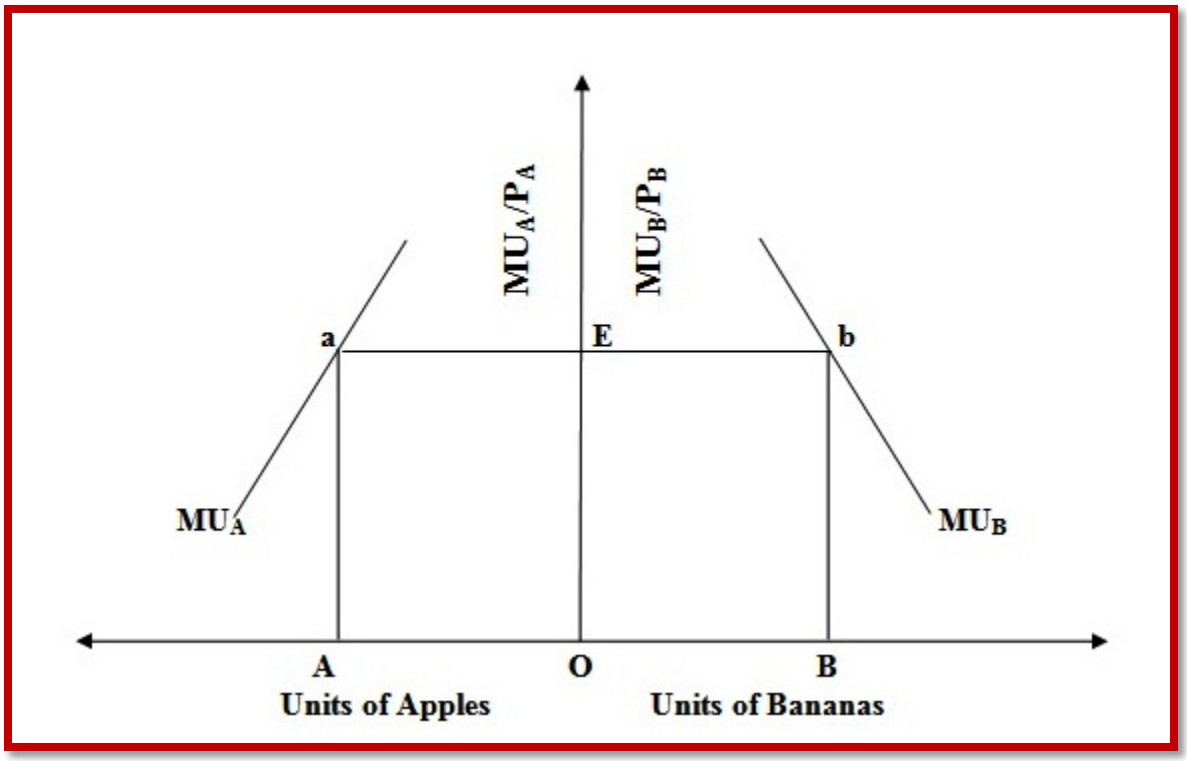


Figure 1.8 – The Law of Equi-marginal Utility.

In Figure 1.8, when the consumer buys OA units of applies and OB units of bananas, the ratio of marginal utility of A and the price of A is equal to the ratio of marginal utility of B and the price of B which is equal to EO.

The law of equi-marginal utility is known as the ***Law of maximum Satisfaction*** because a consumer tries to get the maximum satisfaction from his limited resources by so planning his expenditure that the marginal utility of a rupee spent in one use is the same as the marginal utility of a rupee spent on another use.

It is also known as the ***Law of Substitution*** because consumer continuous substituting one good for another till he gets the maximum satisfaction.

It is called the ***Law of Indifference*** because the maximum satisfaction has been achieved by equating the marginal utility in all the uses. The consumer than becomes indifferent to readjust his expenditure unless some change takes place in his income or the prices of the commodities, etc.

Limitations/Exceptions of Law of Equi-Marginal Utility:

1. **Imperfect Knowledge.** The law assumes that the consumer has perfect knowledge about alternative choices. However, in reality consumers may be ignorant about the usefulness of alternative commodities. The process of substituting one good for the other will not take place if the consumer is ignorant and the law of EMU will not be proved.

2. **Indivisibility of Goods.** The law is not applicable to lumpy or indivisible goods. For example, the marginal utility of national highway cannot be measured because it is a single lumpy unit. Similarly, the consumer will not be able to divide a television unit or a unit of gas stove to compare marginal utilities.

3. **The consumer is not always rational.** Consumer choices are influenced by customs, tastes and habits and advertisements. The consumer knows that the marginal benefit derived by buying 10 grams of gold is definitely less than buying units of mutual fund and yet he or she purchases of 10 grams of gold. The decision to buy gold when gold prices are stagnant over a long period of time is an irrational decision. It is a decision forced by custom rather than wisdom.

4. **Utility is not Measurable.** Cardinal measurement of utility is not possible because satisfaction is a psychological phenomenon.

5. **Marginal Utility of Money is not Constant.** The marginal utility of money actually increases when the stock of money decreases. The law of EMU assumes constant marginal utility of money which is unrealistic.

APPLICATIONS OF THE LAW OF EMU.

According to Alfred Marshall, the application of the principle of proportionality extends to every field of economic inquiry. The law of EMU has following applications:

1. **It is the basis of Consumer Expenditure.** The way consumers spend money is generally based on the law of proportionality. Alfred Marshall gives the example of a clerk who is in doubt whether to ride to town or to walk and have some extra indulgence at his lunch. He is comparing one option against another in order to minimize loss of utility so that the total utility enjoyed by him is maximized. When a consumer buys more than one commodity he or she will always try to equalize the marginal utilities derived from the various items of consumption so that the total satisfaction is maximized.

2. **It is the basis of Savings and Consumption Decisions.** A rational consumer will always save for the rainy day so that the marginal utility derived from present and future consumption is equal. A consumer not only desires to derive maximum satisfaction from present consumption but also future consumption. Saving enables him to ensure future consumption. However, if present consumption gives him more satisfaction than future consumption, the consumer will spend his entire income on present consumption and will not save for future.

3. **It is the basis of Profit Maximization.** A producer will apply the proportionality rule to obtain better results from a given expenditure. The producer will continue to substitute one factor for the other till the marginal returns from all factors are equalized.

4. **It is the basis of exchange in an Economy.** A person who wishes to exchange money for goods will try to equate marginal utility derived from the good with the price of the good so that his total utility is maximized.

5. **It is the basis of Price Determination.** The principle of substitution helps in equalizing the prices of scarce and abundant goods. The price of scarce commodity can be brought down by substituting it with that of an abundant commodity. As you substitute more and more of an abundant commodity, the price of a scarce commodity will fall and that of the abundant commodity will rise until both prices become equal.

6. **It is the basis of Income Distribution.** A producer will substitute one factor service for another till the cost of employing each equals the marginal revenue obtained from the marginal product produced by the factor input.

7. **It is the basis of Taxation and Project Financing.** Taxes are imposed in such a manner that the marginal sacrifice of each tax payer is equal. In the execution of public projects, the government tries to equate the social marginal utility derived from various projects. For instance, if the government finds that the social marginal utility of a highway is higher if it is publicly funded it will not allow private parties to construct the highway.

HOW CONSUMER'S CHOICE IS AFFECTED BY CHANGES IN INCOME.

When the income of the consumer increases, he can afford a larger quantity of goods. Increase in income shifts the budget line to the right as shown in Figure 1.8. Price remaining constant, the price ratio or the relative prices of two goods also remain constant. The slope of the new budget constraint is equal to that of the old budget constraint. There is a parallel shift in the budget line or budget constraint.

The new budget constraint allows the consumer to purchase more of coffee and burgers by reaching a higher indifference curve. The new budget line and the new indifference curve are

tangent to each other at point B. Point B is the new optimum or equilibrium of the consumer. The optimum point reveals that the consumer has opted for a larger quantity of both coffee and burgers. This is because both coffee and burgers are normal goods.

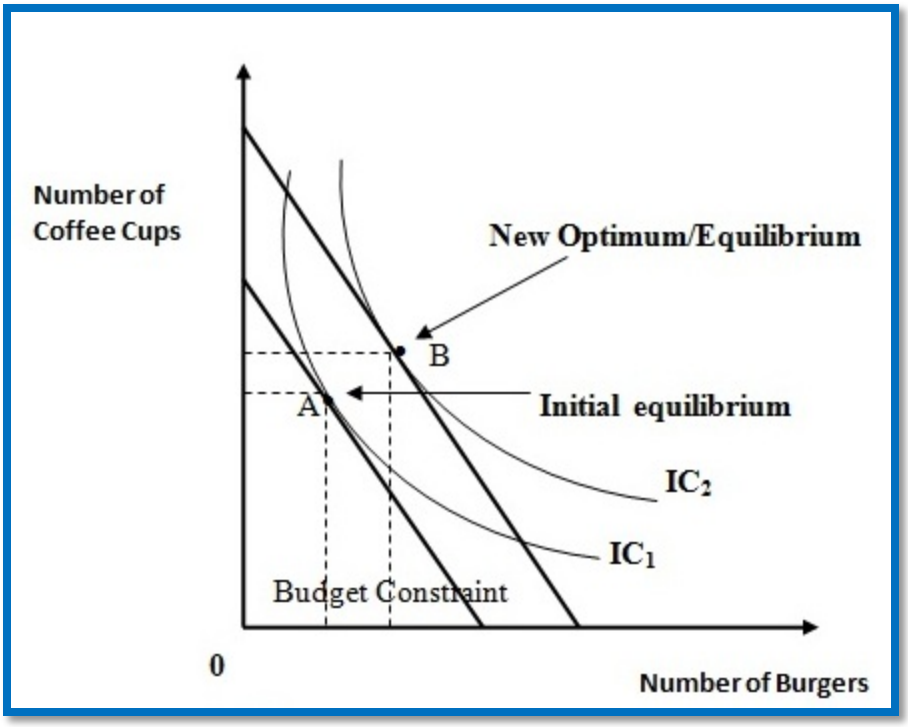


Figure 1.8 – The Consumer's New Optimum or Equilibrium.

Figure 1.9 shows how an increase in income causes the consumer to buy more of burgers but less of coffee cups. When a consumer buys less of a commodity when his income increases such a commodity is known as an inferior good. A good is not inferior in itself. Inferiority of a good is relative to the income of the consumer. A consumer may ascribe a normal status to a good at a lower level of income and when his income increases, he may ascribe an inferior status to the same good. Ascribing an inferior status to a good is not always objective. It is more often subjective because it is the monetary status of the consumer that makes a commodity inferior or normal. Thus at a lower level of income, hiring a taxi for your daily commute may be normal but at a higher level of income driving one's own car may be considered normal and at still further higher level of income, chauffer driven car may be considered normal.

In the vegetable market across the Mumbai city and suburbs, one may find a variety of tomatoes in terms of their size and skin texture. Well shaped red tomatoes of an average size can be objectively considered superior to ill-shaped yellowish tomatoes. It will be natural to a consumer to purchase better tomatoes with an increase in income and consider the yellowish unripe tomatoes to be inferior. The income effect in case of an inferior good is always negative i.e. a consumer will purchase a lesser quantity of an inferior commodity when his income increases.

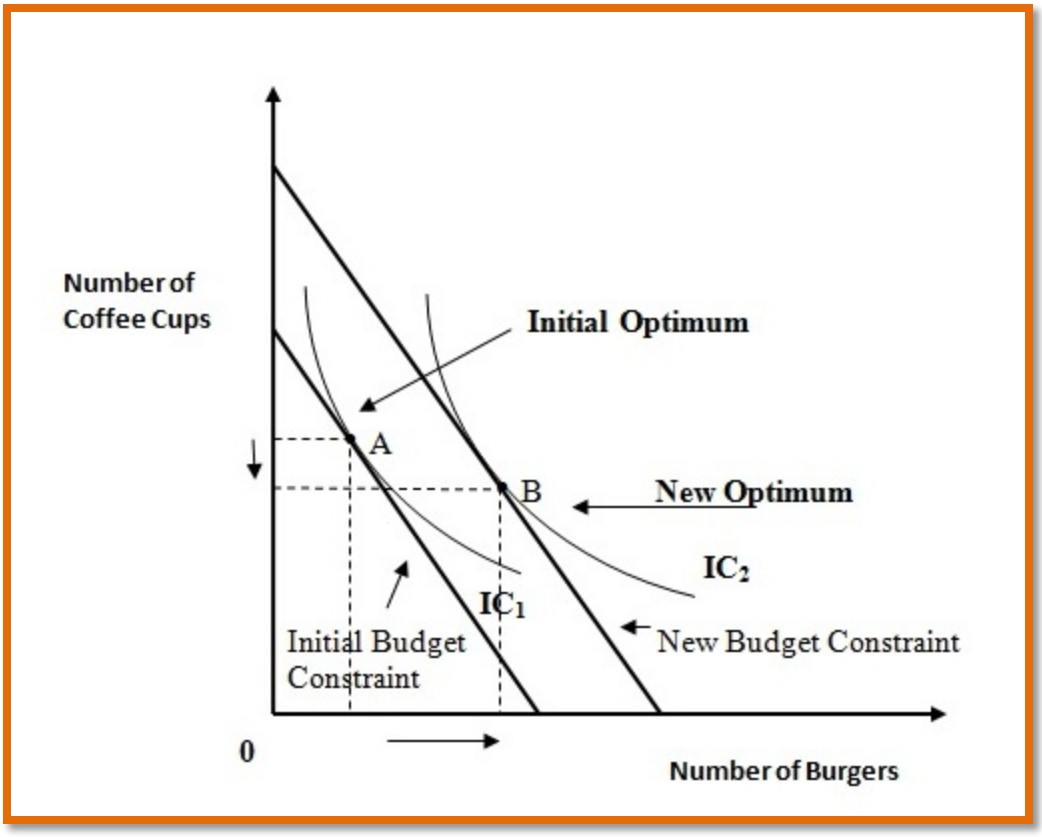


Figure 1.9 – Income Effect in case of Inferior Good.

EFFECT OF CHANGES IN PRICES ON CONSUMER CHOICES.

When the price changes, there is a change in consumer choice. If the price of coffee measured along the vertical axis falls from Rs.50 to Rs.25, the budget constraint or the budget line will shift outward with the pivot on the horizontal axis remaining constant. The consumer can now purchase 24 cups of coffee with his income of Rs.600. In order to reflect the new purchasing power in terms of coffee, the budget constraint moves from point A to C. The new budget constraint is now CB. The slope of new budget constraint has become steeper towards the vertical axis. With the change in the relative prices of coffee and burgers, the consumer can now trade one burger for four cups of coffee. However, the change in consumer choice will be determined by his preferences. The new optimum of the consumer is shown in Figure 1.10 which is to the left of the original optimum. The new optimum indicates that the consumer has preferred a larger quantity of coffee and a lesser quantity of burgers.

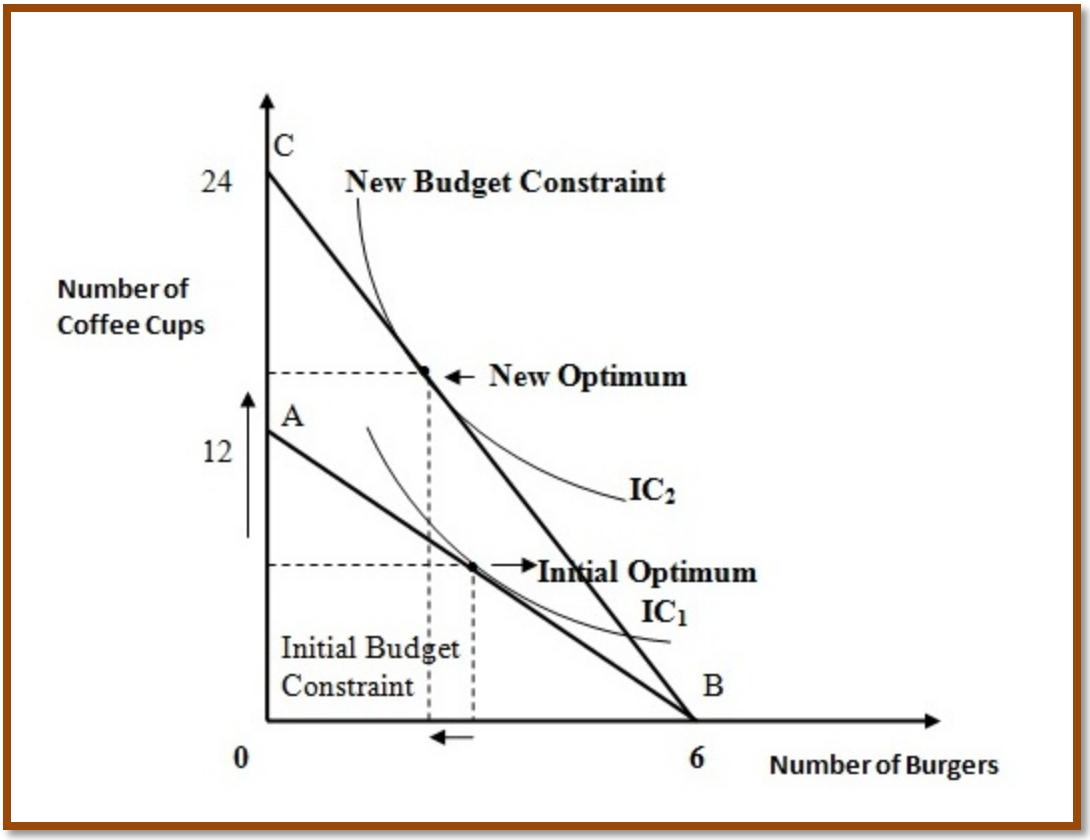


Figure 1.10 – Price Effect.

INCOME AND SUBSTITUTION EFFECTS.

The impact of changes in price of a commodity on consumption can be divided into two effects, namely; the income effect and the substitution effect. When the consumer decides to buy a larger quantity of both the goods, it is known as income effect. However, the relative price of burger has risen i.e. now the consumer would need four cups of coffee to trade with one burger. The consumer would therefore choose to trade more burgers for coffee because coffee has become hundred per cent cheaper in real terms. This is known as the substitution effect. Considering coffee and burgers to be normal goods, the income effect will be positive in both the cases i.e. the consumer will buy a larger quantity of both the goods because the purchasing power has risen. However, the substitution effect for coffee will be positive because the price of coffee has fallen and that of burgers will be negative because the relative price of burgers has risen. Since both the income and substitution effects are positive in the case of coffee, the total effect or the price effect is also positive. In the case of burgers, the income effect is positive but the substitution effect is negative. Hence the net price effect or total effect is not clear or is ambiguous.

Figure 1.11 shows the distribution of price effect into income and substitution effects. When the price of coffee falls, the consumer moves from the initial optimum point A to the new optimum point C. This movement from A to C takes place in two steps. To begin with, the consumer moves along the initial indifference curve IC_1 from point A to point B. Since points A and B are

on the same IC, these points give equal satisfaction to the consumer but at point B the MRS reflects the new relative price. The dashed line through point B shows the new relative price. It is drawn parallel to the new budget constraint. Since there is a rise in real income of the consumer, he moves from point B to point C which is on a higher indifference curve IC_2. Both points B and C have the same MRS because the slope of IC_1 at point B is equal to the slope of IC_2 at point C. The hypothetical line helps to separate the income and substitution effects which determine the consumer's new preference. The movement from point A to point B shows a pure change in the MRS without any change in the welfare of the consumer. The change from point B to point C represents a pure change in consumer's welfare without any change in the MRS. Thus the movement from point A to point B shows the substitution effect and the movement from point B to point C shows the income effect.

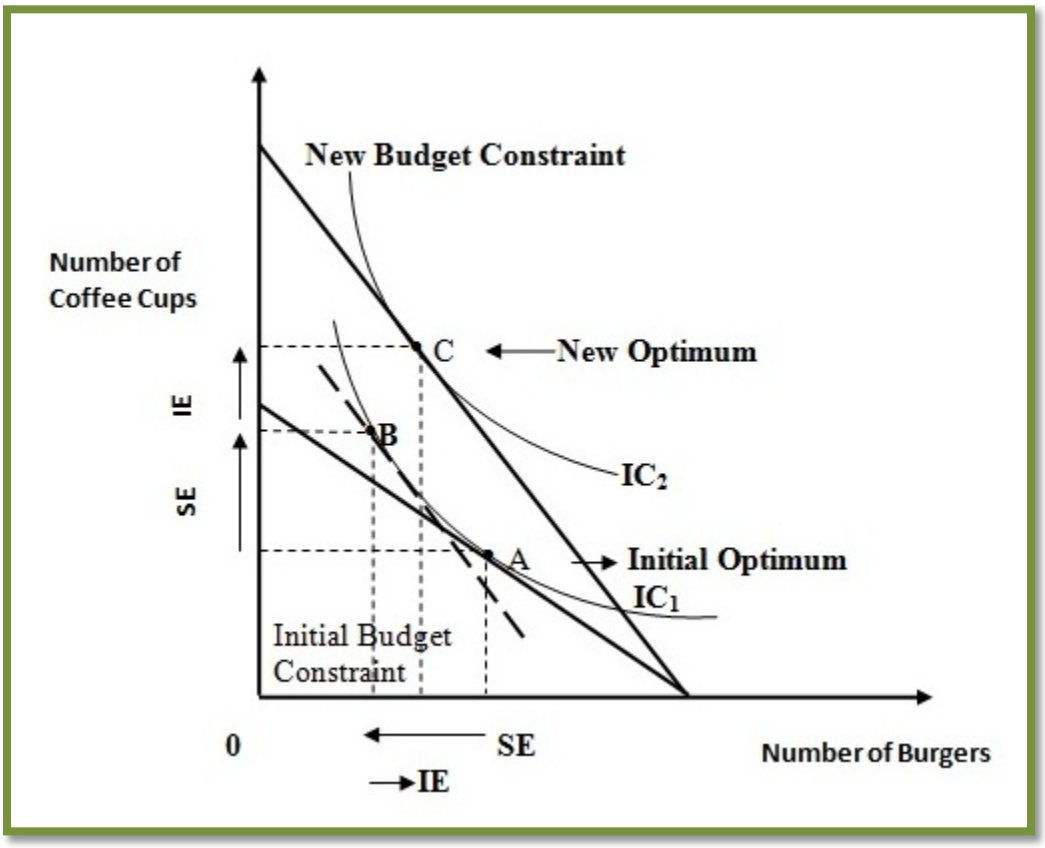


Figure 1.11 – Income and Substitution Effects.

DERIVATION OF THE DEMAND CURVE.

