

MICRO ECONOMICS

(DBME11)

(BBM)



ACHARYA NAGARJUNA UNIVERSITY

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Lesson - 1

INTRODUCTION

1.0 Objectives:

After completing this chapter, the student should be able to:

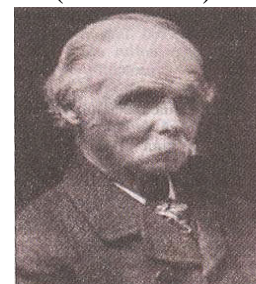
- * define Economics in a way that is acceptable to an economist and understandable to a noneconomist.
- * understand the nature and scope of Economics.
- * explain the significance of Economics.
- * distinguish between Micro and Macro Economics

Structure:

- 1.1 Definitions
- 1.2 Nature and Scope
- 1.3 Significance
- 1.4 Distinction between Micro and Macro Economics
- 1.5 Self - Assessment Questions
 - 1.5.1 Essay Questions
 - 1.5.2 Short Questions
- 1.6 Reference Books



Adam Smith
(1723-1790)



Alfred Marshall
(1842-1924)



Lionel Robbins
(1898-1984)

1.1 Definitions:

Economics is about people. It is about the people and the way they interact with each other in society. It is a social science that studies the way people allocate scarce resources to satisfy human needs. Thus Economics is often defined as science of management of resources for the promotion of well-being of mankind. Economics is a way of thinking.

In ancient times, the term economics was used to mean house hold management. In modern times the term economics is used to cover all aspects of economic development. Economists, right from **Adam Smith** to present-day authors, have defined economics in various ways. These definitions can be broadly classified into (i) classical (ii) neo-classical and (iii) modern definitions.

The classical definition is often called wealth definition. The classical economists like, **Adam Smith, Ricardo, Mill** and others defined economics as the science of wealth. According to them, economics is that body of knowledge which relates to wealth. So, it is concerned with production and distribution of wealth. Classical economists assigned a key position to wealth in the study of economics.

Later emphasis was shifted from wealth to man. Man occupies a primary place and wealth only a secondary one. As Marshall rightly puts it. Economics is on the one side study of wealth; and on the other, and more important side, a part of the study of man. According to him economics is mainly concerned with attainment of material requisites of human well-being. Thus, **Marshall** and **Pigou** said that primary concern of economists is to promote material welfare of human beings. According to these economists, the aim of economics is to study human activities which are conducive to human welfare in its material aspect.

Robins took objection for limiting the scope of economics to material welfare. He led a frontal attack on **Marshallian** view. He observed that to promote welfare not only material things, but also non-material things eg. service of doctors, lawyers etc., are required. **Robins** defined economics as a science which deals with human behaviour as a relationship between ends and scarce means which have alternative uses.

Robins definition lays down the following three fundamental propositions:

- (i) Human beings have wants which are unlimited in number, one is compelled to choose between the more urgent and the less urgent wants. Thus economics is also called a science of choice.
- (ii) The means or resources to satisfy the man's wants are limited.
- (iii) These resources have alternative uses. It means they can be put into several uses.

Thus in the **Robinsian** sense, economic activity lies in man's utilisation of scarce means having alternative uses, for the satisfaction of multiple ends. According to him economics is concerned with best possible use of the limited resources.

During the last 75 years or so, economic thinking has moved much further from **Robins** view. The credit for bringing out a revolution in economic thinking goes to **Keynes**. According to him economics studies how the levels of income and employment in a community are determined. He defined economics as the study of administration of scarce resources and of the determinants of income and employment. In other words, it studies the causes of economic fluctuations to see how economic stability could be promoted.

In **Benham's** words, economics is a study of the factors affecting the size, distribution and stability of a country's national income. More recently, the study of economic growth has come to occupy an important place in the study of economics. Thus modern economists have expanded the scope of economics by adding the concepts of economic growth and stability.

Thus there are numerous classical, neo-classical and modern definitions of economics. That is why **Viner** pointed out that economics is what economists do.

Keeping in view all the above definitions, we can comprehensively define economics as a social science concerned with proper uses and allocation of resources for the achievement and maintenance of growth with stability.

1.2 Nature and Scope:

While discussing the nature and scope of economics, we may consider (a) whether economics is a science or an art (b) whether it is a positive science or normative science (c) whether it is a social science and (d) whether it can solve practical problems.