The demand curve for goods reflects the consumption decisions of the consumer. The demand curve is a reflection of the optimal decisions taken by the consumer given his budget constraint and the indifference curves. For example, Figure 1.12 considers the demand for coffee. Panel (a) shows that the price of coffee falls from Rs.50 to Rs.25 and the consumer's budget constraint shifts outward to become steeper towards the vertical axis. This outward shift indicates the increase in purchasing power of the consumer in terms of coffee. Since the price of burgers has not changed, the origin of the new budget constraint remains the same. Due to the positive substitution and income effects, the demand for coffee rises from 6 cups to 18 cups. Panel (b) shows the demand curve that is based on the new optimal decision taken by the consumer. The theory of consumer choice thus provides the theoretical foundation for the consumer's demand curve.

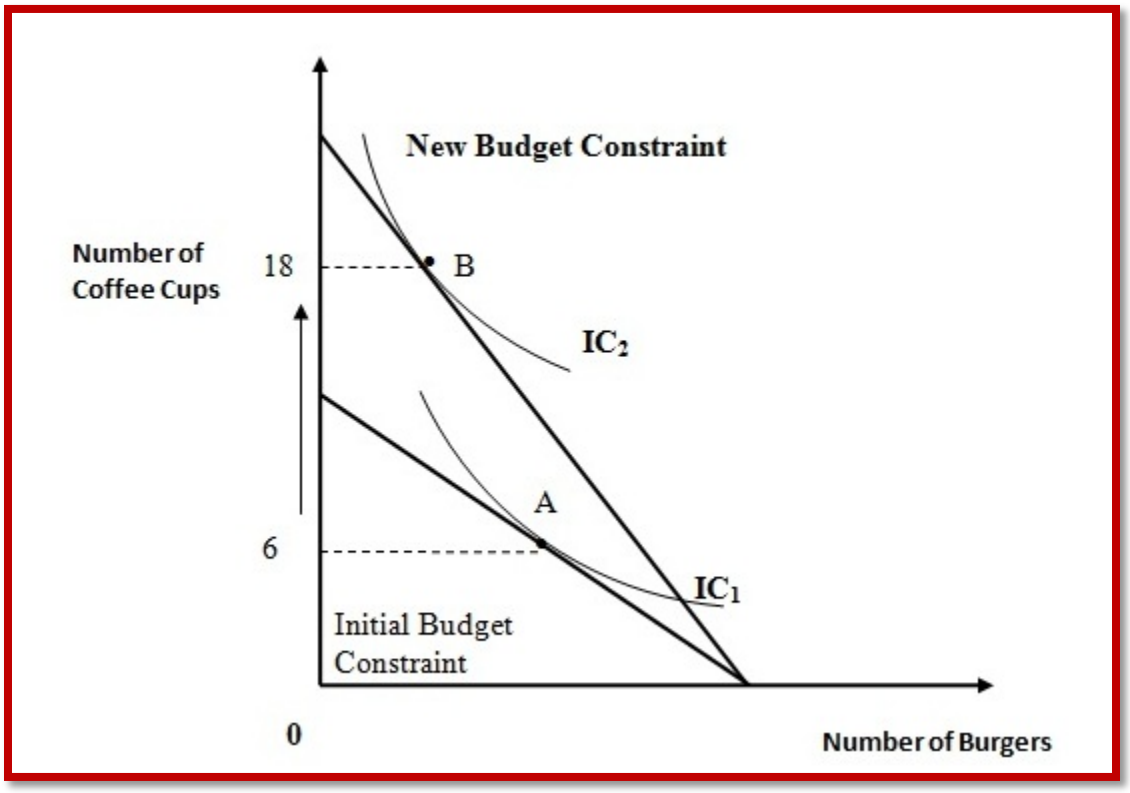


Figure 1.12 (a) – The Consumer's Optimum.

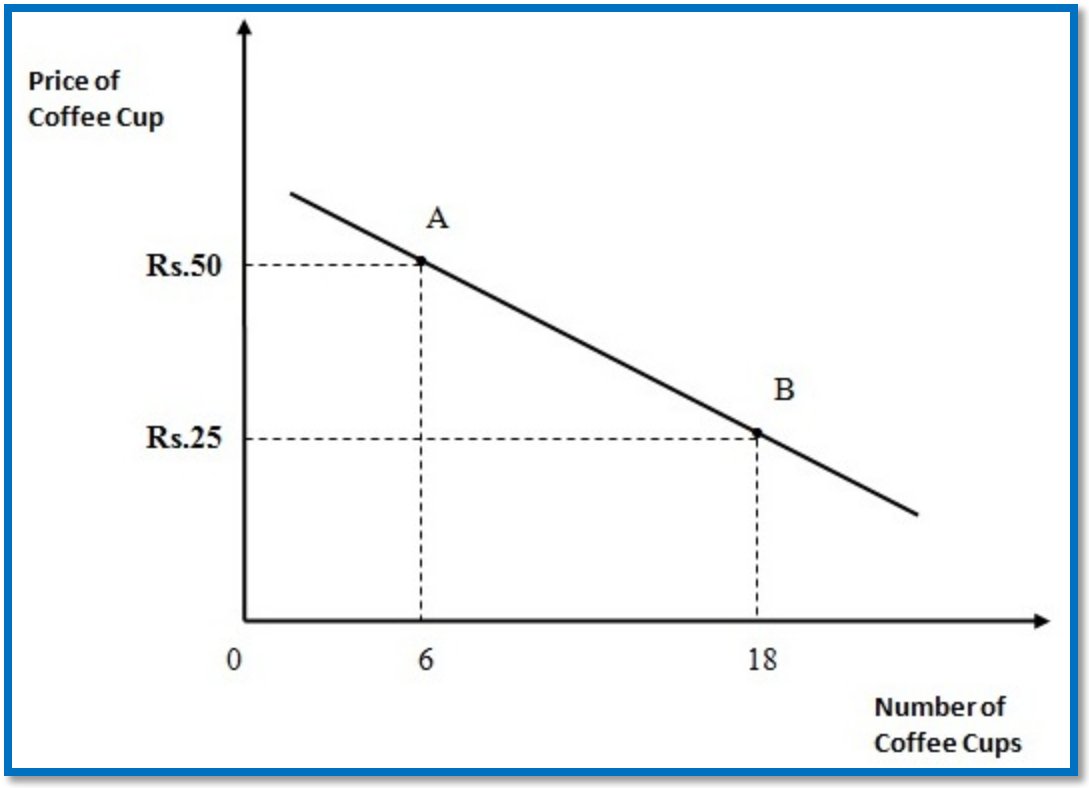


Figure 1.12 (b) – The Demand Curve for Coffee.

QUESTIONS.

1. What is preference and explain the laws of preference?
2. Explain how utility represents consumer preferences?
3. 'More is preferred to less' is not a law of preference. Explain.
4. Explain the concepts of strong and weak ordering.
5. Explain the concept of consumer preference and budget constraint.
6. Explain the concept of consumer optimum with indifference curve.
7. Explain the effect of changes in price and income on consumer's optimal decision making in case of a normal good.
8. Explain the effect of changes in price and income on consumer's optimal decision making in case of an inferior good.
9. Explain the concepts of income and substitution effects.
10. Derive the demand curve with the help of indifference curve.

MODULE TWO

PRODUCTION ANALYSIS

PREVIEW.

- Production function.
- Cobb-Douglas production function.
- Short run and Long run Production Function.
- Returns to Scale.
- Isoquants and their properties.
- Iso-cost curves.
- Cost minimization and producer's equilibrium.
- Derivation of factor demand curves.

PRODUCTION FUNCTION (SHORT AND LONG RUN)

Production in economics refers to the creation of utilities. Production therefore is the end result of a given production process. Utilities are created when resources are converted into usable goods and services. To produce a given quantity of goods and services, a definite quantity of a combination of resources is required. These resources are known as inputs and the resultant goods and services are known as the output. **The functional relationship between input and output is known as production function.**

Production function therefore, can be explained as the relationship between physical units of input and physical units of output. Broadly speaking, the inputs are land, labor, capital and enterprise and the output is the quantity of goods and services. **Prof. Samuelson** has defined production function as: ***"the technological relationship which explains the quantity of production that can be produced by a certain group of inputs. It is related with a given state of technological knowledge."***According to **Prof. Leftwitch,*****"the term production function is used to explain the physical relationship between the units of the factors of production of a firm and the units of goods and services obtained per unit of time."*** These definitions bring out some of the important characteristics of production function such as the time element and the state of technology. Production function must be considered with reference to a particular period of time and the available state of technology. Technology is an important factor because it determines the rate at which a given commodity is produced per unit of time.

In economic theory, we discuss two types of production functions with reference to the time element. These two types are the short run production function and the long run production function.

SHORT AND LONG RUN PRODUCTION FUNCTION.

The short run is a time period during which the existing or the installed plant capacity of a firm is fully utilized. Once full capacity utilization is achieved, the firm can go in for expansion provided the markets are available. For the purpose of expansion, the firm needs to install additional plants, acquire new land, construct factory building, etc. In the long run, the expansion of the firm takes place. While the long run is a continuous time period, the short run is definite. However, the short run time period depend upon the nature of the industry. The short period of a consumer goods manufacturing firm will be relatively shorter than a capital goods manufacturing firm.

Algebraically, the production function of a firm for commodity 'x' can be stated as follows:

$Q_x = f(L, K)$

where Q_x = the quantity of commodity 'x' produced per unit of time.

L = units of labor input.

K = units of capital input.

The production function stated above is a simple one assuming that the firm employs only two inputs–labor and capital in the production of commodity 'x'. However, in the short run, a combination of fixed and variable factors is used. Since capital is lumpy and indivisible, it is a fixed factor in the short run. The firm can therefore increase its output by increasing the labor inputs. Labor therefore becomes a variable factor. The short run production function can thus be stated as follows:

$Q_x = f(L, \bar{K})$ …….. Short Run

The bar on 'K' denotes that capital as a factor input is fixed or constant in the short run. In the long run, there is no distinction between fixed and variable factors. We can therefore remove the bar on 'k' and state the long run production function as follows:

$Q_x = f(L, K, N \ldots)$ ……... Long Run

THE COBB-DOUGLAS PRODUCTION FUNCTION.

The Cobb–Douglas production function explains the input output relationship with the help of statistical techniques. The American economists: **C. W. Cobb** and **P. H. Douglas** carried out their study on the relationship between input and output in the American manufacturing industry during the period 1899 and 1922. The Cobb Douglas production function considers only two factor inputs namely labor and capital. It is stated as under:

$$P = bL^{a} C^{1-a}$$

where P = total output

L = index of employment of labor in manufacturing.

C = index of fixed capital in manufacturing.

The exponents 'a' and '1–a' are the elasticities of production. They measure the percentage change in output in response to percentage changes in inputs of labor and capital respectively. The production function estimate for the manufacturing industry in the United States of America by Cobb–Douglas was:

$$P = 1.01\ L^{0.75}\ C^{0.25}$$

The production function stated above shows that with capital held constant, a one percent change in labor input results in a 0.75 percent change in output. In the same manner, with labor being held constant, a one percent change in capital brings about a 0.25 percent change in output. The Cobb–Douglas production function indicates constant returns to scale which means economies and diseconomies of large scale production are absent and that irrespective of the scale of production, the profitability of manufacturing firm would be equal or that the average and marginal cost of production will be constant.

The Cobb–Douglas production function can be diagrammatically explained as in figure 8.1 below:

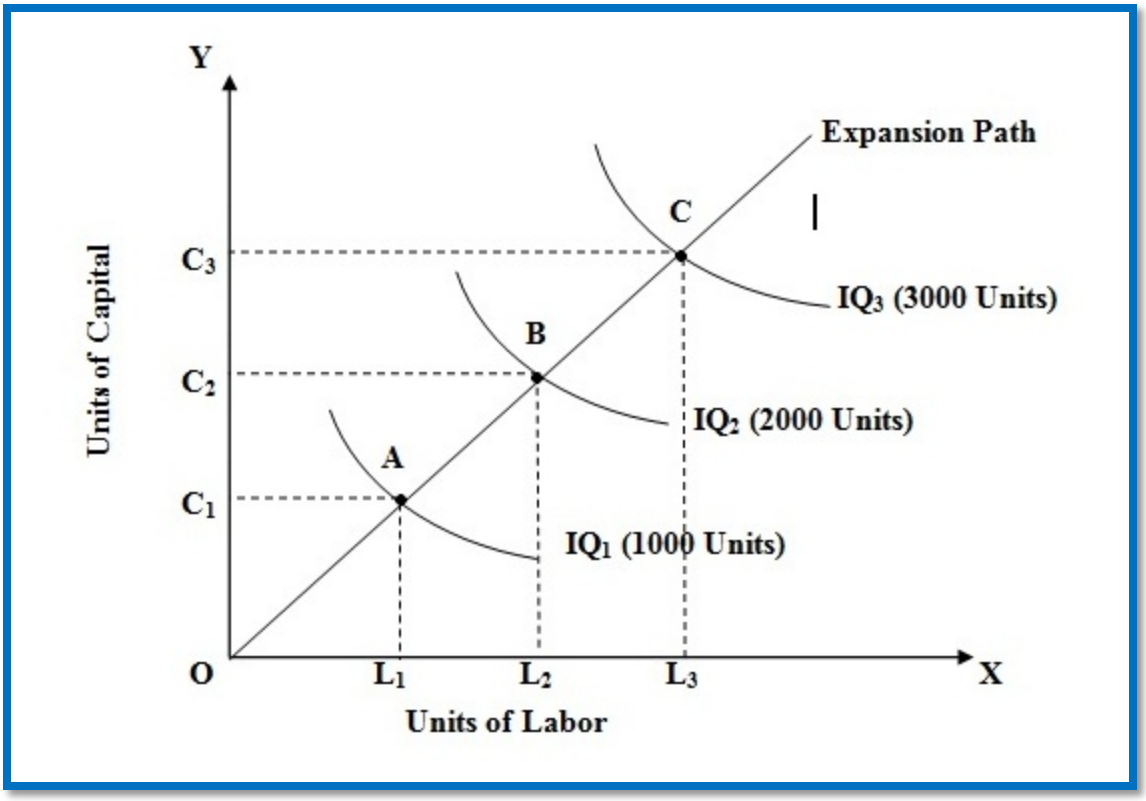


Fig.2.1- The Cobb–Douglas Production Function (Constant returns to scale).

In fig. 2.1, the Cobb–Douglas production function showing constant returns to scale is exemplified in terms of Isoquant curves. You will notice that percentage change in output is equal to percentage change in input indicating constant return to scale i.e., units of labor and capital are raised from OL_1 to OL_2 and OC_1 to OC_2 respectively, the quantity of output goes up from 1000 units to 2000 units. Similarly, when units of labor and capital are further increased by the same proportion, quantity of output proportionately goes up to 3000 units. Algebraically, constant returns to scale suggested by the Cobb–Douglas production function can be stated as follows:

$$\frac{\Delta P}{P} = \frac{\Delta F}{F}$$

where $\frac{\Delta P}{P}$ = percentage change in output, and

$\frac{\Delta F}{F}$ = percentage change in inputs.

In this case, the production function coefficient is equal to unity (PFC=1).

The Cobb–Douglas production function is criticized on the following grounds:

1. Production function is a micro-economic concept. Cobb–Douglas has been criticized for having used a micro-economic concept for explaining macro-economic phenomenon i.e., estimating production function for national economies without adequate justification. Hence their findings may be inaccurate.

2. In the Cobb–Douglas studies, only labor was measured by the actual quantity used inproduction but capital was measured in terms of capital investment. Hence, the measure of capital employed was theoretically incorrect except in the case of full employment. The output elasticity of capital will remain constant only if annual capital input always remained a constant proportion of total capital investment.

THE LAWS OF RETURNS TO SCALE.

In the long run when the firm is in a position to expand the scale of output or production, it needs to increase the inputs of all the factors of production. Unlike in the short run, when one of the factors is variable and the rest are fixed, in the long run all factors become variable. The laws of returns to scale explain the behavior of total output and the causes of the change in the behavior of output which takes place on account of expansion. The laws of returns to scale explains the manner in which proportionate increase in input combinations influences total output at various points on the path of expansion. When a firm launches its expansion program, it comes across three technical possibilities, namely:

1. The total output of the firm may increase more proportionately than the input which means the returns to scale are increasing or the firm is experiencing increasing return to scale.

2. The total output of the firm may increase proportionately or in equal proportion with the inputs which means the returns to scale are constant or the firm is experiencing constant return to scale.

3. The total output of the firm may increase less proportionately than the input which means the returns to scale are diminishing or the firm is experiencing diminishing returns to scale. Thus on the expansion path, the firm experiences three stages of returns to scale, namely: increasing returns, constant returns and finally diminishing returns.

We now try and understand the returns to scale with the Isoquant approach.

INCREASING RETURNS TO SCALE.

When output increases more proportionately than the inputs, the firm is said to be enjoying increasing return to scale i.e., when percentage increase in output is greater than percentage increase in input, the scale of returns are said to be increasing. Symbolically, increasing returns to scale can be stated as follows:

$$PFC = \frac{\Delta P}{P} > \frac{\Delta F}{F}$$

where PFC = production function co-efficient.

$\frac{\Delta P}{P}$ = percentage or proportionate change in output or production.

$\frac{\Delta F}{F}$ = percentage or proportionate change in factor input.

Since the proportionate change in output is greater than the proportionate change in input, the production function co-efficient is greater than one (PFC>1). Increasing returns to scale through the Isoquants is depicted in Fig. 2.2 below.

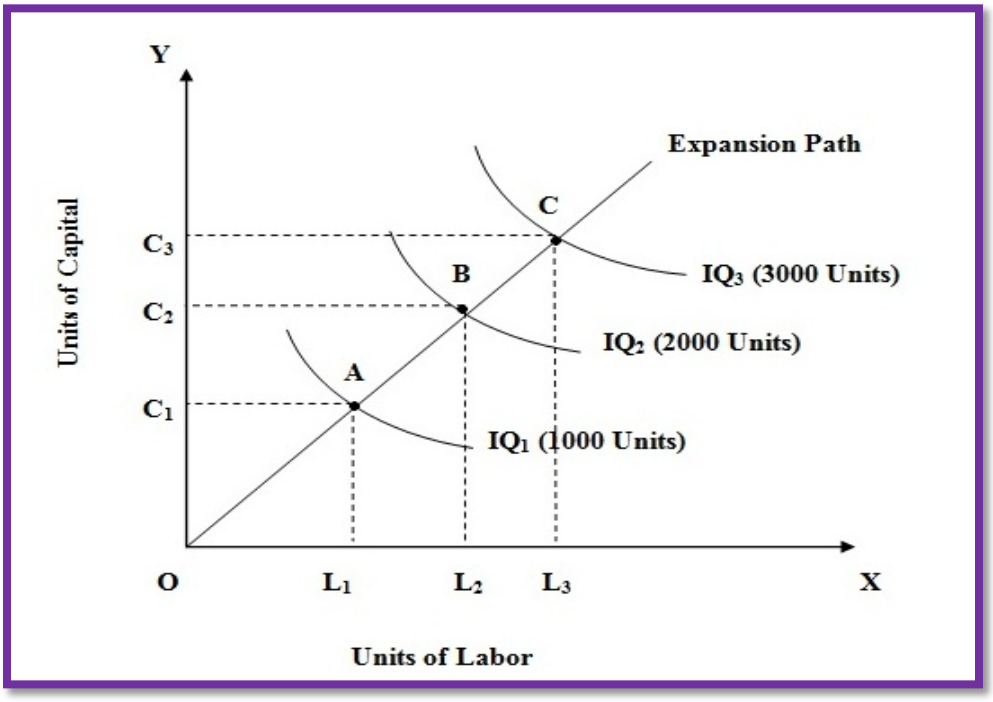


Fig. 2.2 – Increasing Returns to Scale

In Fig. 2.2 above, you will observe that there are three Isoquants IQ_1, IQ_2 and IQ_3 each representing 1000, 2000 and 3000 units of output respectively. The OR curve shows the expansion path of the firm. You will notice that the incremental output of 1000 units of commodity 'x' is obtained by a progressively smaller input combination of both the factors; labour and capital. This is evident from the progressive fall in the distance between the Iso-quants. Thus Oa>ab>bc which means a progressively diminishing rate of factor input is yielding equal increase in output which further proves the fact that the firm is enjoying increasing return to scale.

Increasing returns to scale occurs on account of the following important reasons:

1. **Technical and Managerial Indivisibilities:** Both managerial skills and machinery are available at a certain irreducible size. These inputs cannot be divided further to obtain a smaller output. Hence, when the scale of production expands by increasing all the factor inputs, the productivity of indivisible factors increases more than proportionately, resulting into increasing return to scale. Economists like Joan Robinson, Kaldor, Lerner and Knight have attributed increasing return to scale to the indivisibility or lumpiness of certain factor inputs. Increasing return to scale occurs because of imperfect divisibility of factor inputs.

2. **Higher degree of Specialization of Human Resources and Machinery:** With the increase in scale of production or expansion, it becomes possible to introduce greater specialization of human resources and more efficient machinery. The use of advanced machinery and highly specialized human resources increases marginal productivity of factor inputs. The combined effect of specialized inputs results in increasing return to scale.

3. **Dimensional Advantages:** Prof. W. J. Baumol has put forward dimensional economies as one of the reasons for increasing returns to scale. For instance, a store house with an area of 100 sq. feet i.e. 10'×10' when doubled will obtain an area four times the original area i.e., 20'×20'= 400 sq. feet. Similarly, when factor inputs are doubled, the output will increase more proportionately than the increase in input.

CONSTANT RETURNS TO SCALE.

Constant returns to scale occur when percentage change in factor inputs is equal to percentage change in output. Algebraically, constant return to scale can be stated as:

$$PFC = \frac{\Delta P}{P} = \frac{\Delta F}{F} = 1$$

Thus the production function co-efficient is equal to unity (PFC=1). When change in output is equal to change in input, the production function is known to be a linear homogeneous production function. Constant return to scale is depicted in Fig 3.3 below.

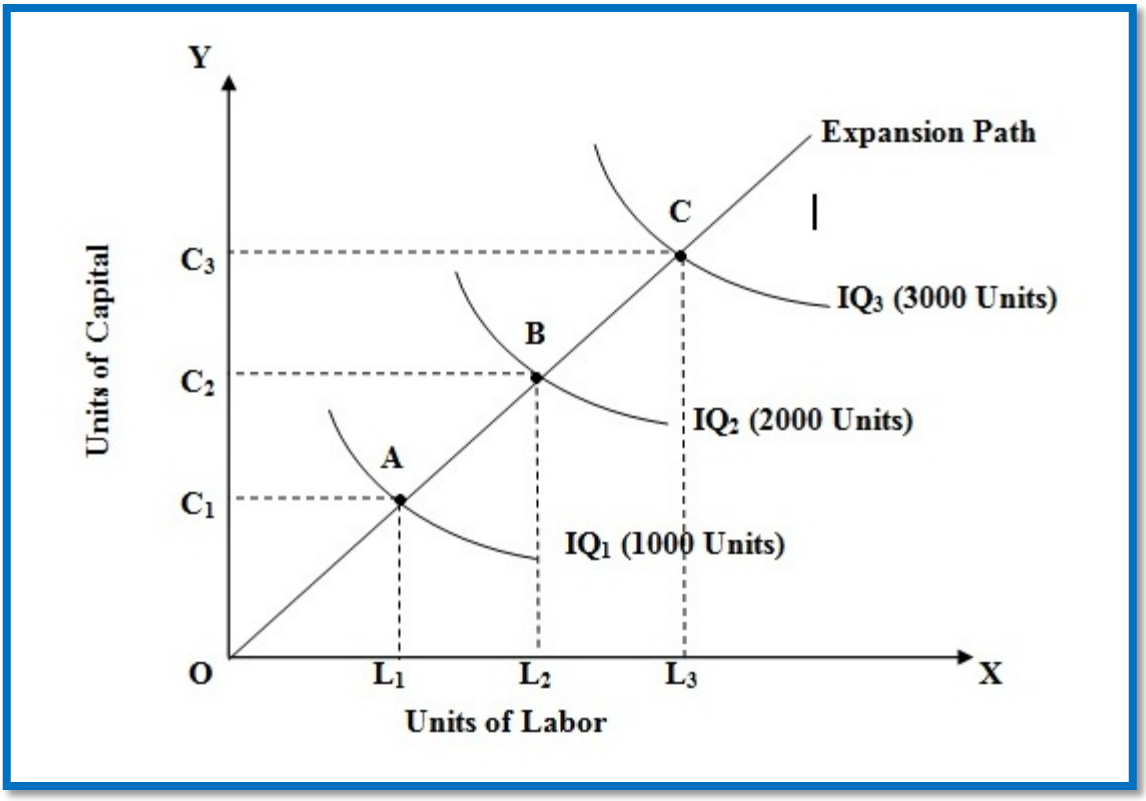


Fig. 2.3 - Constant Returns to Scale

You will notice from figure 3.3 above that the distance between any two Iso-quants on the Iso-quant map is equal i.e., Oa = ab = bc. It means that the combination of factor inputs is increased proportionately on the expansion path and the output increases in the same or equal proportion.Constant Return to Scale occurs on account of the following reasons:

1. **Emergence of Diseconomies of Scale:** While increasing returns occur on account of economies of scale outnumbering the diseconomies, Constant returns to scale can be attributed to the process of equalization between economies and diseconomies of scale. When the firm expands beyond its optimum limit, diseconomies such as financial, managerial, marketing, technical and risk-taking emerges in-equality with the economies of scale that the firm enjoyed in the initial stage. As a result, proportionate change in output is found to be equal to proportionate change in input. Both internal and external diseconomies of scale are known to be limits to large scale production.

2. **Perfect Divisibility of Factor Inputs and Constant, Capital - Labor Ratio:** When factors of production are perfectly divisible, constant returns to scale are obtained. Joan Robinson, Nicholas Kaldor, A. P. Lerner and other believe that if all the factor inputs are increased or decreased in equal proportion, output will also rise or fall in the same proportion which means that constant returns to scale will be obtained. Further, when factors of production are perfectly divisible, an optimum combination of factor inputs can

be employed and constant return to scale can be obtained. However, the views expressed by these economists are contested by Prof. Chamberlin who believes that when the scale of production goes up, economies of scale must emerge and hence increasing return. Further, the empirical evidence provided in the form of Cobb-Douglas production function relates to the British manufacturing industry for the period 1899 to 1922.

DECREASING RETURNS TO SCALE.

When proportionate change in output is found to be less than proportionate change in input, decreasing scale to return is said to have begun. Algebraically, it can be expressed as:

$$\frac{\Delta P}{P} < \frac{\Delta F}{F}$$

In case of decreasing return to scale, the production function co-efficient is less than one (PFC<1). Diagrammatically, decreasing return to scale is depicted in Fig. 3.4 below. You will notice from Fig. 3.4 that the successive distance between any two points on the expansion path or the scale line goes on increasing, thereby suggesting that in order to increase the output by a given fixed proportions, a progressively increasing combination of factor inputs is required. Thus Oa<ab<bc.

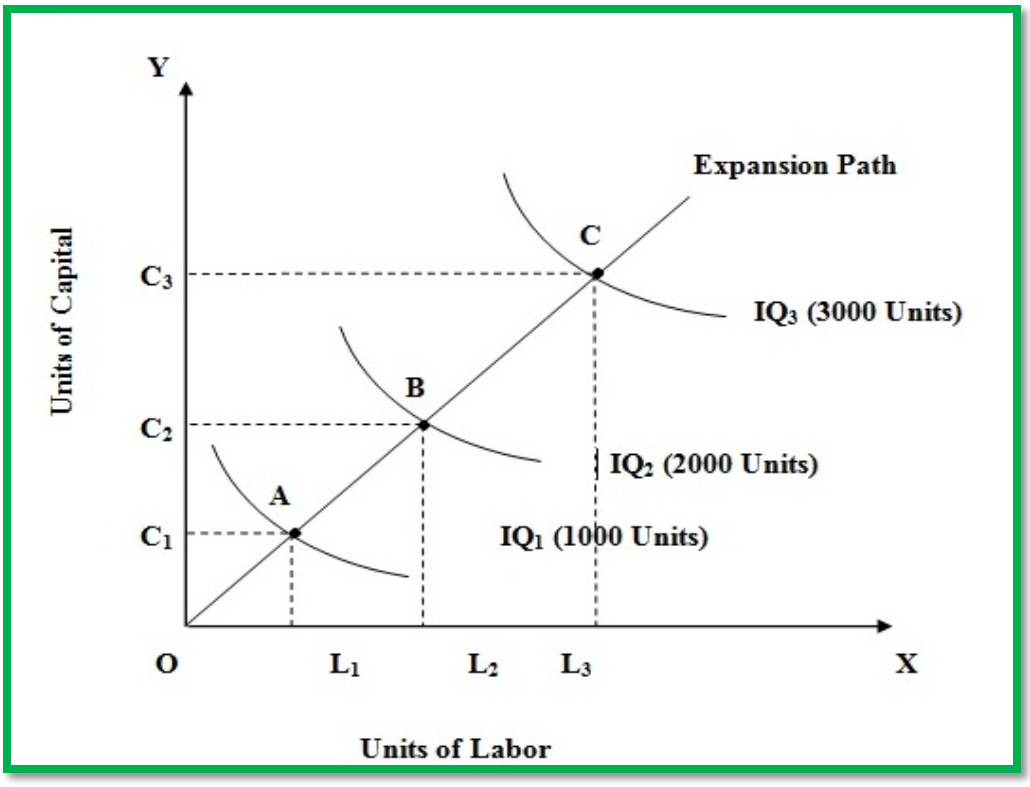


Fig. 2.4 Decreasing Return to Scale

The following are the causes of decreasing returns to scale:

1. **Diseconomies Outnumbering Economies of Scale:** When the firm expands beyond the point of constant returns, the diseconomies of scale outnumber the economies which the firm enjoyed in the earlier stages of expansion resulting in decreasing returns to scale.

2. **Limited Reserves of Natural Resources:** Natural resources such as gas, oil, coal, metal ores etc. are given and fixed. Beyond a point of exploration, these reserves begin to exhaust and if the firm expands its plant capacity in such a situation, the rate of return will be less than proportionate.

PROPERTIES OF ISOQUANT.

Isoquants or equal product curves have the following important properties:

1. **Iso-quants have a negative slope:** The Iso-quant curve has a negative slope in its economic region. The economic region is the area on the Iso-quant map in which substitution between two factor inputs is possible. The economic region is known as the profit maximizing region. The downward or negative slope of the Iso-quant indicates substitutability between two factor inputs. As we move from left to right on an Iso-quant in the downward direction, we find, units of capital are reduced and the reduction in capital inputs is compensated by the increase in labor inputs so that the level of production remains constant.

2. **Iso-quants are convex to the origin:** Convexity of the Iso-quant indicates diminishing marginal rate of technical substitution. The marginal rate of technical substitution is given by the slope of the Iso-quant which is given by: $\frac{\Delta K}{\Delta L}$, where ΔK refers to change in the inputs of capital and ΔL refers to change in the inputs of labor. The MRTS indicates the rate of reduction in one factor input for an additional unit of another factor input, total output remaining constant. The MRTS is diminishing because imperfect substitutability between factor inputs.

3. **Iso-quants do not intersect with each other:** Every Iso-quant, by definition, represents a certain level of output. When two Iso-quants intersect with each other, they will have a common point as in figure 2.5 below which indicates that the given Iso-quant represents two different levels of output. This intersecting Iso-quants are in contradiction and inconsistent with the definition of an Iso-quant. Further, it would also mean that the same level of output will be obtained from a larger factor input combination, which would imply that the marginal productivity of the abundant factor is zero which is not true in the context of the economic region of the Iso-quant.

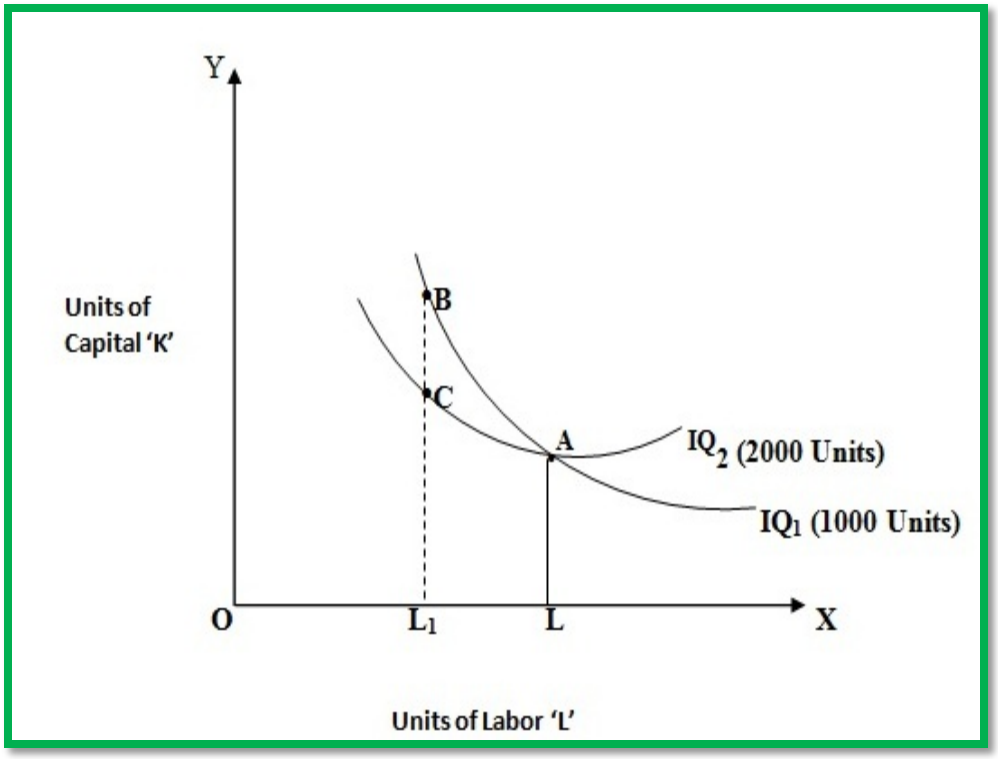


Fig. 2.5 Intersecting Isoquants indicating Inconsistency with the Definition

In fig. 2.5 above, two Iso-quants are drawn intersecting with each other at point 'A'. Point 'A' is therefore common to both the Iso-quant IQ_1 and IQ_2. Points 'B' and 'C' are two other points on IQ_2 and IQ_1 respectively. On IQ_1, factor combination denoted by points 'A; and 'C' yields the same level of output. Similarly, factor combination indicated by points 'A' and 'B' on IQ_2 also yields the same level of output. Since point 'A' is common to both the Iso-quants, it would mean that factor combination denoted by points 'B' and 'C' also yield the same level of output. It would mean:

$$OL_2 + CL_2 = OL_2 + BL_2$$

Since OL_2 is common to both the sides, it would mean:

$$CL_2 = BL_2$$

However, the fact is that $BL_2 > CL_2$, whereas, the intersection of the two Iso-quants indicates that BL_2 and CL_2 are equal which is incorrect. Further, points 'A' and 'B' are on IQ_2 which mean A = B. Both points indicating an output level of 2000 units of 'x'. Points 'A' and 'C' are on IQ_1 both indicating an output level of 1000 units of 'x' which mean A = C. Since A = B and A = C, it follows that B = C, which mean 2000 = 1000 which is nonsense. It can therefore be stated that two Iso-quants cannot intersect with other.

4. **Higher Iso-quants indicates higher level of output:** In a given Iso-quant map as shown in fig. 2.6 below, a higher level of Iso-quant will indicate a higher level of output and vice-versa. This is because, a higher Iso-quant indicates a larger use of either one or both the factor inputs. Higher the use of factor inputs, higher will be the output.

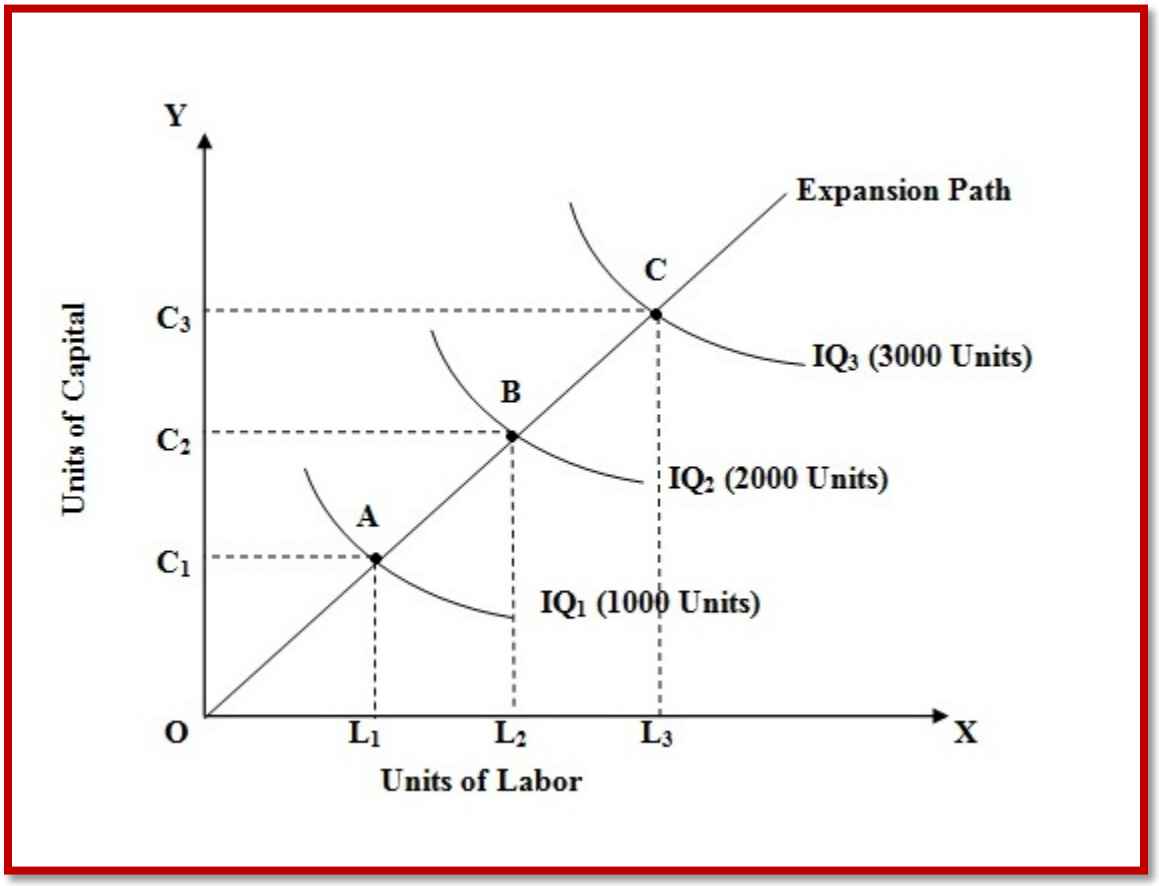


Fig. 2.6 Higher Iso-quants Indicating Higher Level of Output

In fig. 2.6 above, $IQ_3 > IQ_2 > IQ_1$ each indicating output levels of 3000, 2000 and 1000 units of 'x' respectively. Now consider point 'B' on IQ_2. Point 'B' on IQ_2 shows a larger use of capital input as compared to point 'A' on IQ_1 while the use of labor input is same. Similarly, point 'C' on IQ_2 indicates a larger use of labor as compared to point 'A' on IQ_1 while the use of labor input is identical. Further any point between points 'B' and 'C' on IQ_2 would indicate a larger use of either of the factor inputs. Hence, IQ_2 represents a larger level of output and IQ_3 therefore would indicate a still higher level of output.

ISO-COST CURVES.

The Iso-cost curve represents different combinations of two inputs that a firm can purchase given the prices and the outlay available to the firm. The iso-cost curve is also known as the iso-outlay curve or the factor cost curve. Figure 2.7 shows three iso-cost curves each representing outlays of Rs.10 lakh, 20 lakh and 30 lakh respectively. With the given outlay, the firm can purchase either OB of labor or OA capital or any combination of labor and capital as represented by the iso-cost curve. When the outlay increases from Rs.10 Lakh to Rs.20 Lakh, the iso-cost curve shifts upwards and remains parallel to the original curve because the ratio of prices of labor and capital is held constant. If the price of capital is 'r' and the price of labor is 'w', then the slope of the iso-cost line is the ratio of prices of labor and capital i.e. **w/r.**

In figure 2.7, the iso-cost curve A_1B_1 is tangent to the iso-quant curve IQ_1 at point P which represents least cost combination of the two factors for producing a given output. When all such points are joined together, the expansion path or the least cost outlay curve is obtained. PQR is the least cost outlay curve.

With the outlay remaining constant, a fall in the price of labor will shift the iso-cost curve to the right with the pivot on the Y-axis remaining constant i.e. the iso-cost curve will become flatter towards the X-axis as shown in Figure 2.8. Similarly, if the price of capital falls, labor price remaining constant, the iso-cost curve will become steeper towards Y-axis with the pivot on the X-axis remaining constant. When the least cost outlay points are joined together, the factor price curve LMN is derived.

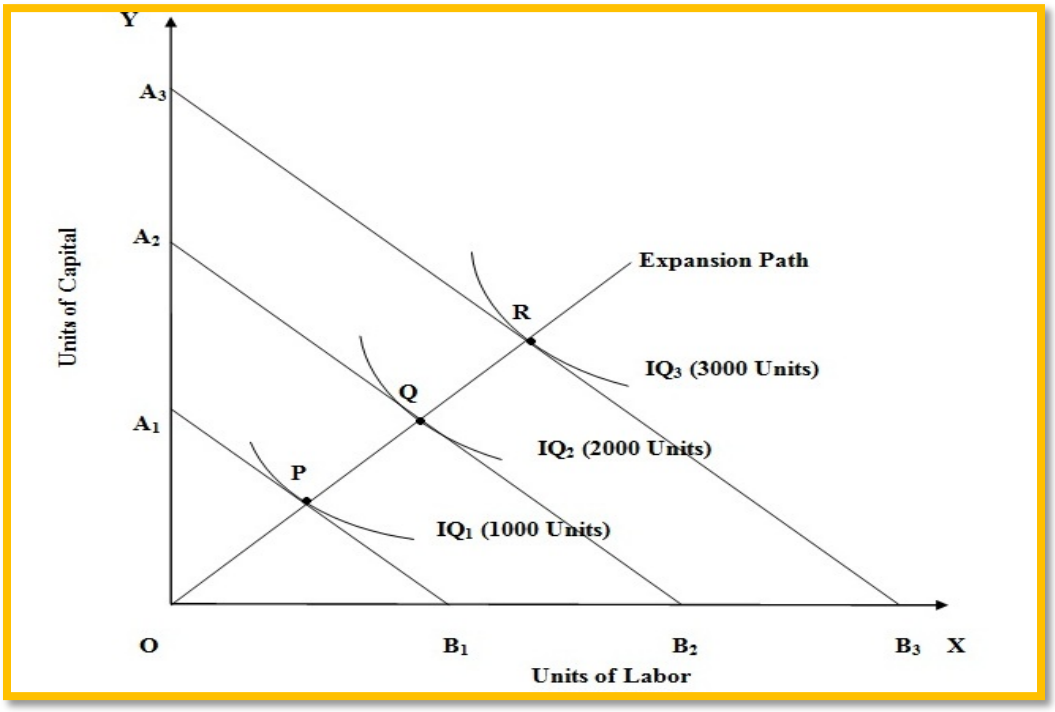


Fig. 2.7 – Iso-cost Curves.

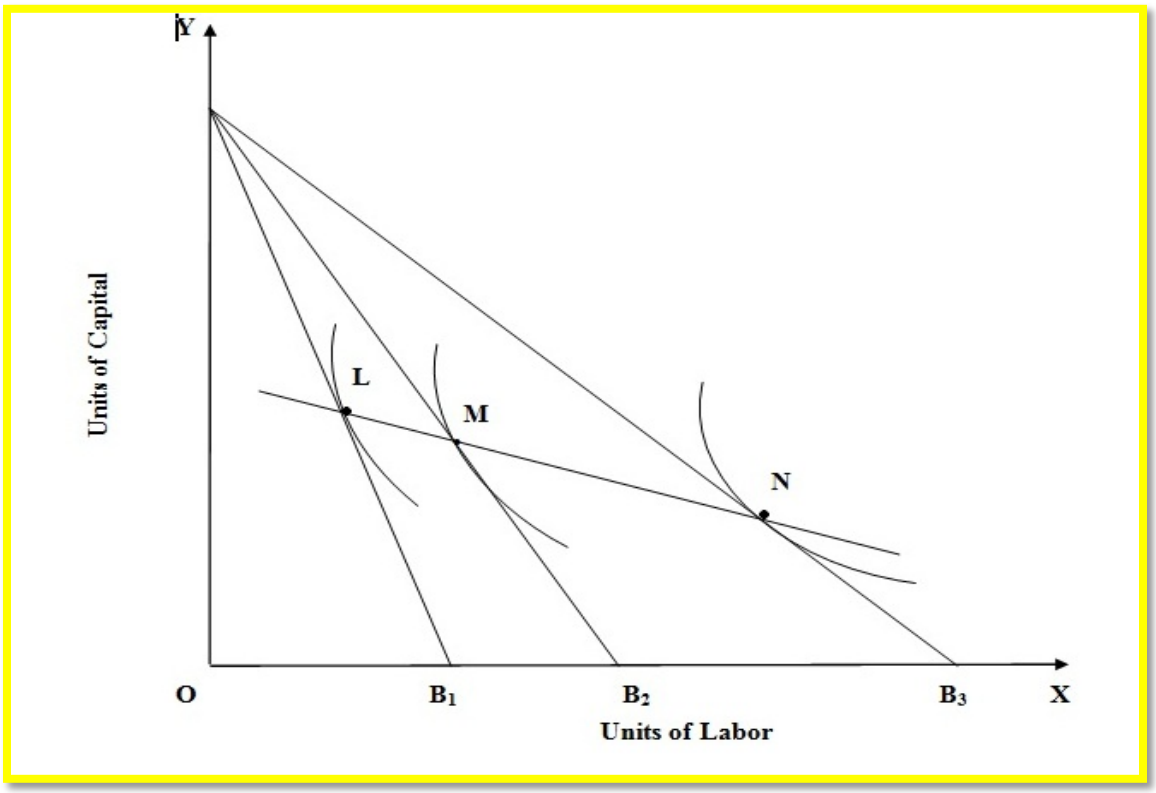


Fig. 2.8 – The Factor Price Curve (LMN).