- (a) Science is a systematic body of knowledge which is concerned with establishing truth. In

science, facts are collected and analysed systematically and laws are formulated. Judged by this standard, economics is a science. Economists collect the facts, analyse them and discover general principles governing these facts. Like other sciences, economics claim number of discoveries that have improved our economic performance. Thus economics is a science which is concerned with the promotion of human welfare.

It is now fully agreed that economics is a full fledged science. In fact, it is in no way less than other sciences.

Economics is not only a science but also an art. An art is defined as a subject of application. The theory will become useful if it possible for an application. Economics is a science in its methodology and art in its application. Thus economics is both science and art, since it has both the theoretical and applied aspects. It is both light giving and fruit bearing.

However, economics cannot predict the future consequences exactly as other sciences. In economics, human behaviour plays a crucial role in determining various events. Economics thus presents a continually changing body of doctrine. But this does not prevent economics from being called a science.

(b) Science is classified into positive science and normative science. A positive science explains 'what is' and normative science tells us 'what ought to be. That means positive science describes and normative science evaluates. Positive science is expected to collect facts and draw conclusions. It has no right to pass on judgements. In the classical view, economics was a positive science. But later economists viewed that economics is fundamentally a normative science. Faced with scarce resources and unlimited wants, the choice of the final want, needs value judgement. The choice resulting from subjecting competing desires to judgement makes economics obviously a normative science. Economics is, therefore, both a positive and a normative science.

(c) Economics is primarily a study of man. It studies man as a member of the society. Economics studies social behaviour i.e. behaviour of men in groups. The process of satisfying wants is a social process. Hence economics is a social science.

(d) The classical view was that economics was not concerned with solving practical problems of life. But many economists like **Adam Smith, Marshall, Keynes** have all actively interested themselves in the problems of their time. In the present times, economics is extensively used in solving various practical problems. Economists are employed by government and private sector industries to give advice on practical problems. Thus economics is useful in solving day to day problems of life. Economics is also used for the analysis of business problems and decision - making.

1.3 Significance:

Economics is highly helpful in the formulation of economic policies that will promote that welfare of masses. It explains functioning of a free enterprise economy. It will tell us how millions of consumers and producers in an economy take decisions about the allocation of productive resources among millions of goods and services. It explains how through market mechanism, goods and services produced in the economy are distributed. It explains conditions of efficiency both in consumption and production. The economic theory shows that economic efficiency is achieved when there prevails perfect competition, in the product and factor markets.

Economic analysis is also usefully applied to the various applied branches of economics such as Public Finance and International Economics. It is used to explain the factors which determine the

distribution of burden of a commodity tax between producers and sellers on the one hand and the consumers on the other.

The subject matter of economics explain what determines the level of national income and employment. It explains the growth of national income over a long period of time. It examines the determination of the level, fluctuations and trends in the overall economic activity. It explains how general level of prices or inflation is determined. It further explains what determines economic growth.

The areas of business issues to which economic theory can be directly applied may be broadly divided into two categories: (i) operational or internal issues and (ii) environmental or external issues.

Application of relevant economic theories to the problems of business facilitates decision - making in three ways: (i) They help in clear understanding of various economic concepts; (ii) They help in ascertaining the relevant variables and specifying the relevant data; and (iii) They state general relationship between two or more economic variables and events.

1.4 Distinction between Micro and Macro Economics:

The subject matter of economics has been divided into two parts: Macroeconomics and Micro economic. The terms Micro and Macro are derived from Greek words meaning small and large respectively. An economic system may be looked at as a whole or in terms of its innumerable decision-making units. If we are analysing the problems of the economy as a whole, it is macro-economic study. If we are analysing, the behaviour of any particular decision-making unit (firm, industry, consumer), it is micro-economic study.

The word micro means a millionth part. When we speak of micro-economics, what we mean is that it is small part or component of the whole economy that we are analysing. We may be studying an individual consumer, firm or industry. Thus micro-economic theory studies the behaviour of individual decision-making units such as consumers or business firms.

In macro-economics, emphasis will be given to the analysis of economic system as a whole. In macro-economics, we study as it were the forest, whereas in micro-economics, we study the trees. Macro economics is concerned with aggregates and averages of the entire economy. Macro-economic analysis deals also with how a economy grows. It is helpful in understanding the functioning of a complicated economic system.