COST MINIMIZATION AND PRODUCER'S EQUILIBRIUM.

A profit maximizing firm will aim to produce the least cost maximum output. Cost minimization for a given level of output is determined at the point of tangency between the iso-cost curve and the iso-quant. The theory of least cost maximum output is based on the following assumptions:

1. There are two factors of production i.e. labor and capital.
2. All units of factor inputs are homogenous.
3. The prices of factor inputs 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 objective of the firm is to maximize profits.
8. There is perfect competition in the factor market.

In figure 2.9 the Iso-cost curve AB is tangent to the isoquant 2000 at point Q. Accordingly, the firm employs OA of capital and OB of labor units to produce 2000 units of output. Point 'Q' indicates least cost maximum output. Other points on the isoquant such as P and R are placed on

a higher isocost curve and they indicate higher cost of production. The point of tangency between the isocost curve and the isoquant is the first order condition of producer's equilibrium. The other two second order conditions are as follows:

1. The slope of the isocost curve must be equal to the slope of the isoquant at the point of tangency i.e. the ratio of prices of labor and capital must be equal to the marginal rate of technical substitution of labor and capital ($MRTS_{LC}$) which must also be equal to the marginal product of labor to the marginal product of capital (MP_L/MP_C). The condition of producer's equilibrium can be stated as follows:

$$\frac{w}{r} = \frac{MP_L}{MP_C} = MRTS_{LC}$$

2. At the point of tangency, the isoquant curve must be convex to the origin so that the marginal rate of technical substitution of labor and capital is diminishing. A concave isoquant curve would indicate that the MRTS of labor and capital is increasing which is unrealistic and untenable because it would mean that the given output can be produced only with labor or capital.

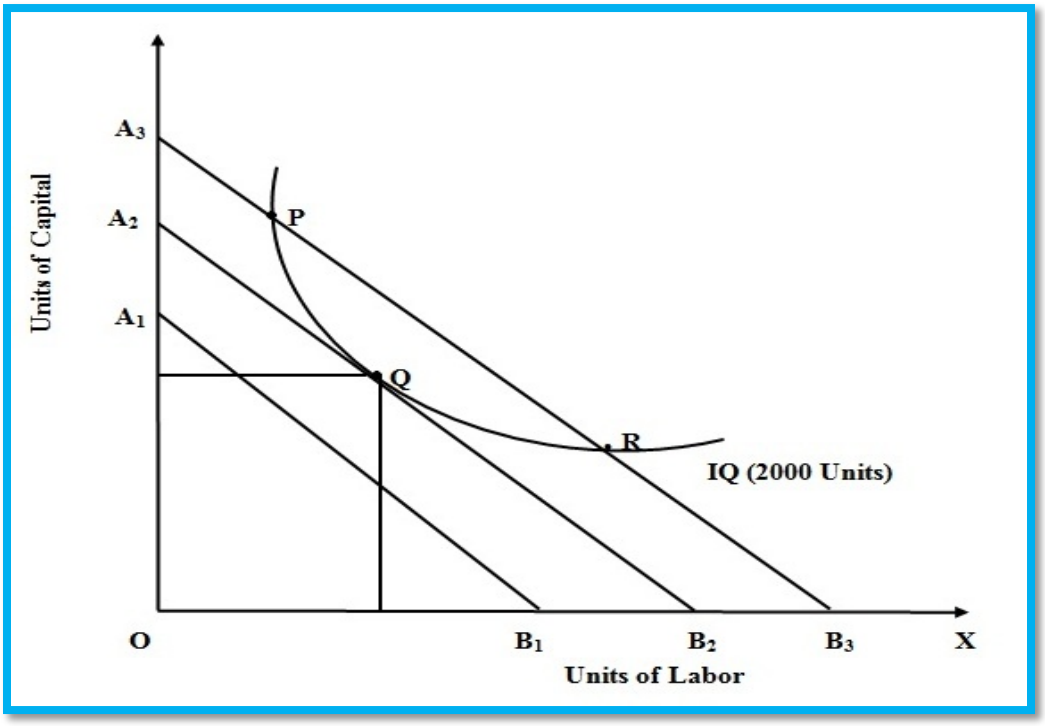


Fig. 2.9 – Producer's Equilibrium.

DERIVATION OF FACTOR DEMAND CURVE.

Under the conditions of perfect competition, the price of a factor service (labor) is determined by the demand for and supply of labor in an industry. The equilibrium wage rate is determined at the point of intersection between the demand and supply of labor.

Demand for Factor Service (Labor).

The demand for labor is a derived demand. It increases with the increase in demand for goods and services. The wage rate is equal to the marginal revenue productivity of labor (MRP_L). The marginal revenue productivity of labor refers to the addition made to the total revenue by an additional unit of labor employed. The demand curve for labor is the MRP_L curve. It shows the amount of labor the firm would employ at each possible wage rate. The MRP_L curve is downward sloping due to the operation of the law of diminishing marginal productivity. The demand schedule for labor as a factor service is given in Table 2.1.

Table 2.1 – Demand Schedule for a Factor Service (Labor).

Units of Factor (n)	Total Product	Marginal Physical Product of Labor ($MPP_L = TPn - TP_{n-1}$)	Price per unit of Output (in INR)	Value of Marginal Product (VMP = 3 × 4)	Total Revenue (2×4)	Marginal Revenue Product of Labor (MRP_L)
1	**2**	**3**	**4**	**5**	**6**	**7**
1	10	10	5	50	50	50
2	25	15	5	75	125	75
3	37	12	5	60	185	60
4	45	08	5	40	225	40
5	50	05	5	25	250	25
6	53	03	5	15	265	15
7	54	01	5	05	270	05

Under the conditions of perfect competition, the wage rate or the factor price of labor is determined by the industry. Industry demand for and supply of labor determines the market wage rate. At the given market wage rate, the firm can only decide its demand for labor or equilibrium level of employment. The equilibrium level of employment or the demand for labor will be determined by the equality between marginal revenue productivity of labor and the wage rate. Assuming that the market wage is Rs. 5, the firm will employ seven units of labor because

the marginal revenue product of the 7th unit of labor is five. The demand curve for labor is shown in Figure 2.10 below.

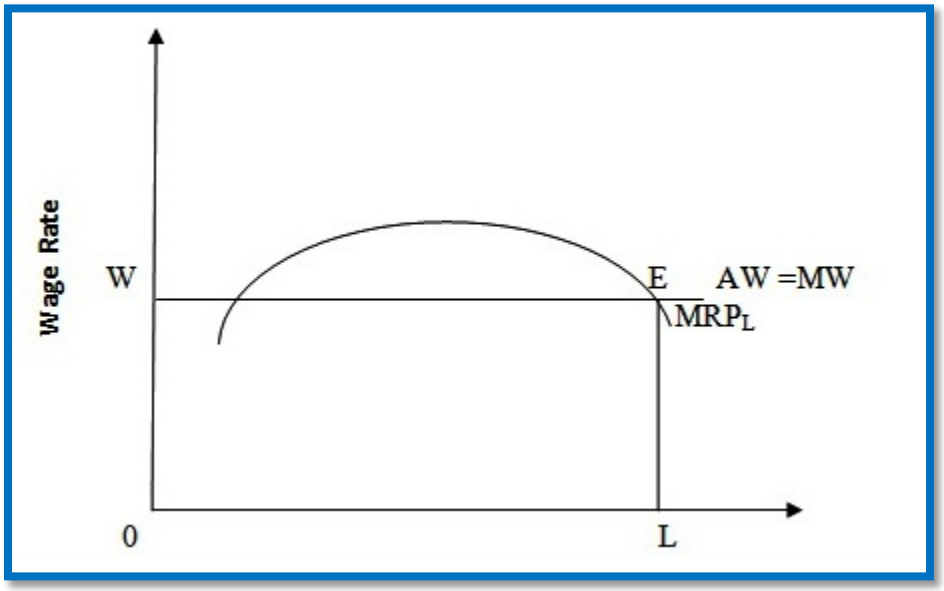


Figure 2.10- Derivation of the Factor Demand Curve for Labor

In Figure 2.10, the wage rate is measured along the vertical axis and the firm's demand for labor is measured on the horizontal axis. Since the wage rate is determined by the industry demand and supply of labor, the firm can only determine its demand for labor given the wage rate OW. The supply curve of labor is perfectly elastic as at the given wage rate, any quantity of labor will be supplied. The MRP_L curve intersects the supply curve at point E and equilibrium demand for labor OL is determined.

Questions.

1. **What is production function? Explain the short and long run production functions.**
2. **Explain the Cobb-Douglas production function.**
3. **Explain the laws of returns to scale.**
4. **What is an isoquant? Explain the properties of isoquant.**
5. **Explain the iso-cost curve.**
6. **Explain the concept of least cost maximum output or producer's equilibrium.**
7. **Explain the derivation of factor demand curve.**

MODULE THREE

COSTS AND REVENUE

PREVIEW.

- Various concepts of costs and their inter-relationship.
- Behavior of costs in the short run and the long run.
- Long run average cost curve and its derivation.
- Implicit and explicit costs.
- Total revenue, Marginal revenue and Average revenue.

INTRODUCTION.

The concept of cost of is central to decision-making. Cost consciousness contributes to cost minimization or cost optimization which leads to cost effectiveness and business expansion. A firm which produces its goods and services at a comparatively lowest cost with a qualitative edge over its competitors will not only survive but also prosper. The micro-economic effect of cost consciousness will be the prosperity of individual firms. When cost effective firms in different industries and sectors of the economy produces its goods and services by minimizing cost and maximizing quality, the macro-economic effect would be increase in economic welfare of the largest possible number of people.

The entrepreneur must be aware of the short run costs because they are important in deciding price and output of the firm. The long run costs are also important. However, their importance lies in deciding the investment and growth policies of the firm. In the economic context, the importance of cost in decision making can be explained in terms of price and output decisions, entry barriers, market structure and growth policy. It is also important for the government to understand the cost and cost structure of the industry because it is the regulatory and law-making body which governs the industry.

Prices are no doubt determined by costs in all market structures, be it be market determined prices or administered prices as in the case of public enterprises. Costs determines price and output in both the time periods i.e. the short run and the long run because the profit maximizing equilibrium condition (MC = MR) do not change with the change in the time period. The monopoly firm may add margin to the cost in order to determine the price of the product. However, the oligopoly firm can only compete on the basis of cost. One of the leadership models in oligopoly is based on low cost known as the low-cost price leadership model.

Costs determine the height of entry barriers in imperfect markets. The lower the cost of production, the greater will be the entry barrier raised by the firm and the more difficult will it be for a new firm to find foothold in the industry. Costs also determine the structure of the market. Large economies of scale can only be reaped by large firms and hence their cost of production will be lower. Larger the size of the firms, fewer will be the number operating in an industry and the market form that may emerge will be the oligopoly market. The direction of growth of a firm is also determined by cost. A firm facing a 'U' shaped average cost curve will decide to set up new production facilities as part of its expansion plans in a growing market. In other circumstances such as a saturated market, the firm may aim at diversification. The decisions on vertical and horizontal integration are based on cost considerations. Post liberalization, the attempts made by larger firms in terms of take over and mergers both friendly and hostile are also based on cost considerations. Finally, the administrative apparatus of the government must be aware of the cost structure of the various industries in the country to put in place a proper regulatory mechanism.

COST CONCEPTS AND THEIR INTER-RELATIONSHIP.

1. **Fixed and Variable Costs:** Fixed costs are fixed for a certain given level of output and hence they are known to be independent of the output. Fixed costs are incurred in the short run and they include costs on account of contractual rent, insurance fees, maintenance costs, property taxes, interest on capital invested, administration expenses such as manager's salary and watchman's wages etc. Fixed costs are also known as overhead costs. Fixed costs can therefore be defined as the costs which are incurred in hiring the fixed factors of production whose amount cannot be changed in the short run.

   Variable costs are those costs which are incurred on the employment of variable factor inputs. Variable costs thus vary with the level of output. Variable cost includes payment of wages to the labour employed, cost of raw materials, fuel, power, transportation etc. Variable costs are incurred only when the production process begins and hence they vary with the level of output. Variable costs are also called prime costs or direct costs.

2. **Total Cost, Average Cost and Marginal Cost:** The total cost of a firm is the sum of its total fixed cost and total variable cost. Symbolically, TC = TFV + TVC.

   The total cost changes with the level of output since its variable component changes in the short run.

   Average cost is a statistical concept. It is obtained by the dividing the total cost by the total output. Symbolically, average cost can be stated as:

$$AC = \frac{TC}{Q}$$

Where, AC = Average total cost
TC = Total cost
Q = Output

Marginal cost is the cost of producing an additional unit of output. Symbolically, the marginal cost can be stated as:

$$MC_n = TC_n - TC_{n-1}$$

For instance, the total cost of ten units of output is Rs. 100/- and the total cost of eleven units of output is Rs. 110/-, then the marginal cost of the eleventh unit of output is Rs. 110 - Rs. 100 = Rs. 10/-.

3. **Short-run and Long-run Costs.** Short run costs are those costs which changes with the change in the level of output. All variable costs are incurred in the short run. Long-run costs are the costs incurred on the fixed assets such as plants, building, machinery, etc. Fixed costs are considered as long run costs. However, when the firm expands its scale of operation, the fixed costs becomes variable costs.

4. **Social Costs and Private Costs.** Social costs are those costs which are implicitly borne by the society on account of production activity carried out by firm. Social costs include use of freely available resources and the cost of dis-utility created in the production process. For instance, the cost of air, water and noise pollution or environmental pollution is borne by the society. Environmental pollution causes ill-health and the cost of ill-health is borne by the individual and the society. Social cost is known to be external cost to the firm. The concept of social cost is important in understanding the general impact of the working of the firms on the society. It is also important in computing the social cost of private gains made by firms.

   Private costs are actually incurred by a firm. All actual costs are private costs and hence they go into the total cost of production.

5. **Actual Cost and Opportunity Cost:** Actual cost refers to the actual expenditure incurred for acquiring or producing a commodity or service. The money expenses recorded in the books of accounts are known to be actual costs. Payments of wages, cost of acquiring materials, plant, machinery, building, equipment, travelling, transport, advertising, payment of interest etc. are all examples of actual cost.

   Opportunity cost is the cost of opportunity lost. It can be defined as the expected receipts from the next best use of resources foregone on account of scarcity. Opportunity cost is also known as alternative cost. Opportunity cost can therefore also be defined as the revenue foregone for not making the best alternative use. For instance, if a person earns

Rs. 20,000/- per month from his present employment and an alternative employment available to him would fetch him Rs. 15,000/- per month, then the opportunity cost of the person would be Rs. 15,000/-. Here the person has to forego the second best alternative because of scarcity of time. The opportunity cost of higher education is the income receipts that you might have received had you opted for taking up employment rather than higher education. Thus, there is an opportunity cost for everything that we do. However, for those goods which have no alternative use, the opportunity cost is zero. The concept of opportunity cost is useful to managers in decision-making i.e., in choosing the best opportunity. Opportunity cost or imputed costs are not actually incurred and hence they are not recorded in the books of accounts.

6. **Incremental Costs and Sunk Costs:** Incremental cost is the additional cost incurred on account of a change in the level or nature of business activity. This change may assume several forms, such as: addition of new products, venturing into new markets, machine replacement etc. Incremental costs arise only when a change is effected in the present business.

   Sunk costs are those which cannot be altered by changing the rate of output or the level of business activity. Sunk costs remain the same irrespective of the level of business activity.

7. **Historical Costs and Replacement Costs:** Historical cost is the cost of an asset acquired in the past. Since historical costs are actual costs in the past, they are recorded in the books of accounts. Replacement cost refers to the financial provision which has to be made for replacing an old asset. Since prices are not stable, there is a divergence between historical costs and replacement costs. While historical costs are used in the assessment of the net worth of the firm, replacement costs are used in the context of renovation of the plant, building, machinery etc. of the firm. The actual incurrence of replacement cost is a fairly accurate forecast given the assumptions regarding the rate of inflation. For instance, the cost of machinery was Rupees One crore in the year 2000, its replacement cost can be estimated for a future time period. Assuming that the life of the machinery is 12 years and the annual inflation rate is six percent, the replacement cost twelve years hence i.e. in 2012 would be Rs. Two crores.

8. **Out-of-Pocket and Book Costs:** Out-of-pocket costs are those costs which involve current cash payments. For instance, payment of wages, rent, interest, transport expenses etc. are known as out-of-pocket costs. Actual business costs which do not involve cash payments but a provision is made in the books of accounts and is taken into consideration while finalizing the profit and loss accounts are known as Book-Costs. Book-Costs are payments made by a firm to itself. For instance, depreciation allowances and unpaid interest on the owners' capital are book-costs.
9. **Urgent and Postponable Costs:** Urgent costs are those costs which must be incurred by the firm in order to continue operations. For instance, the cost of raw materials and labour. Postponable costs as the name suggests are those costs which can be postponed to be incurred in future. For instance, maintenance expenditure.

COST-OUTPUT RELATIONS IN THE SHORT-RUN.

Cost-output relations or the theory of production cost plays a significant role in managerial decision-making in the area of cost minimization, optimization of output and maximization of profit. The cost function or the total cost is a function of the quantity of output produced. Thus the cost function can be stated in a very simple manner as: TC = f (Q), where 'TC' refers to total cost, 'f' for the functional relationship and 'Q' for the quantity of output produced. Both the production function and the prices of factor inputs determine the cost function. With reference to the time element, the cost function can be classified into short run and long run cost functions. In the succeeding paragraph, we will look at the short run cost function or cost behavior and the attendant cost concepts.

The cost concepts used in the economic analysis of cost behavior are total cost, average total cost and marginal cost. The short run total cost consists of the total fixed cost and the total variable cost. Symbolically,

$$TC = TFC + TVC$$

Where, TC =total cost

TFC=total fixed cost, and

TVC=total variable cost.

The Average Total cost can be obtained by dividing the total cost by the output. Hence,

$$ATC = \frac{TC}{Q} \text{ or } \frac{TFC + TVC}{Q} \therefore ATC = AFC + AVC$$

Where, ATC=Average total cost

Q =Quantity of output

Similarly, the average fixed cost and the average variable costs can be obtained as follows:

$$AFC = \frac{TFC}{Q} \text{ and } AVC = \frac{TVC}{Q}$$

The marginal cost is the cost of an additional unit of output. It can be obtained as:

$$MC_n = TC_n - TC_{n-1}$$

where MC_n =marginal cost of the n^{th} unit of output

TC_n =total cost of 'n' units of output

TC_{n-1}=total cost of n-1 units of output.

The marginal cost of the n^{th} unit of output can also be obtained by dividing the change in total cost by the change in output. Then,

$$MC = \frac{\Delta TC}{\Delta Q}$$

where MC =Marginal cost

Δ=small change

In the short run, the total fixed cost (TFC) remains constant. Hence, a small change in the total cost is equal to a change in the variable cost. We can therefore say:

$$\Delta TC = \Delta TVC$$

Since marginal change refers to a small change or a unit change, a marginal change in the output will be always equal to one. Thus, if

$$\Delta Q = 1, MC = \Delta TVC$$

i.e., a small change in the total variable cost will be equal to the marginal cost of the n^{th} unit of output.

The cost output relations and the relationship between various costs are presented in Table 3.1 below.

Table 3.1 reveals the behavior of various costs and their relationship with the output. You will notice from the table that the total fixed cost remains constant throughout the short run. The total variable cost and the total cost changes with the changing level of output. The average fixed cost continuously falls as the output increases because the total fixed cost gets spread over an increasing output. Column '5' in Table 3.1 shows the behavior of the AFC. You will notice that when one unit of output is produced, the AFC is Rs. 100 and when ten units of output is produced the AFC is only Rs. 10/- i.e., 100 ÷ 10. The AFC curve slopes downwards from left to right throughout its stretch. In mathematical terms the AFC curve approaches both the axes

asymptotically i.e., it gets very close to both the axes but remains short of intercepting them. This can be seen in Figure 3.1 as under. Yet another feature of the average fixed cost curve is that the product of the AFC for a given level of output multiplied by the given level of output always remains the same. This is on account of the fact that the product of AFC and the given quantity of output will give you the total fixed cost which is constant by definition. Geometrically, a curve representing such a data is called a rectangular hyperbola.

Table 3.1:The Short Run Output, Total and Average Costs of a hypothetical firm

UNITS OF OUTPUT	TOTAL FIXED COST	TOTAL VARIABLE COST	TOTAL COST	AVERAGE FIXED COST	AVERAGE VARIABLE COST	AVERAGE TOTAL COST
(n)	**TFC = TC - TVC**	**TVC = TC - TFC**	**TC = TFC + TVC**	**AFC = TFC ÷ n**	**AVC = TVC ÷ n**	**ATC = AFC + AVC**
1	**2**	**3**	**4**	**5**	**6**	**7**
`0	100	0	100	0	0	0
1	100	40	140	100.00	40.00	140.00
2	100	70	170	50.00	35.00	85.00
3	100	120	220	33.34	40.00	73.34
4	100	200	300	25.00	50.00	75.00
5	100	290	390	20.00	58.00	78.00
6	100	380	480	16.66	63.34	80.00
7	100	474	574	14.28	67.72	82.00
8	100	568	668	12.50	71.00	83.50
9	100	668	718	11.11	74.22	85.33
10	100	778	878	10	77.80	87.80

The average variable cost is the total variable cost divided by the number of units of output produced. The AVC is the variable cost per unit of output. The AVC assumes a 'U' shape because of the operation of the theory of non-proportional output or the laws of variable factor proportion theory. The AVC therefore falls as the output increases and after a point the AVC begins to rise. While the fall in the AVC is attributed to increasing return, the rise in AVC is on account of diminishing return. The Average Total Cost (ATC) is the sum of AFC and AVC. As the output increases, the AFC progressively declines, the vertical distance between the ATC and the AVC also declines and when the AFC reaches nearer the X-axis, the AVC curve approaches the ATC curve. The ATC is the per unit cost of output. The behavior of the ATC curve is influenced by the behavior of the AFC and the AVC curves. To begin with, both the AVC and

the AFC falls leading to a sharp fall in the ATC curve. When the AVC curve is rising, the AFC is falling sharply but the ATC continues to fall because the net effect of a falling AFC and a rising AVC is negative. However, with further increase in the output, the rise in AVC is much greater than the fall in AFC and hence, the ATC begins to rise. The Average Total cost curve thus like the AVC, has a negative slope in the beginning. It reaches its minimum point or the lowest average total cost and thereafter, it rises. As a result, the ATC like the AVC also assumes a 'U' shape.

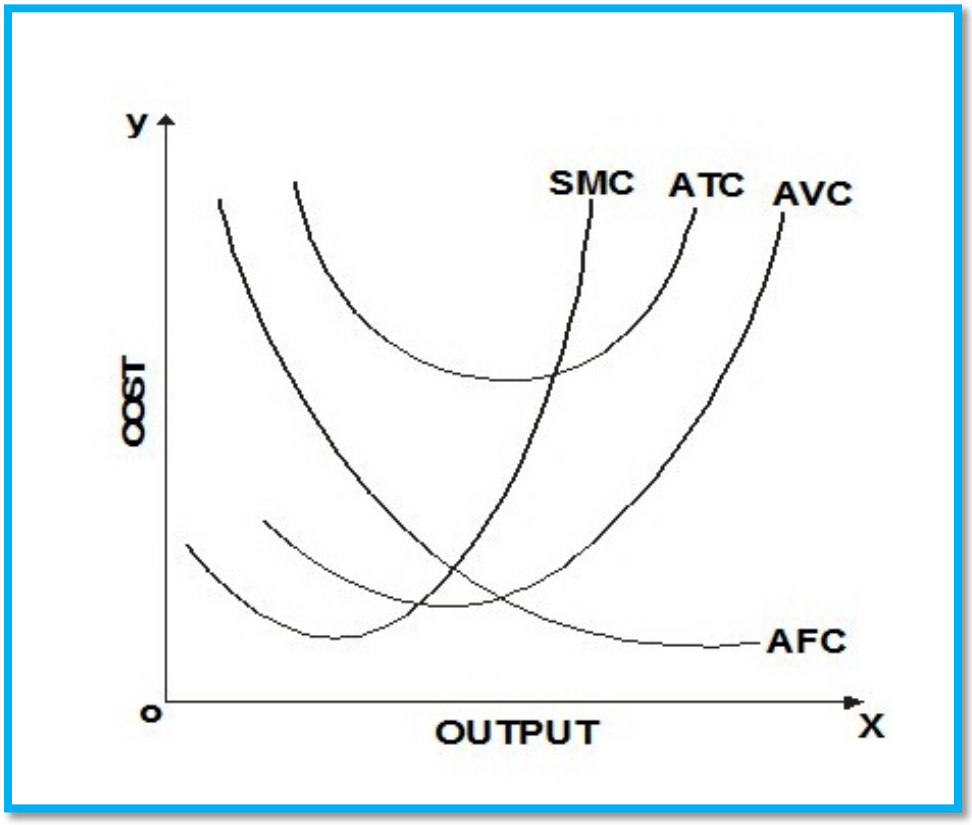


Fig. 3.1 Short Run Average Cost Curve

The computation of the marginal cost is shown in Table 3.2 below:

Table 3.2: Marginal Cost

Output (n)	**Total Cost (TC)**	**Marginal Cost** $MC = TC_n - TC_{n-1}$ or $\frac{\Delta TC}{\Delta Q}$
0	140	-
1	200	60
2	250	50
3	290	40
4	320	30
5	360	40
6	412	52
7	472	60
8	545	73

Table 3.2 above shows the computation of the marginal cost curve. $\frac{\Delta TC}{\Delta Q}$ represents the shape of the total cost curve. By drawing a tangent to the total cost curve at any given point, we can measure the marginal cost. You will notice from Fig. 9.1 that the marginal cost curve also assumes 'U' shape showing that in the beginning, the MC falls with the rise in output and thereafter it remains constant for a certain period and finally starts rising upwards. The marginal cost is the rate at which total cost changes when output is increased by one unit. It can also be said that in the short run the marginal cost is the rate at which the total variable cost changes since

$\Delta Q = 1$ and therefore $MC = \Delta TVC$. It is because the AFC does not influence either the marginal cost curve or the average variable cost curve.

The relationship between the marginal cost curve and the average cost curve can be described as follows:

(a) When the marginal cost curve falls, the average cost curve also falls. However, the rate of fall in MC is greater than that of AC because the decreasing marginal cost is on account of a unit change in output, whereas the decreasing average cost is spread over the entire range of output. Hence, the average cost falls at a rate less than that of the marginal cost.

(b) When the marginal cost is rising, the average cost also rises but at a lower rate than that of the marginal cost. This can be attributed to diminishing return. However, in a certain given range of output as can be seen from figure 9.1 that when the MC is rising, the AC is still falling. This is because the rate of increase in the marginal cost is only large enough to reduce the rate of fall in the average cost.

(c) The marginal cost curve intersects the average cost curve at its minimum point from below. At the point of intersection, the marginal cost is equal to average cost (AC = MC).

DERIVATION OF THE LONG RUN AVERAGE COST CURVE.

In the long run, all factor inputs become variable because in the long run the supply of fixed factors becomes elastic. Since the firms have already used their available production capacity, they are free to expand their scale of output in the long run. The long run consists of a series of short-run production decisions and hence the long run cost curve is composed of a series of short run cost curves. The derivation of the long run total cost curve (LTC) is shown in fig. 3.2 below.

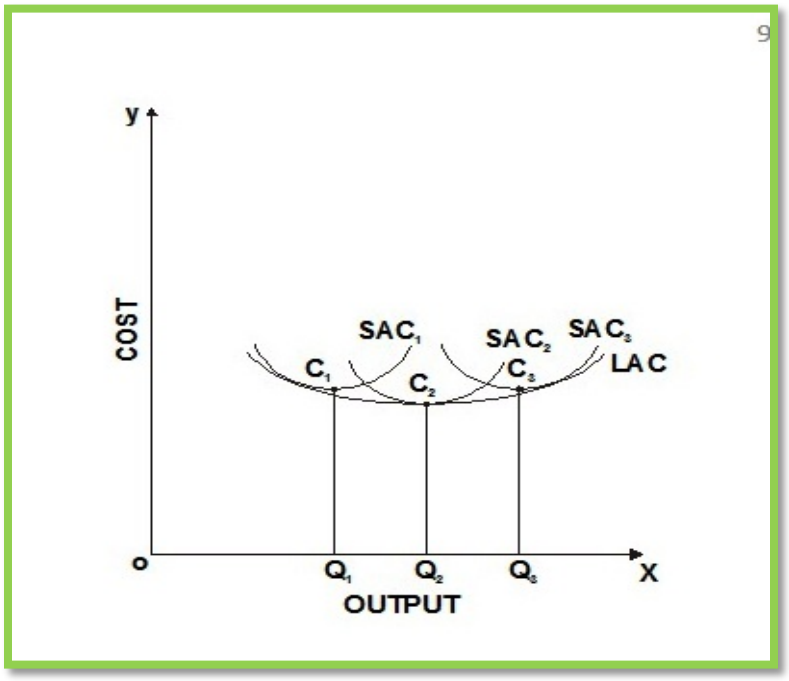


Fig. 3.2 Derivation of the Long Run Average Cost Curve

The long run average cost curve is derived by combining the short run average cost curves. In fig. 3.2 above, we can observe three short run average cost curves namely: SAC_1, SAC_2 and SAC_3. When the firm operated on plant number one, its short run average cost curve was $SAC_1$and C_1 being the minimum point on SAC_1, the optimum output produced was OQ_1. The average cost falls to C_2Q_2 when the firm expands and adds plant number two. However, with further expansion i.e., with the addition of plant number three, the average cost rises. Note that $C_3Q_3>C_2Q_2$. The long run average cost curve (LAC) is drawn through the bottom of all the three curves as shown in figure 3.5 and hence the LAC is known as planning curve or the Envelope Curve. You will notice that the Long run average cost curve initially declines until the optimum utilization of the second plant and thereafter it begins to rise. The behavior of the LAC indicates that when the firm expands, the average cost declines initially, remains constant over a certain range of output and finally begins to rise. The shape of the long run average cost curve is attributed to the Laws of Return to Scale.

The long run marginal cost curve is derived from the slope of the long run total cost curve. The LMC has a flat 'U' shape indicating that initially as output expands in the long run, the LMC declines, thereafter it remains constant for a while and finally rises. The behavior of the LMC and its relationship with LAC is shown in Fig. 3.3. From the figure, the relationship between the LAC and the LMC can be described as follows:

a) When the LAC falls, the LMC also falls. However, LMC<LAC.

b) After a point, the LMC begins to rise, although LAC continues to fall. However, LMC continues to remain less than LAC.

c) When the LAC is minimum, LMC = LAC. The LMC curve thus intersects the LAC curve at its lowest point.

d) After the optimum point on the LAC, the LMC begins to slope upwards and lie above the LAC (LMC>LAC).

You will notice that there is no difference in the relationship between the short run and the long run average and marginal cost curve.

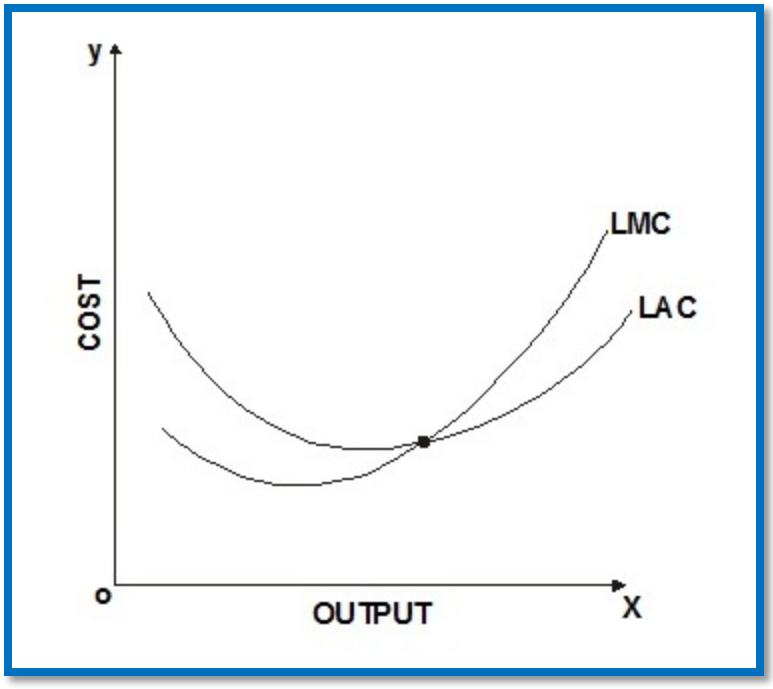


FIG. 3.3 -RELATIONSHIP BETWEEN LAC AND LMC

EXPLICIT COSTS.

Explicit Costs are the costs which involve expenditure of cash by the firm. The cost is incurred when production takes place. The cost is a charge for the use of factors of production like land, labour, capital and enterprise. They are in the form of rent, salary, raw material, wages, and other expenses like electricity, stationery, postage, transportation etc.Explicit Costs show that payment has been made to outsiders, while business is carried out. The recognition and reporting of the explicit cost takes place when they arise and they are recorded immediately.

Recording of the explicit cost is very important because it helps in the calculation of business profit as well as it fulfils purposes like decision-making, cost control, reporting, etc.

IMPLICIT COSTS.

Implicit Cost, also known as the economic or opportunity cost, is the cost which the company had foregone while employing an alternative course of action. They do not involve any outflow of cash from the business. It is the monetary value of sacrifice made by the firm at the time of exercising alternative opportunity. The cost occurs when an asset is used as a factor of production by the firm instead of renting it out.

Implicit costs are not actually incurred and hence they need to be estimated. They are not recorded in the books of accounts as well as these are not reported. The purpose of ascertaining the implicit cost is that it helps in decision making regarding the replacement of any asset.

Implicit costs have a direct impact on the profitability and performance of the company. Some common examples of implicit costs are interest on owner's capital, salary to the proprietor, etc. which are not actually incurred but they exist.

Implicit and explicit costs can be distinguished as follows:

1. Explicit cost is incurred when the firm has to pay for the use of productive factors. Implicit cost is the opportunity cost which is incurred when the firm uses the proprietor's resources like land and building.

2. Explicit cost is also known as out-of-pocket cost whereas implicit costs are known as imputed cost.

3. Explicit costs are objective because they are actually incurred whereas implicit costs are indirect costs and hence their measurement is subjective. For example, the opportunity cost of land and building owned by the proprietor is the amount of money the proprietor might have received by renting out the building. Such an amount has to be an estimated amount not the actual amount.

4. Explicit costs are considered in calculating accounting profit as well as economic profit but implicit costs are considered only in calculating economic profit.

5. Explicit costs are recorded and reported to the firm whereas implicit costs are neither recorded nor reported to the firm.

TOTAL REVENUE, MARGINAL REVENUE AND AVERAGE REVENUE.

Total Revenue.

Total revenue is the product of price multiplied by the output sold by a firm. $TR = P \times Q$,
Where TR stands for total revenue, P stands for price of the product sold and Q stands for the quantity of output sold by the firm. For instance, if a firm sells a product at Rs.100 per unit and the total units sold is also 100, then the total revenue from the sale will be Rs.100 × 100 = Rs.10,000/-.

Average Revenue:

Average revenue is revenue earned per unit of output sold. Average revenue can be obtained by dividing the total revenue by the number of units sold. Thus,

Average revenue = total revenue/total output sold

AR = TR/Q

Where AR stands for average revenue, TR for total revenue and Q for total output produced and sold. In our example, when total revenue TR equal to Rs. 10,000 is received by selling 100 units of the product, the average revenue will be equal to Rs. 10,000/100 = Rs. 100. Rs. 100 is here the revenue earned per unit of output. The average revenue is the price per unit of output. The price is equal to average revenue over the entire range of output sold because the price is assumed to be constant.

Marginal Revenue:

Marginal revenue is the additional revenue earned by selling an additional unit of the product. In other words, marginal revenue is the addition made to the total revenue by selling one more unit of a commodity. Putting it in algebraic expression, marginal revenue is the addition made to total revenue by selling n units of a product instead of n – 1 where n is any given number.

If a producer sells 100 units of a product at price Rs. 100 per unit, he will get Rs. 10,000 as the total revenue. If he now sells 101 units, he will, therefore, obtain total revenue of Rs. 10,100 from the sale of 101 units of the product. This means that 101th unit of output has added Rs. 100to the total revenue. Hence Rs. 100 is the marginal revenue. Now, we see that the price, average and marginal revenue are same because, the price is assumed to be constant.

Total revenue when 100 units are sold at price of Rs. 100 = 100 x 100 =Rs. 10,000/-

Total revenue when 101 units are sold at price of Rs. 100 = 101 x 10 = Rs. 10,100

Marginal revenue = 10100 – 10,000 = Rs. 100/-

Therefore, marginal revenue = difference in total revenue in increasing sales from n – 1 units to n units.

If TR stands for total revenue and Q stands for output, then marginal revenue (MR) can also be expressed as follows:

$MR = \Delta TR/\Delta Q$

$\Delta TR/\Delta Q$ indicates the slope of the total revenue curve.

Thus, if the total revenue curve is given to us, we can find out marginal revenue at various levels of output by measuring the slopes at the corresponding points on the total revenue curve.

Average and Marginal Revenue under Imperfect Competition:

Under the conditions of imperfect competition, the marginal revenue is always less than average revenue because a larger output can only be sold at a lesser price. Since the average revenue is declining with a rise in output, the total revenue rises but less than proportionately. The relationship between AR, MR and TR under imperfect competition will become clear from Table 3.3.

Table 3.3.
Total, Average and Marginal Revenue (in INR) under Imperfect Competition.

Units Sold (n)	**Price or AR (P or TR/n)**	**Total Revenue (P × Q = TR)**	**Marginal Revenue ($MR_n = TR_n – TR_{n-1}$)**
1	2	3	4
1	20	20	20
2	19	38	18
3	18	54	16
4	17	68	14
5	16	80	12
6	15	90	10
7	14	98	08
8	13	104	06
9	12	108	04
10	11	110	02
11	10	110	Zero
12	09	108	-2

It will be seen from the Column 3 that price (or average revenue) is falling as additional units of the product are sold. Marginal revenue is the difference between two successive total revenues. Thus, when 1 unit is sold, total revenue is Rs. 20. When 2 units are sold, price (or AR) falls to Rs. 19 and total revenue increases to Rs. 38.

Marginal revenue is therefore equal to 38 - 20 = 18, which is recorded in Col. 4. When 3 units of the product are sold, price falls to Rs. 18 and total revenue increases to Rs. 54. Hence marginal revenue is now equal to Rs. 54 - 38 = Rs. 16.

Marginal revenue is positive as long as total revenue is increasing. Marginal revenue becomes negative when total revenue declines. Thus when quantity sold is increased from 11 units to

12units the total revenue declines from Rs. 110 to 108 and therefore the marginal revenue is negative and is equal to -2.

Table 3.2 clearly reveals the fundamental fact that under the conditions of imperfect competition, the average and marginal revenue declines as more and more output is sold i.e. the demand curve faced by the firm is a downward sloping demand curve and has a negative relationship with price and quantity sold. Firms operating under Monopoly, Oligopoly and Monopolistic market structures operate under imperfect competition and these firms cannot sell a larger output without reducing the price or average revenue.

The case, when average revenue (or price) falls when additional units of the product are sold in the market is graphically represented in Fig.3.4. In Fig. 3.4 it will be observed that average revenue curve (AR) is falling downward and marginal revenue curve (MR) lies below it.

The fact that MR curve is lying below AR curve indicates that marginal revenue declines more rapidly than average revenue. When OQ units of output are sold, AR is equal to QH or OP and MR is equal to QS. When OM units of the product are sold, marginal revenue is zero. If the quantity sold is increased beyond OM, marginal revenue becomes negative.

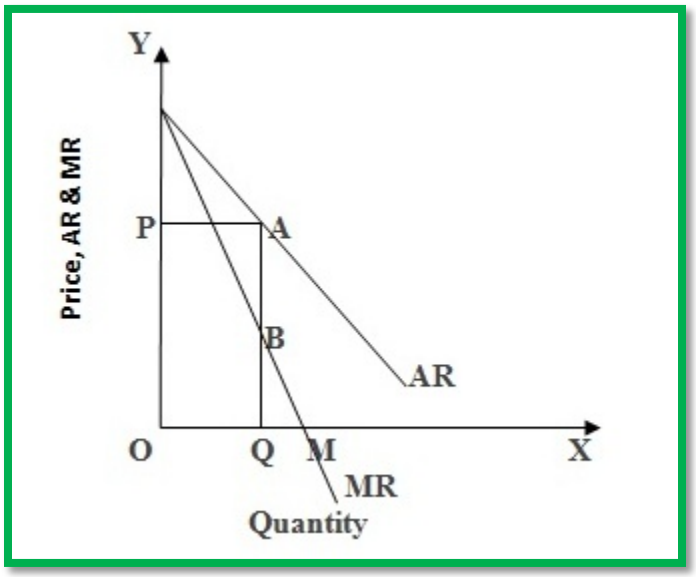


Fig.3.4 – Average and Marginal Revenue Curves under Imperfect Competition.

Average and Marginal Revenue under Perfect Competition:

Under perfect competition, the demand curve facing an individual firm is perfectly elastic and the price is beyond the control of a firm and that the firm is known to be a price taker as against a price maker under imperfect competition.Since the price is decided by the industry and remains

constant over the entire range of output, the average revenue remains constant. If the price or average revenue remains the same when more units of a product are sold, the marginal revenue will be equal to average revenue.

The relationship between price, average and marginal revenue is shown in Table 3.4.

TABLE 3.4.
Average and Marginal Revenue under Perfect Competition

Units Sold (n)	**Price or AR (P or TR/n)**	**Total Revenue (P × Q = TR)**	**Marginal Revenue ($MR_n = TR_n - TR_{n-1}$)**
1	2	3	4
1	20	20	20
2	20	40	20
3	20	60	20
4	20	80	20
5	20	100	20
6	20	120	20
7	20	140	20
8	20	160	20
9	20	180	20
10	20	200	20

In the above table, price remains constant atRs. 20 when more units of the product are sold. Column 3 shows the total revenue increases in proportion to the quantity sold.

Since the price remains constant over the entire range of output, the marginal revenue is equal to the average revenue. Thus, when two units of the good are sold instead of one, the total revenue rises from Rs. 20 to Rs. 40, the addition made to the total revenue i.e. marginal revenue will be equal to Rs. 40 - 20 = Rs. 20.

Similarly, when three units of the product are sold, the total revenue increases to Rs. 60, and the marginal revenue will be equal to Rs. 60 - 40 = Rs. 20. The relationship between AR, MR and Price under perfect competition is depicted in Fig. 3.5. The Average revenue curve is a horizontal straight line (i.e., parallel to the X-axis) and the marginal revenue curve is superimposed on the AR curve.

Horizontal-straight-line average revenue curve (AR) indicates that price or average remains constant at OP level when quantity sold is increased and the firm can sell any quantity of output at the given price OP. Marginal revenue (MR) curve coincides with average revenue (AR) curve since marginal revenue is equal to average revenue.