Micro-economics is also called price theory and macro-economics is called Income and Employment theory. Micro questions are such things as: What determines the relative prices of commodities?, What determines the behaviour of individual units in the economy? What determines a firm's rates of output and employment of labour. Macro questions are concerned with the behaviour of the economy as a whole. What are the major influences on the rates of output and employment in the economy? What is the relation between the total consumption expenditures and total incomes? Why do economics experience cyclical variations in economic activity.

Micro economics explain how the resources are allocated to the production of various goods. It also seeks to explain whether the allocation of resources determined is efficient. On the other hand, macro economics explain what determines the level of national income and employment. It explains how general level of prices or inflation is determined. It also explains what determines economic growth.

Both micro and macro economics are applied to business analysis and decision - making. Micro economics is applied to operational or internal issues of business. Macro economics is applied to business environment.

Actually micro and macro economics are interdependent. The theories regarding the behaviour of some macro economic aggregates are derived from the theories of individual behaviour. The theory of relative prices of products and factors is essential for the determination of general price level.

Micro economics also depends upon to some extent macro economics. The determination of the rate of profit and the rate of interest greatly depend upon the macro economic aggregates. Thus the determination of profits and rates of interest cannot be explained without the tools and concepts of macroeconomics.

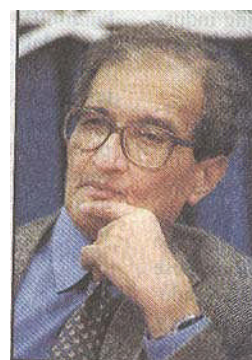
1.5 Self - Assessment Questions:

1.5.1 Essay Questions:

1. Critically examine the definitions of economics.
2. Explain the nature and scope of economics.
3. Distinguish between micro and macro economics.
4. Explain the importance of economics.

1.5.2 Short Questions:

1. Economics is not only a science but an art. Explain?
2. Is Economics a positive science or normative science?
3. What is the role of economics in solving practical problems.
4. Economics is a social science. Explain?



Amartya K Sen (1933 -)

1.6 Reference Books:

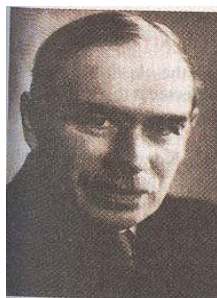
1. Donald Dewey : Micro Economics
2. Ferguson & Gould : Micro Economics Theory
3. K.K. Dewett : Micro Economics or Primary Theory
4. Reddy & Appannaiah : Principles of Business Economics
5. D.N. Dwivedi : Managerial Economics



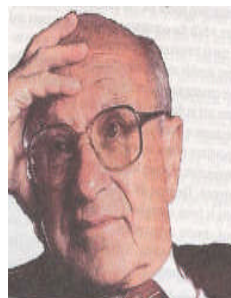
Gunnar Myrdal
(1898 - 1987)



Arthur C Pigou
(1877 - 1959)



John Maynard Keynes
(1883-1946)



Milton Friedman
(1912 -)

Dr. P.C. Sai Babu

Lesson - 2

CARDINAL UTILITY ANALYSIS

2.0 Objectives:

After completing this lesson, the student should be able to:

- * state the law of diminishing utility and explain it with diagrammatic representation.
- * explain the concept of utility
- * define consumer's equilibrium
- * explain the law of equi-marginal utility and its importance.

Structure:

- 2.1 Introduction
- 2.2 Utility Analysis
- 2.3 Law of Diminishing Marginal Utility
 - 2.3.1 Illustration of the Law
 - 2.3.2 Diagrammatic Representation
 - 2.3.3 Exceptions to the Law
 - 2.3.4 Uses of the Law
- 2.4 Law of Equi-Marginal Utility
 - 2.4.1 Consumer's Equilibrium
 - 2.4.2 Statement of Law
 - 2.4.3 Illustration and Diagrammatic Representation
 - 2.4.4 Limitations of the Law
 - 2.4.5 Uses of the Law
- 2.5 Self-Assessment Questions
 - 2.5.1 Essay Questions
 - 2.5.2 Short Questions
- 2.6 Reference Books

2.1 Introduction:

Consumption is the end of all economic activity. The theory of consumer behaviour focusses its attention on the relationship between man and economic goods. The consumer behaviour is studied in two ways: i. Utility Analysis and ii. Indifference Curve Approach. We will take up Utility Analysis in this lesson.