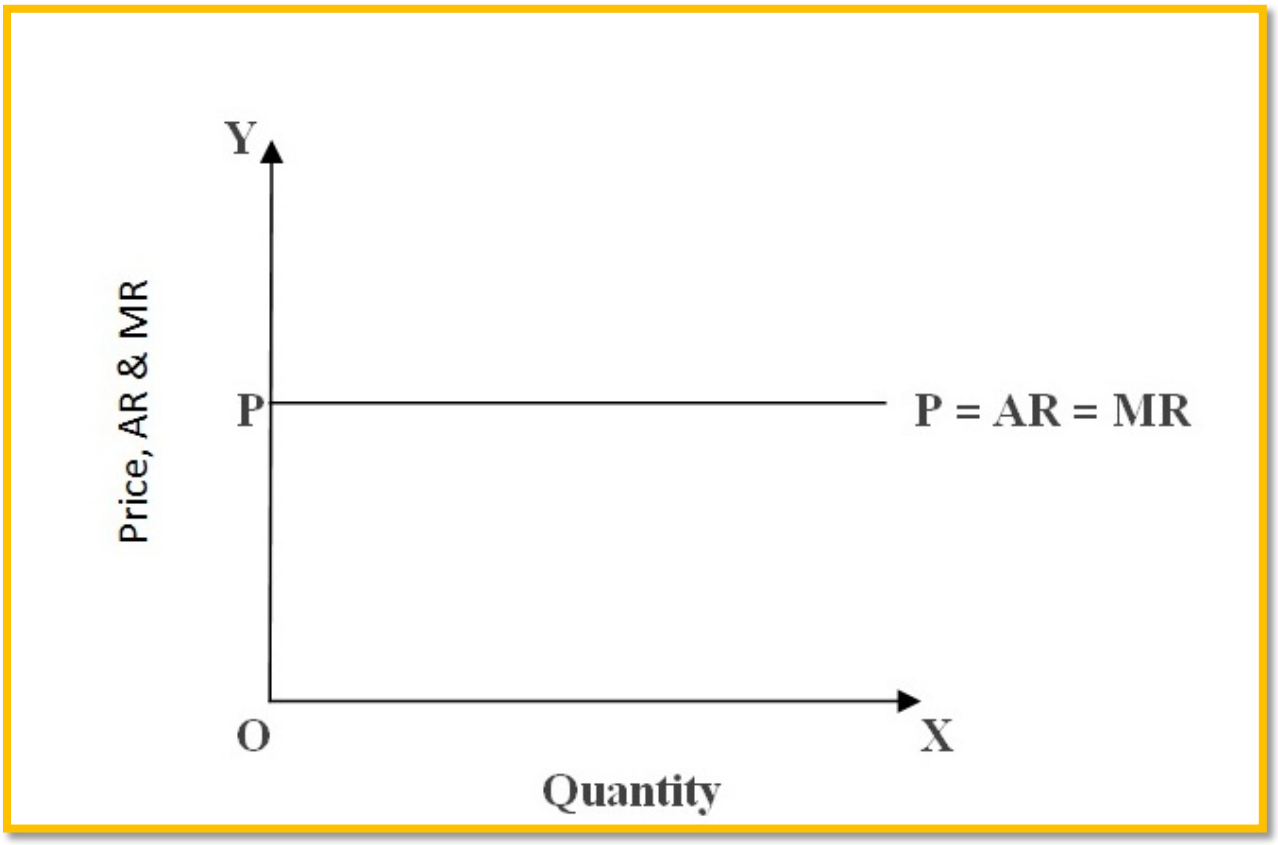


Fig.3.5 – Average and Marginal Revenue Curves under Perfect Competition.

Questions.

1. **Explain the concepts of fixed cost and average fixed cost with the help of a diagram.**
2. **Explain the concepts of Average Total Cost and Marginal cost with the help of a diagram.**
3. **Explain the relationship between average and marginal cost curves.**
4. **Explain the short run behavior of cost curves.**
5. **Explain the derivation of the long run average cost curve.**
6. **Distinguish between implicit and explicit costs.**
7. **Explain the relationship between Average Revenue and Marginal revenue under perfect competition.**
8. **Explain the relationship between Average and Marginal Revenue under imperfect competition.**

MODULE FOUR

COMPETITIVE MARKETS

PREVIEW.

- Homogenous goods - no barriers to entry - no collusion among sellers.
- Availability of market information – price equals marginal cost in competitive markets.
- Supply curve and its derivation in competitive markets.
- Equilibrium of the firm and the industry.
- Consumer's surplus.
- Producer's surplus.
- Economic efficiency in competitive markets.

INTRODUCTION.

A market is a phenomenon in which goods and services are exchanged for a price. The exchange may take place through a monetary mechanism or by barter. Markets therefore exist wherever exchange takes place. In all modern economies, goods and services are exchanged through the monetary mechanism i.e., the use of money as a medium of exchange. The value of goods and services are expressed in terms of money which is known by the term 'Prices'.

Market structures known to modern economies, assumes various forms such as perfect competition, Monopoly, Oligopoly and Monopolistic competition. The Market form or structure is determined by two important elements, namely: (a) the number of firms producing a given product and (b) the nature of products produced by the firms i.e., whether the products are homogeneous or similar or heterogeneous or dissimilar. Thus under perfect competition, the number of firms are large and the products are homogeneous. Perfect competition is an idealized market form and hence a theoretical extremity. The other extreme form is monopoly characterized by a single seller producing a unique product which does not have close substitutes. Perfect competition, a desirable market form is absent in reality while monopolies, although undesirable are actually on the wane with national economies rapidly moving towards a free market system. Between these two extreme forms, we have monopolistic markets and Oligopolistic markets. Monopolistic markets are characterized by large number of firms (the number of firms being lesser than that of perfect competition), their products are differentiated or heterogeneous. Thus each monopolistic firm enjoys a partial monopoly over the market by virtue of its distinctive and dissimilar products. Oligopoly market constitutes a few firms with product differentiation. Both oligopoly and monopolistic market forms are generally seen in reality. However, oligopoly market form assumes pre-eminence in modern market economies. Let us understand the concept of perfect competition.

COMPETITIVE MARKET.

A market consisting of large number of buyers and sellers is known as a competitive market. When there are a large number of buyers in a market, one buyer or a few buyers will not be able to influence market demand and price. Similarly, when there are a large number of sellers, one seller or a few sellers will not be able to influence market supply and price. The market price of any product is determined by the market forces of market demand and market supply. For instance, the price of onions in the vegetable market is determined by the market demand and supply of onions. Single buyer or a group of buyers will have no influence on the market demand and price of onions because their demand constitutes only a negligible fraction of market demand. A single seller is a price taker and will not be able to influence the market price. At the given market price, a single seller or a group of sellers can sell as much as they can sell. The seller or a group of sellers will not be able to influence market supply and price because their supply constitutes only a negligible fraction of market supply of onions. A competitive market is known to be perfectly competitive and has the characteristics of perfect competition.

PERFECT COMPETITION.

Perfect competition is an idealized form of market structure characterized by perfection in its various features. The features of perfect competition are stated below:

1. **No Collusion among Sellers.**Under perfect competition or in a perfect market, there are large number of buyers and sellers. Individual buyers or individual sellers have no influence or bearing on the market prices of goods and services produced by the firms. While the market supply is determined by the collectivity of firms in a given industry, the market demand for the goods and services produced by a given industry is determined by the collectivity of buyers for the given goods and services produced by a given industry. There is no collusion or agreement or tacit understanding either among the sellers or the buyers in determining price or the quantity demanded. The free and collective forces of market demand and market supply interacts with each other and the equilibrium market price is determined. The process by which prices are determined in a perfect market is known as price mechanism or market mechanism.

2. **Homogenous Goods.**In a perfect market, the products of an industry are homogeneous. For instance, let us assume of a soap manufacturing industry – under the conditions of perfect competition. All the soap manufacturing firms in the soap industry will produce soaps in identical or similar size, color, smell or fragrance, weight, design etc. Thus the attributes of soaps available in a perfect market will be perfectly identical. Further, there will be a single price or an identical price for the given variety of soap. Hence, the buyers will be indifferent between soaps manufactured by different firms. Buyers therefore do

not have any particular choice or preference for commodities available in a perfect market.

3. **No Barriers to Entry.**Firms are free to enter and free to exit to and from a perfect market. Thus there are neither entry barriers nor exit barriers. Loss making firms can therefore exit and reallocate their resources to profitable uses. Factors of production or factor inputs are perfectly mobile between different uses. Resources are therefore not only optimally utilized but are also put to their best possible or the most profitable uses. Labor, Capital and Enterprise are perfectly mobile between firms, industry and regions within an economy. Land with the exception of being geographically immobile is also perfectly mobile between firms and industries.

4. **Availability of Market Information.**Buyers and sellers possess perfect knowledge and information about the market. Thus the two constituents of the market i.e., firms and households are equally informed, knowledgeable and wise. The great economic questions as to what to produce, how much to produce, when and where to produce, for whom to produce and at what price to sell have easy and perfect answers. Similarly, what to consume, how much to consume, when to consume and where to consume are the questions answered freely by the buyers on the basis information that is also freely available to them. Due to availability and accessibility to market information, both buyers and sellers are able to take rational decisions.

5. **Absence of Government Intervention.**The perfect market is perfectly free of government intervention. It is a laissez faire economy or a free market economy where-in individual buyers and individual firms are perfectly free to express their choice and preferences. The pattern of production is guided by consumer sovereignty. The individual buyer and the individual firm know the best. Every one pursues their self interest without hampering or overstepping on the self interest of others. While this happens, the collective interest of the society is maximized or best served because consumers enjoy consumers' surplus and producers enjoy producers' surplus. It is therefore not the business of the government to either do business or to intervene in the decisions making of firms and households.

The perfect market on account of perfection in its various aspects can be considered as a welfare maximizing market form. Although there are two time periods, the long run equilibrium is considered as a stable equilibrium i.e., a situation in which there is neither fresh entry nor exit of firms. Every firm produces optimum output i.e. least cost maximum output. While the average cost of production is minimum, the market price of commodities is equal to the marginal cost and also the average cost. The firms therefore enjoy only normal profits.

Perfectly competitive market is an idealized form, a desirable form but not the actual form. There is no factual evidence of the existence of a perfect market. Markets in reality are imperfect and they assume forms such as monopoly, monopoly of a large number of firms or monopolistic

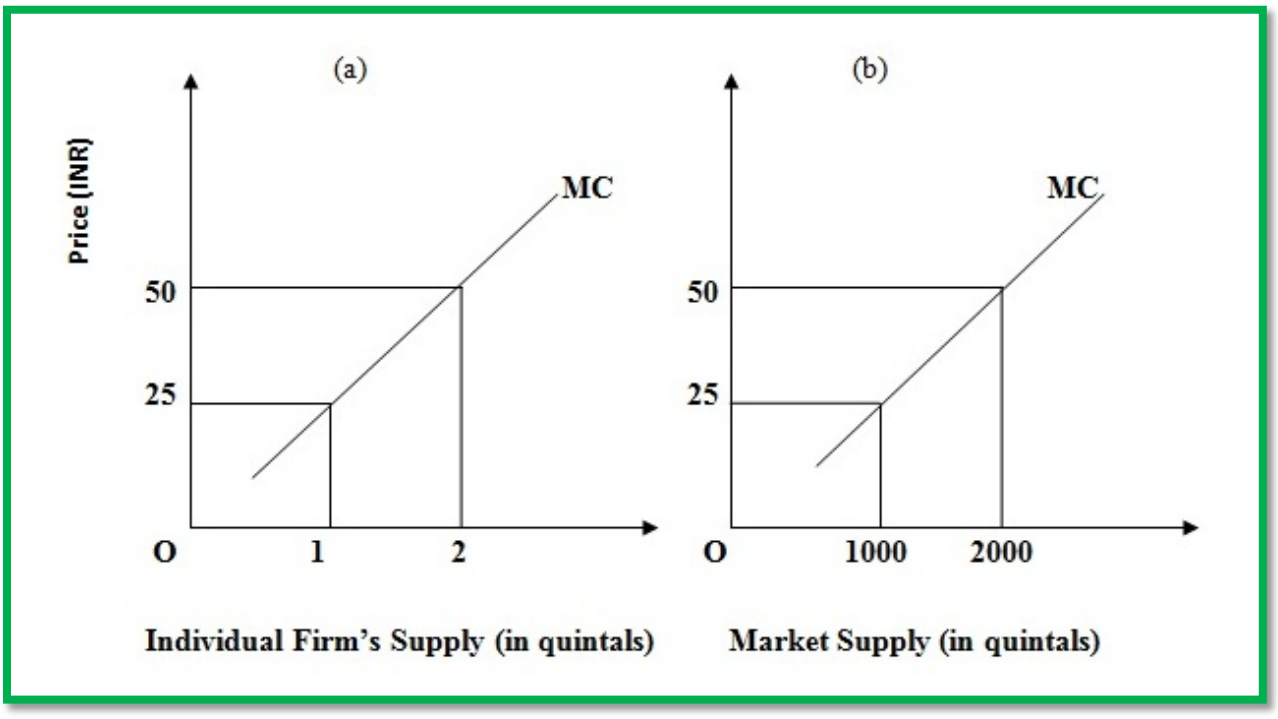
competition and monopoly of a few firms or oligopoly. Nonetheless one needs an ideal type to compare the reality and the extent to which reality deviates from the ideal type.

SUPPLY CURVE AND ITS DERIVATION IN COMPETITIVE MARKET.

Market supply is influenced by the time horizon assumed. In the short period, the number of firms operating in the market is more or less fixed. In the long period, firms have time to make adjustments and decide whether to enter or exit or stay put in the market.

The Short Run Market Supply Curve.

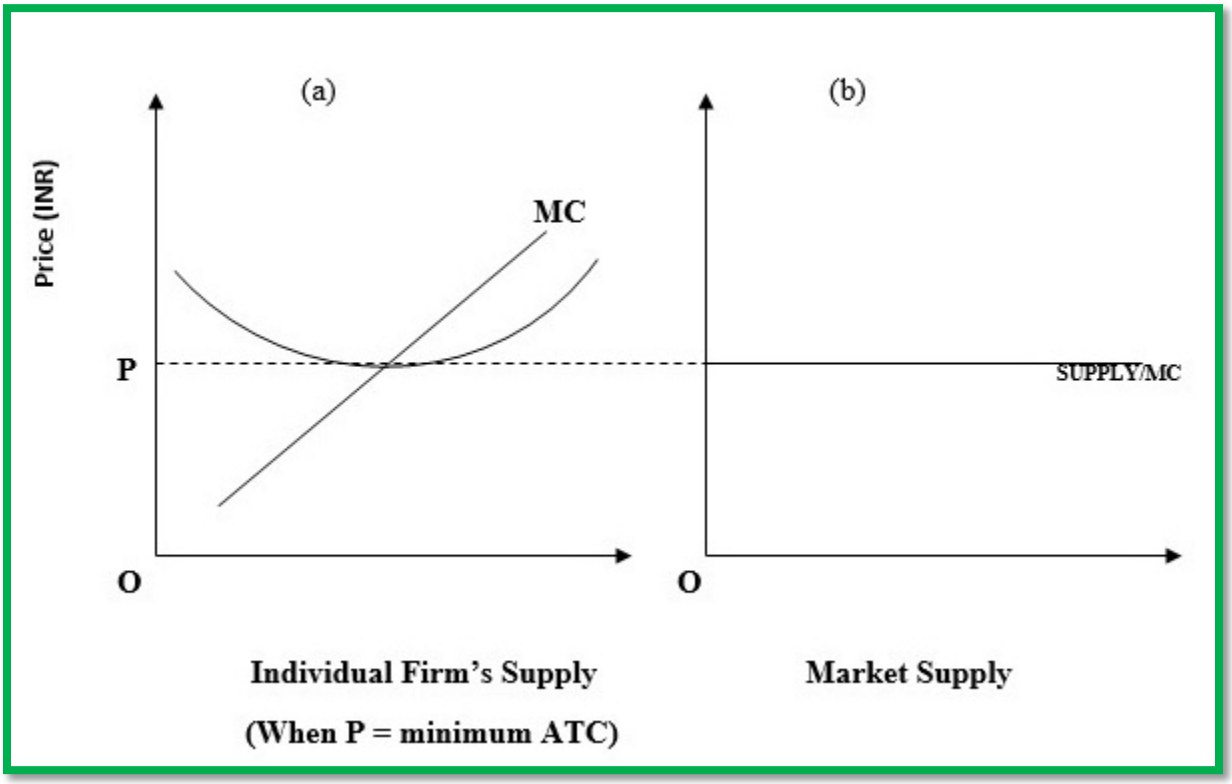
The profit maximizing output of a firm is determined by the equality between price and marginal cost. Assuming there are 1000 sellers in the market for tomatoes and each seller sells one quintal of tomatoes when the price is Rs.25 per kilogram and 2 quintal of tomatoes when the price is Rs.50 per kilogram because the marginal cost of producing the 200th kilogram of tomato is Rs.50, then the market supply of tomatoes at Rs.25 per kilogram will be 1000 quintals of tomatoes and at Rs.50 per kilogram, the market supply will be 2000 quintals of tomatoes. Market supply at the given price is only the sum of individual sellers' supply of tomatoes. Individual seller's supply curve and the market supply curve of tomatoes at various prices is shown in Figure 4.1.



The Long Run Market Supply Curve.

In a competitive market, long run adjustments take place among the firms. Loss making firms leave the market and new firms enter the market. If the profit making firms outnumber the loss making firms, it will provide incentive to new firms to enter the market and as a result, the total number of firms increases in the long run. Increase in market supply will reduce the prices and remove the excess profits. Similarly, when loss making firms outnumber the profit making firms, firms will exit the market and market supply will decrease. Decrease in market supply will cause market price to rise and existing firms will make profits. The process of entry and exit will lead to stability of firms in the long run and all the firms will make only normal profits i.e. the firms will make no economic profit. In the long run, the market price is equal to the average total cost and the marginal cost i.e. when the firm operates at the minimum average cost, the competitive firm achieves grand equilibrium (P = AC = MC = AR = MR).

The long run supply curve is perfectly elastic at the given market price because the long run market price is constant and is in equality with the average total cost and marginal cost. The firm's supply curve and the market supply curve when profit is normal or economic profit is zero is shown in Figure 4.2.



PRICE EQUALS MARGINAL COST IN COMPETITIVE MARKETS.

In competitive markets, the firm is a price taker unlike the price determining firm under imperfect competition. Market price in a competitive market is determined by the market forces of market supply and market demand. The market demand for a product produced by a given industry is the sum of individual demands and market supply of a product refers to the sum of output produced and supplied by all the firms of a given industry. The interaction of these forces of market demand and market supply determines the market price or the industry price which is accepted by the individual firm. Once the price is accepted, the individual firm is left with the only decision to determine its equilibrium output. The equilibrium output of a firm under any market form is determined by the equality between marginal cost and marginal revenue (MC = MR). Therefore the profit maximizing condition of a firm in a competitive market would be obtained by equating the market price with the equilibrium equation i.e. P = MC = MR. However, firms under perfect competition in the short run may operate under different cost conditions and hence their profitability position will be different. In the short period, we may have firms which are making super-normal or pure business profits, normal profits, and losses. There may be also firms which are making abnormally high losses and therefore in a state of exit from the industry. On account of free entry and free exit, in the long run, loss making firms exit from the market and new enterprising firms may enter in the market and actual stable equilibrium, theoretically, is achieved only in the long run.

1. Short Run Equilibrium of a Competitive Firm (Super-normal profits).

A firm is believed to be making super-normal profits when its average revenue is greater than the average cost (AR > AC) or we may say that on account of cost-efficiency, the average cost curve of the firm is positioned below the average revenue curve which is determined by the industry. Such a situation is depicted in Fig. 4.3(a) below.

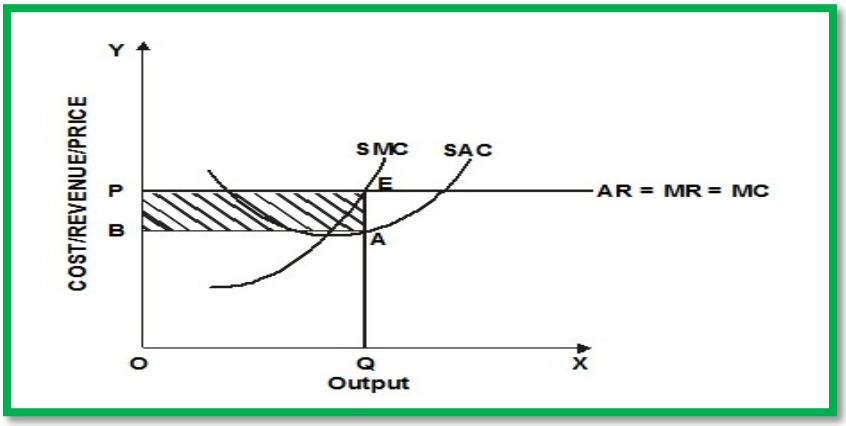


Fig. 4.3(a) Short Run Equilibrium of a Competitive Firm (Supernormal Profits)

You will notice in figure 4.3(a) that the equilibrium of the firm is established at point 'E' where the short run marginal cost curve intersects the marginal revenue curve from below and the equilibrium output 'OQ' and the equilibrium price 'OP' is determined. At price 'OP', the total revenue of the firm is 'OPEQ' (OP × OQ). The area below the short run average cost curve SAC measures the total cost of the firm 'OBAQ' (OB × OQ) and the difference between total revenue and total cost measures the pure business profits or super-normal profits made by the firm. In this case, the super-normal profit is shown by the shaded rectangular area 'PEAB' which is the difference between TR and TC i.e. OPEQ - OBAQ = PEAB. You will recall that when TR = TC, the firm makes only normal profit. The average profit or the per unit profit of the firm is 'AE' which is the difference between AR and AC i.e. AR - AC. (QE - QA = AE).

2. Short Run Equilibrium of a Competitive Firm (Normal Profits or P = MC).

A competitive firm will be making only normal profits when its average cost curve is tangent to the AR = MR curve. Tangency between the SAC and SAR indicates equality between the firm's average cost of production and the average revenue or price. It also means that the total-cost and total revenue of the firm for the given level of output is equal. When TR = TC or AR = AC, the firm would be making only normal profits. The condition of normal profit is depicted in Fig. 4.3(b) below.

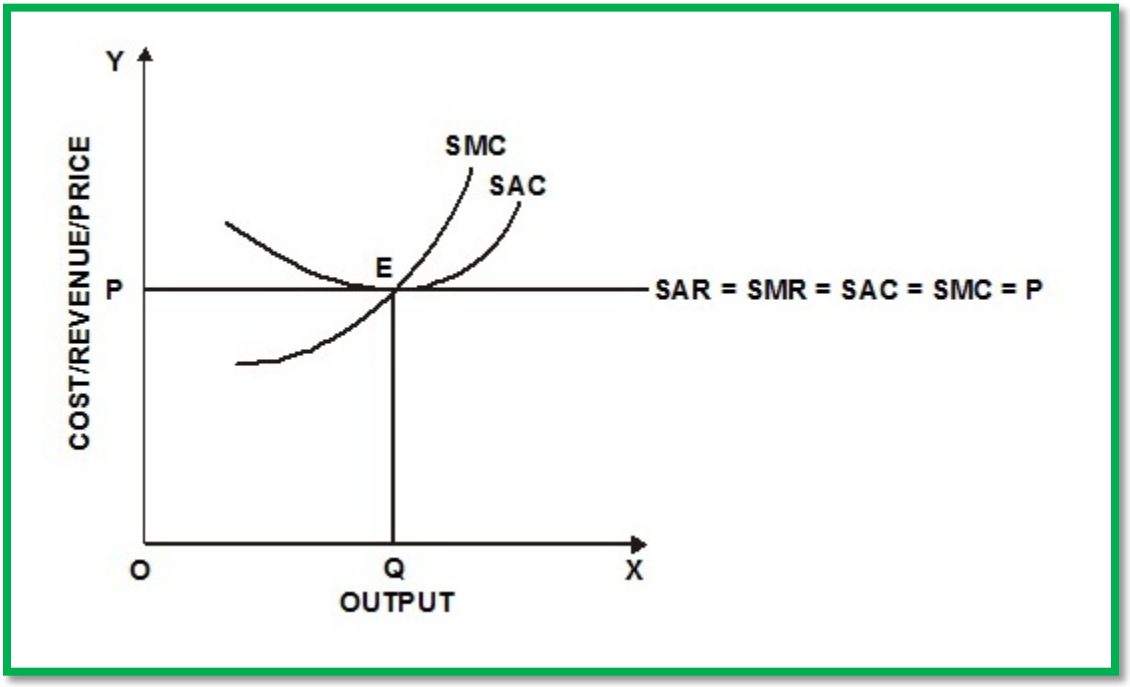


Fig. 4.3(b) Short Run Equilibrium of a Competitive Firm (Normal Profits)

You will notice that the firm's average cost curve is tangent to the average revenue curve at the equilibrium point 'E' at which SMC = SMR. Accordingly, price 'OP' and equilibrium output 'OQ' is determined. The total revenue of the firm is OPEQ (OP × OQ) and the total cost is also OPEQ (EQ × OQ). Thus when TR = TC or when AR = AC, the firm would be making only normal profits.

3. Short Run Equilibrium of a Competitive Firm (Losses).

When the total revenue of the firm is less than total cost, the firm would be making losses. A firm incurs losses when its short run average cost curve is way above the average revenue curve. A loss making firm has to make an important decision i.e., whether it should continue to operate even while it is incurring losses or it should exit from the industry. The decision to stay or exit depends on the extent of losses. In this case, the average variable cost assumes significance. As long as the firm is able to recover the average variable cost or the operating costs, it will decide on to remain in the industry with hopes to make profits in the long run. However, if the firm is not able to recover its operating costs i.e. when the average variable cost curve is positioned above the average revenue curve, the firm will decide to call off and leave the industry in search of green pastures. These situations are discussed below.

a) The decision to remain in the Industry and continue to operate even while losing on the fixed costs.

When the average revenue curve or the demand curve is positioned below the average cost curve or is tangential to the average variable cost curve or is lying in between the average total cost curve (SAC) and the average variable cost curve (SAVC), it will be considered to be making losses. However, the firm may continue to operate as long as it is able to recover its operating costs in the short run. This situation is depicted in Fig. 4.3(c) below:

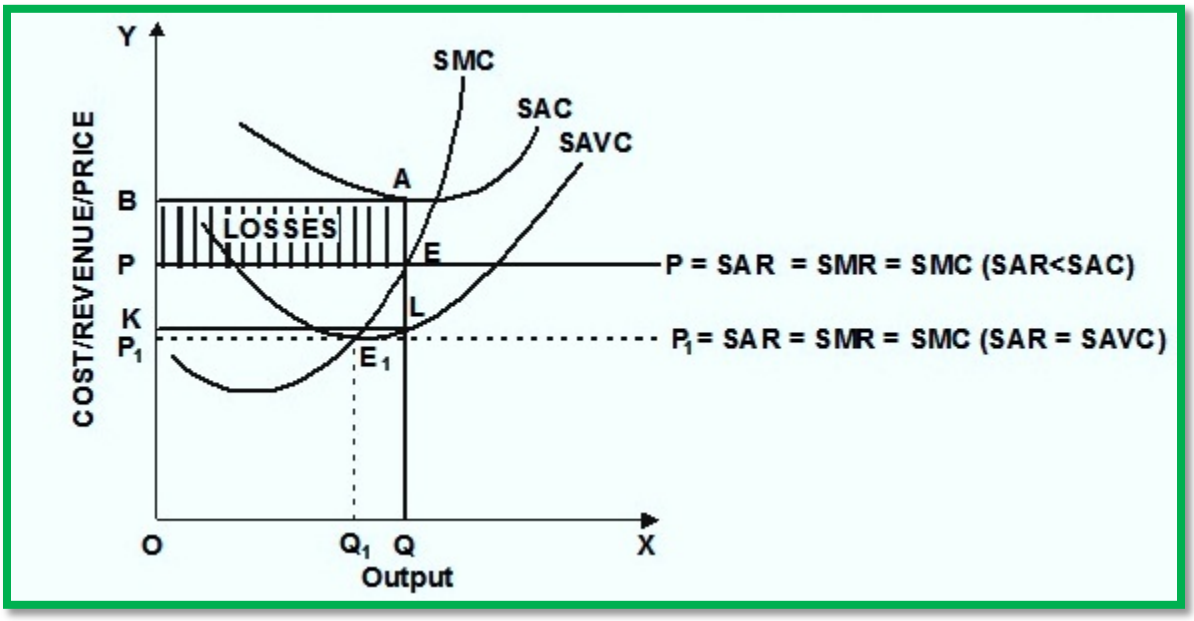


Fig. 4.3(c) Condition in which the Firm Decides to Remain in the Industry

You will notice in Fig. 4.3.(c) above that the initial equilibrium of the firm is determined at point 'E' where the demand curve (AR = MR) intersects the marginal cost (SMC) curve and the equilibrium output 'OQ' and price 'OP' is determined. Since the demand curve is positioned below the SAC curve and above the SAVC curve, the firm is not only able to recover its operating costs but also a part of the fixed cost. The part of the fixed cost that the firm has been able to recover in addition to the operating cost OKLQ is denoted by the PELK. As a result, the losses incurred are reduced to the shaded area PEAB. Under these conditions the firm will definitely continue to operate. However, the firm's willingness to stay afloat will depend on the position of the average revenue curve. The firm will continue to operate as long as the average revenue curve or the demand curve is either positioned above the SAVC curve or is tangent to it. Thus the tangency between the demand curve and the SAVC curve is the loss bearing limit of the firm. You will notice that when the AR = MR curve shifts downwards and becomes tangent to the SAVC curve and where the SMC curve intersects the SAVC curve at point E_1, the firm is able to cover only its operating cost. Thus at price OP_1, the total revenue of the firm is equal to $OP_1E_1Q_1$ ($OP_1 \times OQ_1$). At price OP_1, the total revenue is equal to the total variable cost (TR = TVC). The equality between TR and TVC is the loss bearing limit of the firm. In this situation the firm is losing on its entire fixed cost. Nonetheless the firm will decide to continue to operate with hopes to recover the fixed cost and make profits in the long run

b) The Decision to Shut down and Exit from the Industry.

The competitive firm will shut down its operations and exit from the industry if the demand or the average revenue curve is positioned below the short run average variable cost curve. Such a situation indicates that the firm is not only losing on its fixed costs but also eating into its operating costs. The price at which the firm decides to shut down its operations is called the shut down price and its location is definitely below the average variable cost curve. Such a situation is depicted in Fig. 4.3.(d).

You will notice in Fig. 4.3.(d) that the firm is in equilibrium at point 'E' where the SMC intersects the SAR = SMR curve. The total fixed cost is measured by the area KLAB which is entirely lost by the firm. In addition the firm also loses a part of the operating cost measured by the area PELK which is lying below the SAVC curve and above the SAR or the demand curves. In this situation, the total revenue earned by the firm from the sale of output OQ is less than total variable cost. The total revenue generated by the firm is OPEQ and the total variable cost is incurred by the firm is OKLQ. The operating losses are equal to OKLQ - OPEQ = PELK. Thus when TR < TVC, the firm will decide to shut down its operations and make an exit from the industry. In this case, price 'OP' is the shut down price.

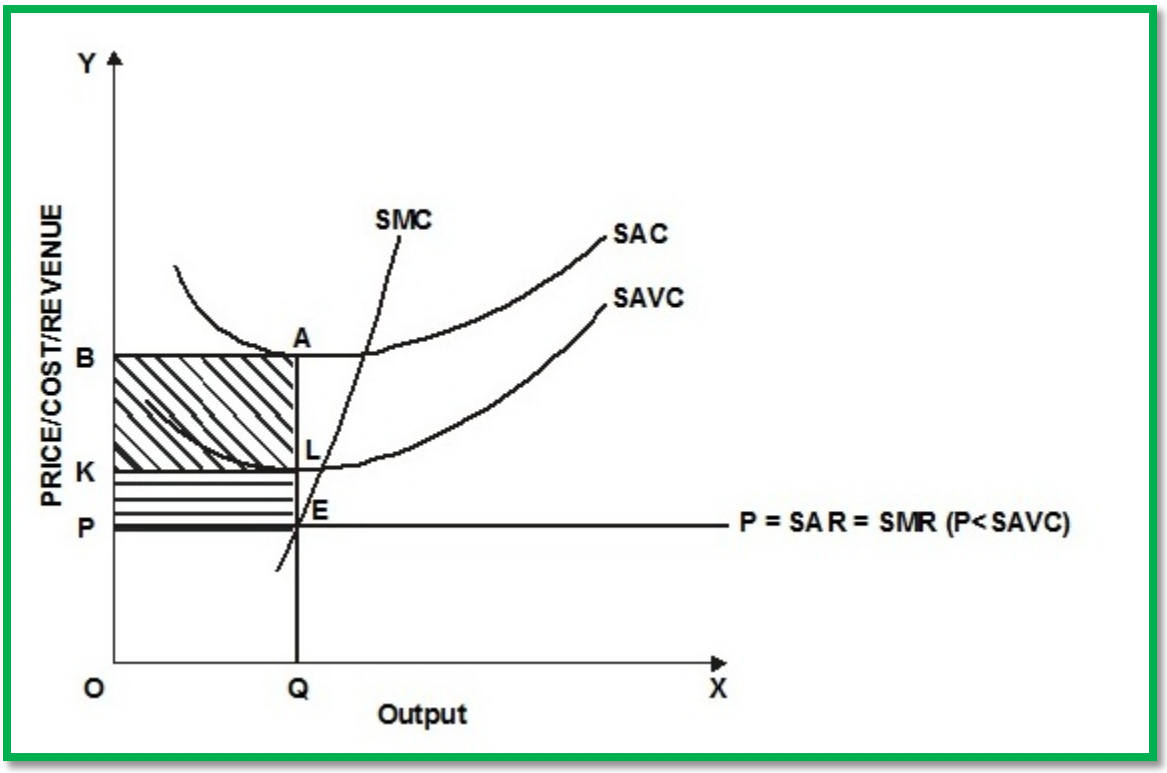


Fig. 4.3(d) The Decision to Shut Down and Exit from the Industry

4. Long Run Price and Output Equilibrium of a Firm under Perfect Competition (P = MC).

The long run is a period of adjustment between the market forces of demand and supply so that stable equilibrium is established. It is also a period of expansion for the firms who have used up their plant capacities and a time for other less efficient and loss making firms to leave the industry. Entry of new firms in the market brings about increased supply of goods and therefore the market price falls. Similarly existing firms who are yet to make use of their plant capacities may do so. Thus while exit of loss making and less efficient firm may reduce the market supply but entry of new firms and expanding existing firms may offset the fall in market supply. As a result, there is adjustment between market demand and market supply resulting in long run stable equilibrium. An important feature of this adjustment process is the competing away of the super-normal profits enjoyed by a few Supra-efficient firms. And the result of this adjustment process is that in the long run all the firms make only normal profit because the ruling market price is exactly equal to the average cost of production and all the firms produces least-cost optimum or maximum output.

In the long run, a firm is in equilibrium when its long run marginal cost curve intersects the long run marginal revenue curve and at the point of intersection, the long run average cost is tangent to it. In the long run, therefore, a firm under perfect competition assumes a grand equilibrium at its minimum point.

The long run grand equilibrium of a competitive firm can be stated as:
P = LAR = LMR = LAC = LMC

Fig. 4.3(e) below depicts the long run equilibrium of a competitive firm.

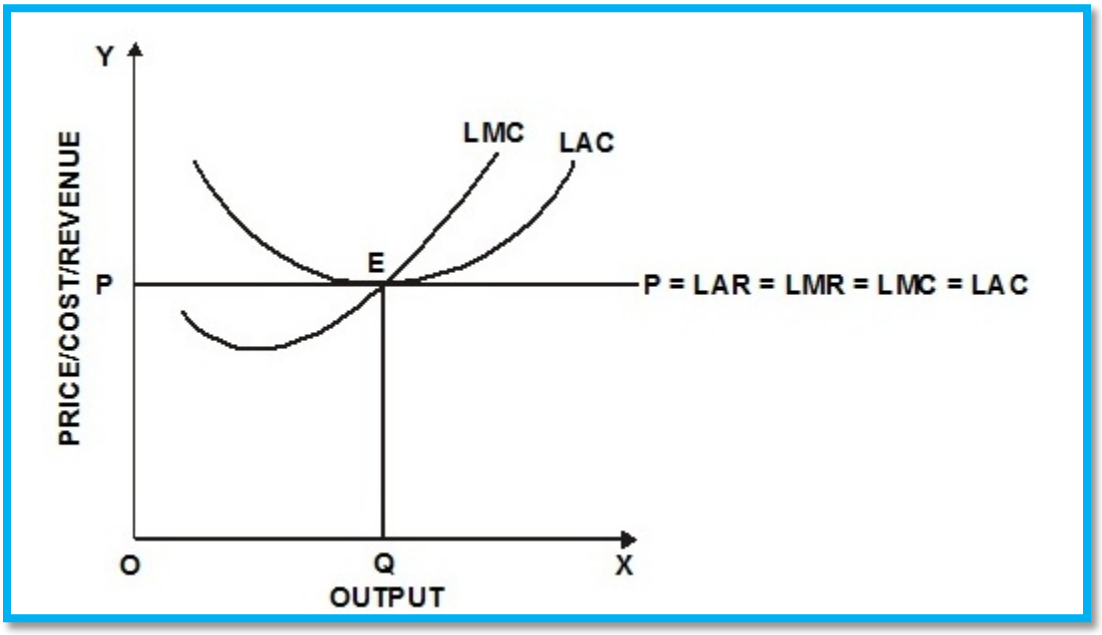


Fig. 4.3(e) Long Run Equilibrium of a Competitive firm

You will notice from Fig. 4.3.(e) above that the long run marginal cost curve intersects the long run marginal revenue curve at point 'E' and the equilibrium output 'OQ' is determined. At the equilibrium point 'E', the long average cost curve is also tangent to it at its minimum point, thus indicating least-cost optimum output. The firm in this case enjoys only normal profits as the total revenue generated from the sale of output 'OQ' is equal to the total cost of production. The total revenue of the firm can be obtained by multiplying price 'OP' with output 'OQ'. Thus:

$$TR = OP \times OQ = OPEQ, \text{ and}$$
$$TC = EQ \times OQ = OPEQ$$

You will notice that both TR and TC are equal and hence only normal profit are earned.

The competitive firm is a welfare maximizing firm because it tends to produce the maximum output at the minimum possible cost. You have seen in Fig. 11.1(e) that the long run equilibrium is achieved only at the minimum point of the long-run average cost curve indicating least-cost maximum or optimum output. The existence of optimum firms ensures optimum utilization of productive resources, lowest possible prices and maximization of social welfare through utility maximization.

EQUILIBRIUM OF THE FIRM AND THE INDUSTRY

Under the conditions of perfect competition, industry refers to a set of firms producing identical or homogeneous products. The price of a product is determined by the market demand and market supply curves. Equilibrium price is therefore determined by the intersection of the market demand and market supply curve. The industry is in equilibrium when the industry demand for the goods is equal to the industry supply of goods. Any disequilibrium between demand for and supply of goods will bring about changes in the prices. Thus if the industry demand or the market demand is greater than the market supply, prices of the products will rise. Rise in prices will increase the profitability of the existing firms thus enticing new enterprising firms to make entry into the industry. When new firms make entry, the market supply rises to be in equilibrium with the market demand and the equilibrium price is restored. Similarly, when the market supply is greater than the market demand, prices of the products will fall, thereby reducing the profitability of the firms and entailing losses to some relatively inefficient firms. When loss making firms exit from the industry, the market supply of goods will fall and be in equilibrium with the market demand, thereby restoring the equilibrium price. This process of adjustment between market demand and market supply is known as market mechanism or price mechanism. Market or price mechanism, however brings about this adjustment only in the long run to establish a stable long run equilibrium.

The long run equilibrium of the industry is achieved when the tendency to change is absent i.e., when both entry and exit of firms is absent and all the constituent firms are in equilibrium. We

now proceed to study, the short run and the long run equilibrium of the industry under perfect competition.

Short Run Equilibrium of the Industry.

Irrespective of the time period, the industry under the conditions of perfect competition would be in equilibrium when the market demand is equal to the market supply. Therefore, with reference to the short period, we may say that the short run equilibrium of the industry will be established when the short period market demand is equal to the short period market supply. Since the scale of output cannot be expanded in the short run, the market supply curve and the market demand curve will be relatively inelastic and individual firms depending on their cost functions may be making normal profits, super-normal profits or even losses. If we assume that all the firms in the industry have identical cost functions, then all firms would be making super-normal profits. However, such an assumption will be inconsistent with the dynamism of a perfectly competitive market and the only difference between the two time periods would be that in the short period all firms would be making equal profits or equal losses and in the long run all firms would be making normal profits. The long run normal profits is not only the result of expansion in output but also because of the entry of new firms and the exit of loss making firms. Hence, it would be realistic to assume that different firms are under different cost conditions and in different profitability conditions.

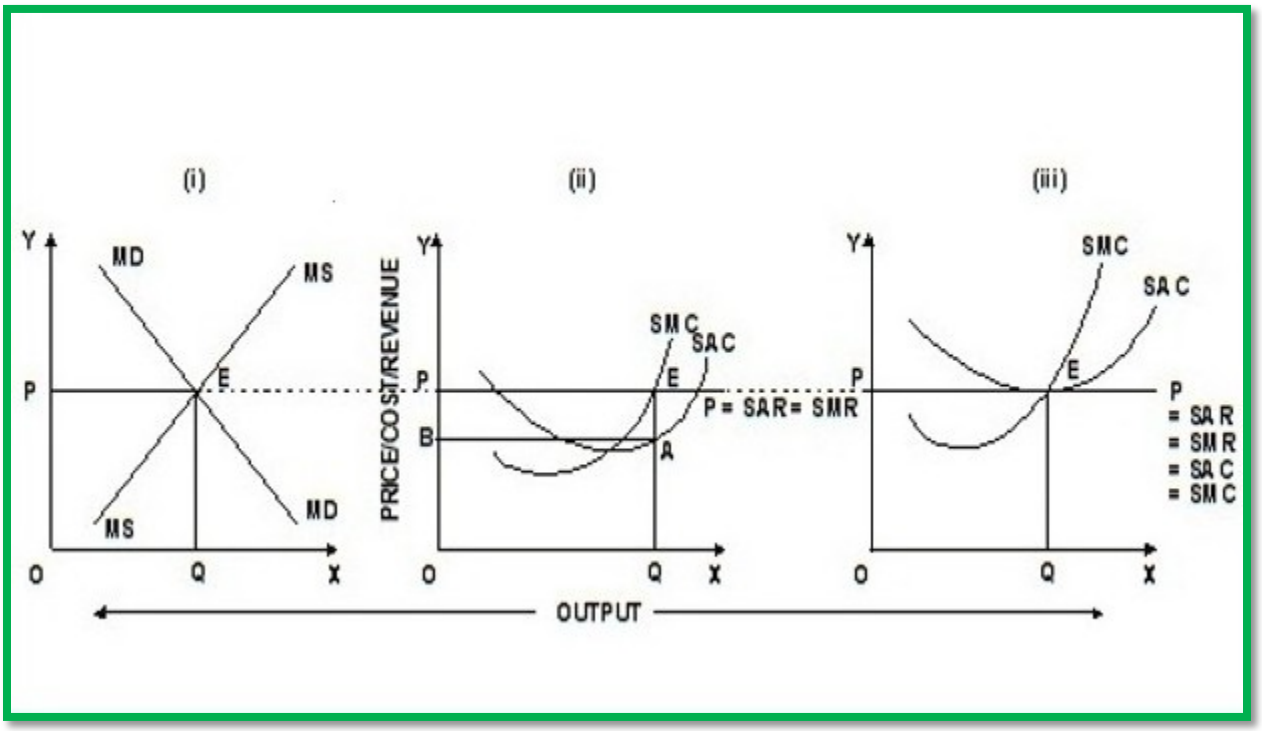


Fig. 4.3(f) Short Period Equilibrium of the Industry and the Firms

The short run equilibrium of the industry is depicted in Fig. 11.1(f). In panel (i) of the Fig. 11.1(f), the short run equilibrium of the industry is depicted. At point 'E', the market demand curve MD intersects the market supply curve MS and the equilibrium price 'OP' and 'OQ' output is determined. The firms being price takers accepts price 'OP' as the short period market price and determine their individual outputs by equating their short period marginal cost with the marginal revenue (SMC = SMR). Given the market price, the profitability condition of the firms will be determined by their cost function. Thus, we have in panel (ii), a firm which makes super-normal profits and in panel (iii), a firm which makes normal profits. There may also be loss making firms whose short run average cost curve may be positioned above the short run average revenue curve as in Fig. 4.3.(c) earlier.

Long Run Equilibrium of the Industry (P = LMC).

The long run equilibrium of the industry is a stable equilibrium like still water. Since there is no movement of firms both in and out of the industry and all existing firms are producing their long run equilibrium output, both the market demand curves and the market supply curves will be relatively elastic. The long run market price will therefore be definitely less than the short run market price. On account of perfect mobility of the productive factors, long run adjustments between demand and supply, competing away of super-normal profits and the exit of loss making firms, all the firms would be making only normal profits. As stated earlier, the long run equilibrium of the industry would be achieved when the long run market demand curve intersects the long run market supply curve. Such a situation is depicted in Fig.4.3.(g).

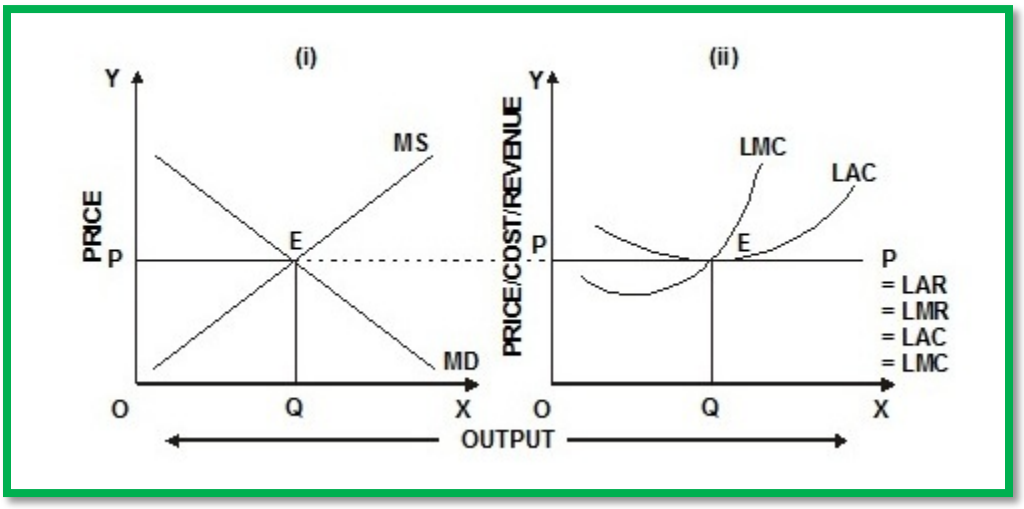


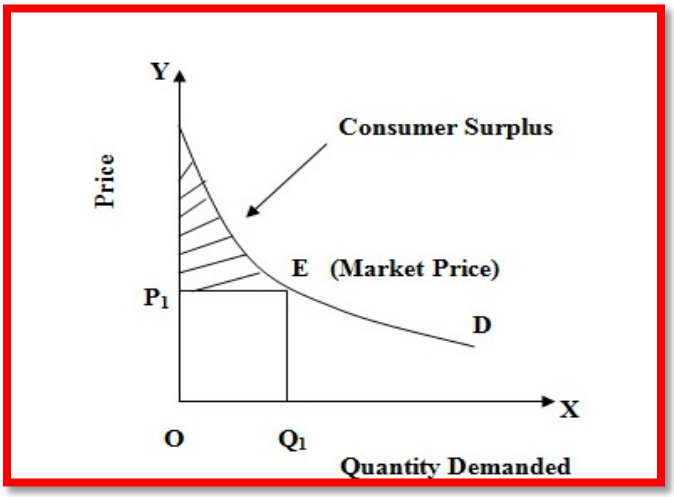
Fig. 4.3(g) Long Run Equilibrium of the Industry and the Firms

In panel (i) of fig. 4.3(g), you will notice that the long run industry equilibrium is established at point 'E' when the market demand curve MD intersects the market supply curve MS and equilibrium price 'OP' and output 'OQ' is determined. Since the long run is a period of adjustment with no possibility of the existence of either the super-normal or the sub-normal firms, you will find that all the firms in the long run are operating at the minimum point of the long run average cost curve. The firms in the long run achieve their equilibrium at the point of tangency between long run average cost curve at its minimum point and the long run average revenue curve. Thus under the conditions of identical cost functions, all the firms produce their optimum output at the minimum cost and also earns only normal profits. This can be seen in panel (ii) of Fig. 4.3(g) where the long run marginal cost curve intersects the long run average cost curve at its minimum point and the equilibrium point 'E' is determined. Accordingly, OQ equilibrium output is determined. The long run average revenue curve or the demand curve is tangent to the LAC at its minimum point. Thus price 'OP' or the average revenue 'OP' is equal to the average cost 'EQ'. According to **Prof. Lipsey,** the competitive firm attains long run equilibrium only when it is producing at the minimum point of its long run average cost curve. In the long run, the grand equilibrium is established where, P = LAR = LAC = LMR = LMC.

CONSUMER'S SURPLUS.

Consumer's surplus arises because consumers would be willing to pay more than the given price for all but the last unit they buy. It is the difference between what the consumers actually pay and what they are willing to pay. For example, Rose is willing to pay Rs.100 for a three course meal in a restaurant but she actually pays Rs.75 for the meal. Rose therefore enjoys a surplus of Rs.25/-.

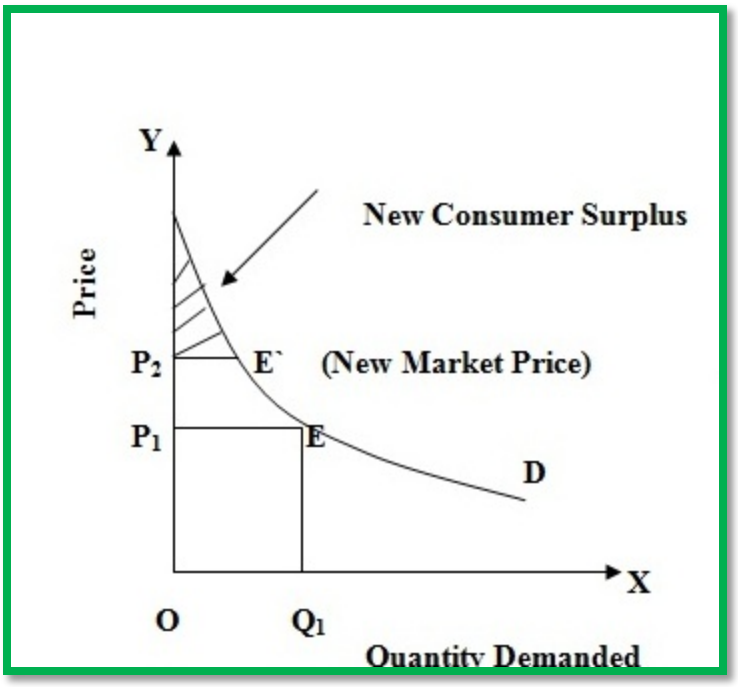
The consumer's surplus is illustrated in Fig. 4.4 below:



In Fig.4.4 above, the shaded area under the demand curve and above the price line shows consumer surplus. Consumer surplus is the difference between the total value consumers place

on all the units consumed and the payments they need to make in order to actually purchase that commodity.

Consumer's surplus changes with the change in market price. For example, if the price increases then consumer surplus is reduced as some consumers are not willing to pay the higher price. This reduction is shown in Fig.4.5 below. The loss of consumer surplus is shown by the area $P_1P_2E`E$.



PRODUCER'S SURPLUS.

Producer surplus is the surplus revenue earned by the producer over and above the minimum supply price. Various points on the supply curve indicate the minimum price at which the producer is willing to supply the given commodity. However, the demand price is higher than the supply price until the equilibrium price is determined. Producer surplus is therefore the difference between the minimum supply price and the equilibrium price at various levels of supply. When the supply expands, the demand price falls and the difference between the equilibrium price and the supply price narrow down. When the quantity demanded is equal to the quantity supplied, equilibrium price is established and there is no producer surplus earned on the last unit of the product sold or supplied. Producer surplus is therefore the difference between the total revenue earned by the producer by selling the given quantity of output and the cost of production of that output.

The producer surplus derived by all firms in the market is the area from the supply curve to the price line, EPB.

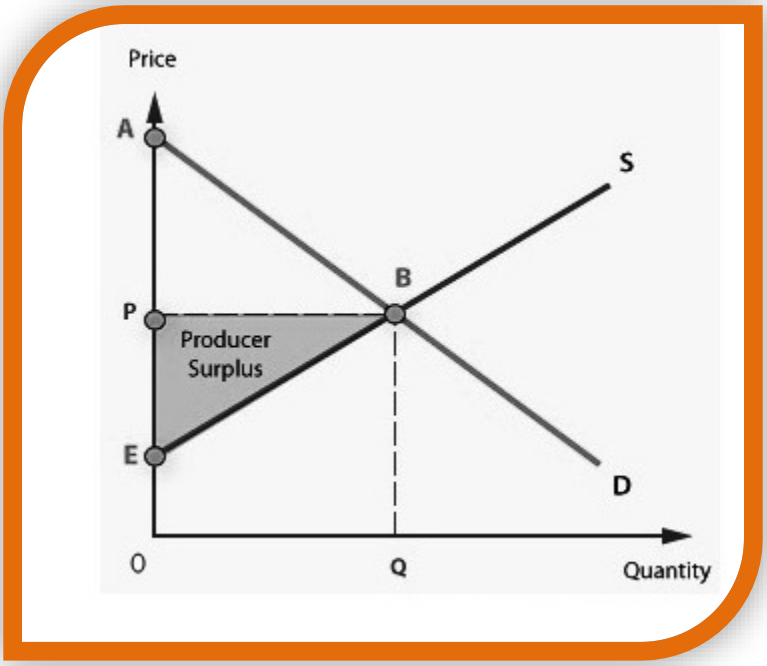


Fig. 4.6 - Producer Surplus.

CONCEPT OF ECONOMIC EFFICIENCY.

A free market economy is one in which the four economic functions of production, distribution, consumption and exchange are carried out according to the forces of market demand and market supply. The free market forces determine both product and factor prices and results in the efficient allocation of resources. A free market economy can operate only in a democratic country with capitalist economic system. The economic system is the mirror image of the political system. Markets cannot be free if there is no democracy and markets cannot be efficient if they are not free.

Economic efficiency means that the economy's resources are used effectively to satisfy the maximum possible wants of the people. An economy must achieve both production and allocation efficiency to realize economic efficiency. **Production efficiency** occurs when an economy cannot produce more of one good without producing less of another good. It means that the economy is operating on the production possibility curve and goods and services are produced at the lowest possible cost. **When goods and services are produced according to the tastes and preferences of the people, allocation efficiency is achieved.** When both production and allocation efficiencies are achieved, economic efficiency is achieved. Economic efficiency is a situation in which optimum allocation of resources takes place. In the actual

world, economic efficiency is scarcely achieved because of the uneconomic use of resources and the retrograde economic policies adopted by countries.

Production Efficiency and Production Possibility Frontier.

The achievement of production efficiency is explained in Fig.4.7 below.

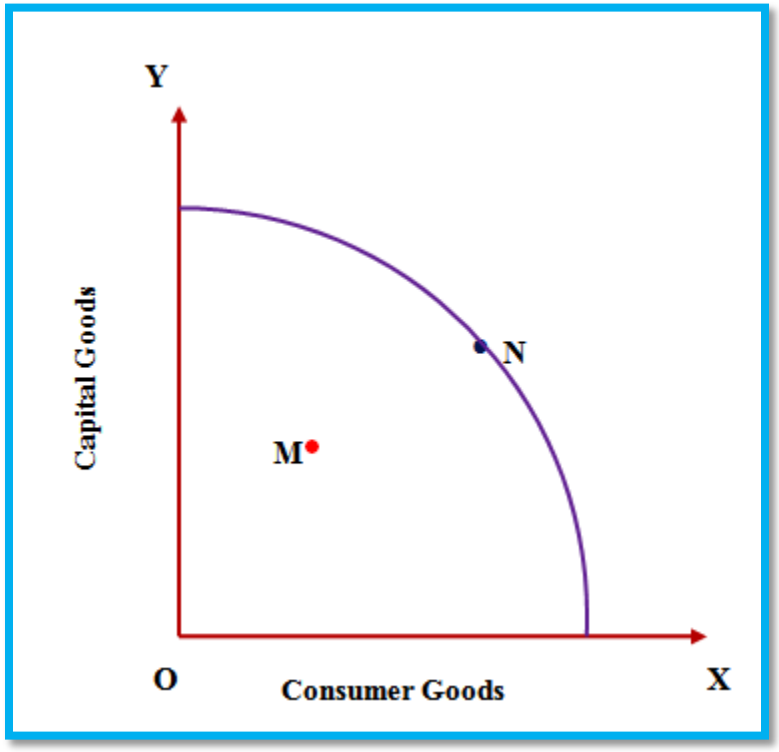


Fig. 4.7 Production Efficiency

Point M in Fig. 4.7 shows unemployment or under-utilization of productive resources in the economy. A movement from point M to point N shows that the economy is fully utilizing its productive resources and full employment is achieved. Production efficiency is achieved when the economy operates on the production possibility frontier. Any point on the PPC would show the achievement of production efficiency.

Production Efficiency and Average Cost Curves.

Production efficiency can also be shown by using firm's cost curves. This is shown in Fig.4.8which consists of three average cost curves. The least cost optimum output will be produced only on AC_3 at its lowest point or minimum point because it is the lowest average cost curve in the figure. Such a lowest point is point E on AC_3 and is known as the point of **technical efficiency.**

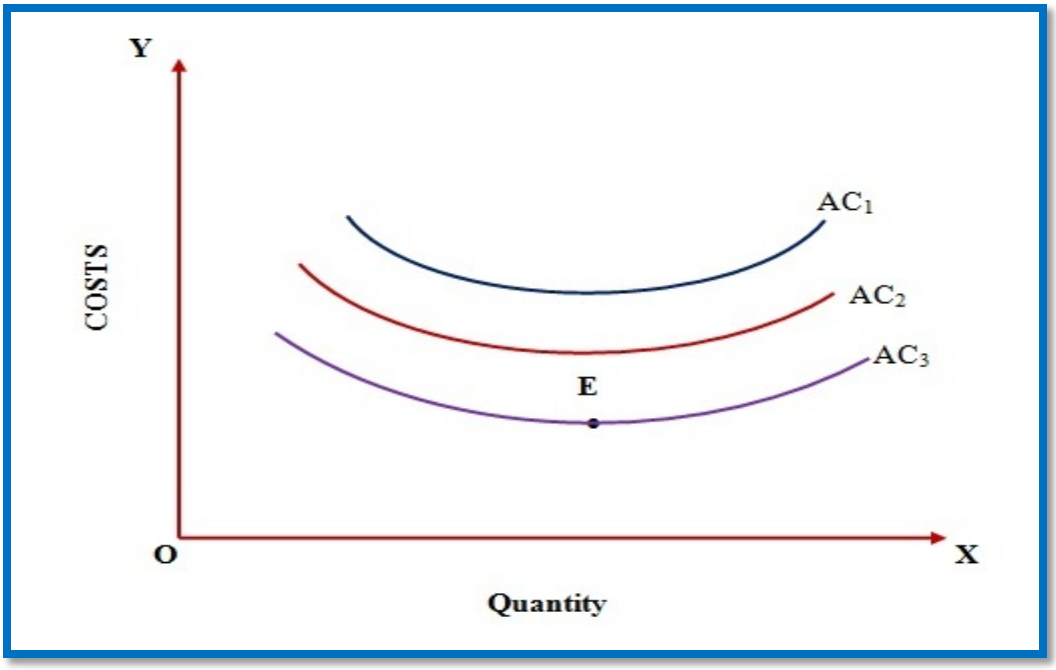


Fig.4.8: Production Efficiency (Point of Technical Efficiency).

Production Efficiency and Perfect Competition.

Production efficiency can be achieved only under the conditions of perfect competition. Firms must produce at the lowest possible cost to maximize profits. Firms who are not able to achieve production efficiency will have to exit the market because other firms would be operating on the lowest point of the lowest average cost curve. Achievement of production efficiency in perfect competition is shown in Fig.4.9.

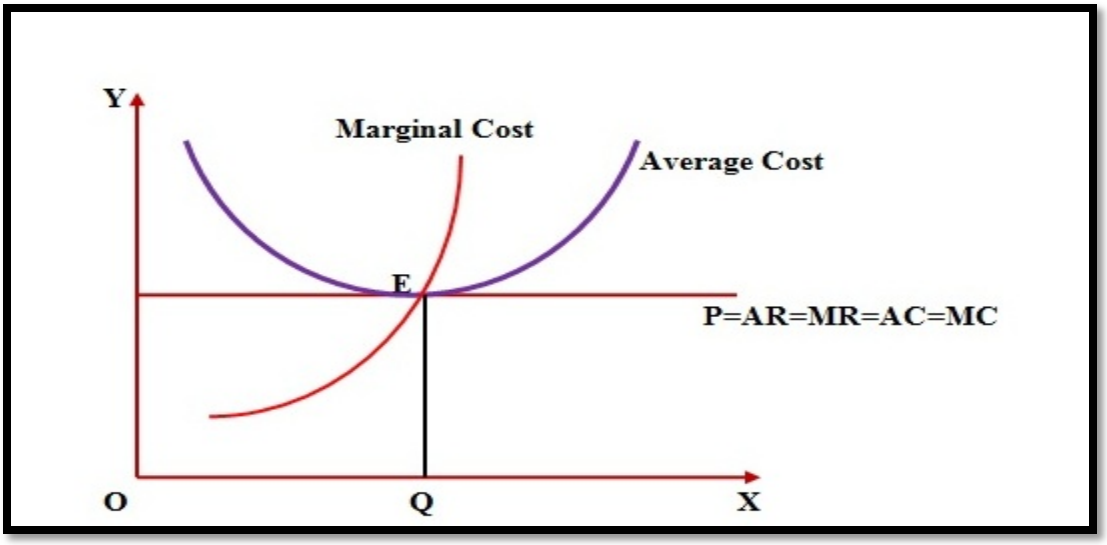


Fig.4.9 Production Efficiency and Perfect Competition

Fig.4.9 shows the long run equilibrium of a firm under perfect competition. Point E is the point of least cost maximum output. The equilibrium condition of the firm is MC = MR. At point E, the MC curve intersects the AC curve at its minimum point and the condition of technical efficiency is achieved. Point E is also the point where the MC curve intersects the MR curve from below and the AC curve is tangent to the AR = MR curve at point E. In this manner, under the conditions of perfect competition, the condition of Grand Equilibrium is achieved. Thus with production efficiency, economic welfare is also maximized under the conditions of perfect competition.

Allocation Efficiency.

When goods and services are produced at the least possible cost and also according to the tastes and preferences of the consumers, allocation efficiency is achieved. Such a combination of goods and services should yield the greatest possible satisfaction to the consumers. **Technically, allocation efficiency will be achieved when the price of a product is equal to the marginal cost of the product.** When price is equal to MC, it represents the correct economic cost of producing the last unit of the product. Such a situation is also shown in Fig.4.9 where the condition of Grand Equilibrium is achieved by the firm under perfect competition in the long run. A numerical explanation of the concept of allocation efficiency is given in Table 4.1.

The condition of equilibrium of a firm is MC = MR. The equilibrium condition is achieved when four units of output is produced because at this level of output, the price is equal to marginal cost. Since price or average revenue is also equal to marginal revenue under the conditions of perfect competition, it can be said allocation efficiency is achieved when Grand Equilibrium is achieved under the conditions of perfect competition.

Table 4.1: Condition of Allocation Efficiency.			
Quantity	**Price**	**Marginal Cost**	Allocation Efficiency (Price = MC)
1	10	4	**P > MC**
2	10	6	**P > MC**
3	10	8	**P > MC**
4	**10**	**10**	P = MC (Allocation Efficiency)
5	10	12	**P < MC**
6	10	14	**P < MC**
7	10	**16**	**P < MC**

Questions.

1. **Explain the features of perfect competition.**
2. **Explain the concept of competitive market.**
3. **'Absence of collusion among sellers indicate free play of market mechanism'. Explain.**
4. **'Price equals marginal cost in competitive markets'. Explain.**
5. **Explain the derivation of supply curve in competitive markets.**
6. **Explain the short run equilibrium of the firm in a competitive market.**
7. **Explain the long run equilibrium of the firm and the industry in a competitive market.**
8. **Explain the concept of consumer's surplus.**
9. **Explain the concept of producer's surplus.**
10. **Explain the concept of economic efficiency.**

UNIVERSITY OF MUMBAI QUESTION PAPERS IN MICROECONOMICS – 2

SYBA – SEMESTER III

MICROECONOMICS (PAPER-II)

TIME - 3 HOURS **MARKS – 100**

1. **All questions are compulsory.**
2. **Each question carries 20 marks.**
3. **Draw diagrams wherever necessary.**
4. **Use of simple calculator is allowed.**

Q.1. Attempt any two of the following:

a) Explain the following terms:
- **i) Strong and weak ordering preferences.**
- **ii) Completeness.**
- **iii) Transitivity.**

b) What are the properties of indifference curve?

c) The table given below shows the marginal utility derived by Kim from two goods namely; apple and banana.

Quantity	MU of apple	MU of banana
1	70	40
2	60	30
3	50	20
4	40	15
5	30	10
6	20	05

The price of apple is Rs.4 and of banana is Rs.2. She has an income of Rs.20 to be spent on the two goods. From the above table, answer the following:

- **i) Given her income, what quantities of both goods will Kim purchase to maximize her utility?**
- **ii) What is the maximum total utility obtained from the two goods?**
- **iii) Explain the law of equi-marginal utility.**

Q.2. Attempt any two of the following:

a) **What is production function? Diagrammatically explain the law of variable proportion.**
b) **Explain the profit maximization of firm with least cost combination of factors.**
c) **Explain the factor demand curve with the help of table and diagram.**

Q.3. Attempt any two of the following:

a) **Graphically explain the relationship between Total, Average and Marginal cost.**
b) **Distinguish between following cost concepts:**

   i) **Implicit and explicit.**
   ii) **Sunk and fixed.**
   iii) **Historical and replacement.**

c) **Given the total fixed cost of Rs.200, calculate the TC, AFC, AVC and MC. Plot the table graphically and diagrammatically explain the behavior of all cost concepts.**

Units of Output	1	2	3	4	5	6	7	8
TVC	25	40	50	70	100	145	205	285

Q.4. Attempt any two of the following:

a) **What are the characteristics of a competitive market?**
b) **Explain the short run equilibrium of a firm under perfect competition.**
c) **Explain the concept of consumer's surplus with the help of a diagram.**

Q.5. Write short notes on (Any Two)

a) **What is substitution effect?**
b) **Explain the properties of isoquants.**
c) **What is producer's surplus?**

Time : 3 Hours **Marks : 100**

N.B. i) All questions are compulsory.
ii) Each question carries 20 Marks.
iii) Draw diagrams wherever necessary.
iv) Use of simple calculator is allowed.

Q.1) Attempt any two of the following.

a) Explain the following properties of indifference curves:
(i) An indifference curve is convex to the origin.
(ii) Two indifference curves can never intersect.

b) The table given below shows the marginal utility derived by Alice from two goods viz: pizza and burgers.

Quantity	MU of pizza	MU of burger
1	90	50
2	80	40
3	70	30
4	60	20
5	50	15
6	40	10

The price of a pizza is Rs.2 and of burger is Rs.1. She has an income of Rs.11 to be spent on the two goods.
From the above table answer the following: (i) Given her income, what quantities of both goods will Alice purchase to maximize her utility? (ii) What is the maximum total utility obtained from the two goods?(iii) State the law of equi-marginal utility.

c) What is the income effect? Graphically explain the income effect for a normal good and an inferior good..

Q.2) Attempt any two of the following.

a) Define production function. Explain the law of returns to scale.
b) Explain the producer's equilibrium with the help of isoquants.
c) The table given below shows the total product schedule of labour:

Units of labour	Total Product (TP)
1	8
2	20
3	36
4	48
5	55
6	60
7	60
8	56

1

From the above table: (i) calculate the average and marginal product (AP & MP). (ii) Plot the table graphically and explain the relationship between TP, AP & MP with the help of a diagram.

Q.3) Attempt any two of the following.

a) Graphically explain the relationship between Average & Marginal cost.

b) Calculate the following costs from the table given below: TC, AFC, AVC, ATC & MC. Plot the table graphically and explain the behavior of all cost concepts from the diagram.

Units of Output	TFC	TVC
0	50	0
1	50	10
2	50	30
3	50	60
4	50	100
5	50	150
6	50	210

c) Explain the relationship between AR, MR and TR in a competitive market.

Q.4) Attempt any two of the following.

a) What are the features of a competitive market?

b) What is normal profit? Explain the equilibrium of a firm under short run with (i) Super normal profit, and (ii) shut down point.

c) Describe the concept of consumer's surplus diagrammatically.

Q.5) Write a short note on any two of the following.

a) Concept of strong and weak ordering in consumer preferences

b) Cobb-Douglas production function

c) Equilibrium of a firm using TR and TC

d) Perfectly competitive markets have allocative efficiency in resource allocation

END