2.2 Utility Analysis:

Utility is the power of a commodity to satisfy human wants. It is defined as the satisfaction experienced by a consumer when the given commodity is consumed. In the process of consumption, man gets satisfaction. Consumption does not mean destruction of matter. It is called destruction of utility.

People demand goods because they satisfy their wants. Utility can also be defined as the property of the commodity which satisfies the wants of the consumers.

A consumer purchases commodities according to his tastes. A consumer desires a commodity more than another commodity because the first one has more utility. Thus the desire for a commodity by a consumer depends upon the utility he expects to obtain from it. The greater the utility he expects from a commodity, the greater his desire for that commodity. Utility is the subjective thing and resides in the mind of consumer.

The central theme of the consumption theory is the utility maximising behaviour of the consumers. All consumers are a utility maximising entity and all their decisions are directed towards utility maximisation.

The theory of consumer behaviour postulates that consumers seek to maximise their total utility or satisfaction. On the basis of this postulate, consumption theory explains how a consumer attains level of maximum satisfaction, under given conditions.

The consumer behaviour can be expected both under cardinal utility approach and ordinal utility approach. The terms cardinal and ordinal are borrowed from the vocabulary of mathematics. The numbers ..1,2,3.... and so on are cardinal numbers. In these numbers, we know that number 2 is twice the size of number..1. In contrast the numbers.. 1st, 2nd, 3rd and so on are ordinal numbers. These numbers are ordered or ranked. In these numbers we cannot know the size relation of them. The second one might or might not be twice as big as the first one. All we can know in ordinal numbers is that the second number is greater than the first.

In this chapter, we will limit our discussion to consumption theory under cardinal utility approach. We will discuss ordinal utility approach in the next chapter.

The exponents of cardinal utility theory which is also known as marginal utility analysis regards utility to be a cardinal concept. In other words, they maintained that utility is a measurable and quantifiable entity. **Marshall** said that utility of a commodity can be measured quantitatively. He said that a person can express the utility or satisfaction he derived from the goods in quantitative terms. Thus he can say that utility from the consumption of apple is 40 units, and that of orange is 25 units. Thus he can express his satisfaction in terms of quantities. This type of measurement is called cardinal system. Some economists belonging to the cardinal school measure utility in imaginary units called 'utils'.

The marginal utility analysis is based on certain assumptions like (i) Utilities are independent. That means utility of a commodity does not depend upon the utility of another commodity and (ii) marginal utility of money remains constant.

2.3 Law of Diminishing Marginal Utility:

Satisfaction of human wants follows some very important laws and one of them is Law of Diminishing Marginal Utility. The law refers to the common experience of every consumer. For

example a person starts eating apples one after another. The first apple gives him great pleasure. But the second apple yields less satisfaction. The satisfaction of the third will be less than that of the second. Like that the additional satisfaction will go on decreasing with every successive apple till it drops down to zero. If the consumer is forced to take more, the satisfaction may become negative.

According to this law, as an individual goes on consuming more and more units of a commodity, its utility goes on diminishing. It means that the extra utility or satisfaction that he derives from the additional unit of commodity goes on falling. The utility obtained from the consumption of additional unit of the commodity is called Marginal Utility (MU). It may be noted here that it is the marginal utility and not the Total Utility (TU) that is diminishing. The total utility increases at a decreasing rate.

The Law is defined as: "The additional satisfaction which a person derives from a given increase of his stock of a commodity, diminishes with every increase in the stock of that commodity". This is **Marshall's** definition.

This law is based on two important facts. Firstly, while the total wants of man are unlimited, each single want is capable of being satisfied. If an individual consumes more and more units of a commodity, intensity of his want for that commodity goes on falling and a point is reached where the individual no longer wants any more units of that commodity. That is when saturation point is reached, marginal utility of a commodity becomes zero. The second fact is that different goods are not perfect substitutes for each other in the satisfaction of various particular wants. This law has been arrived at by introspection and by observing how people behave.

2.3.1. Illustration of the Law:

The following hypothetical table is drawn to illustrate the law of Diminishing Marginal Utility.

Table 2.1

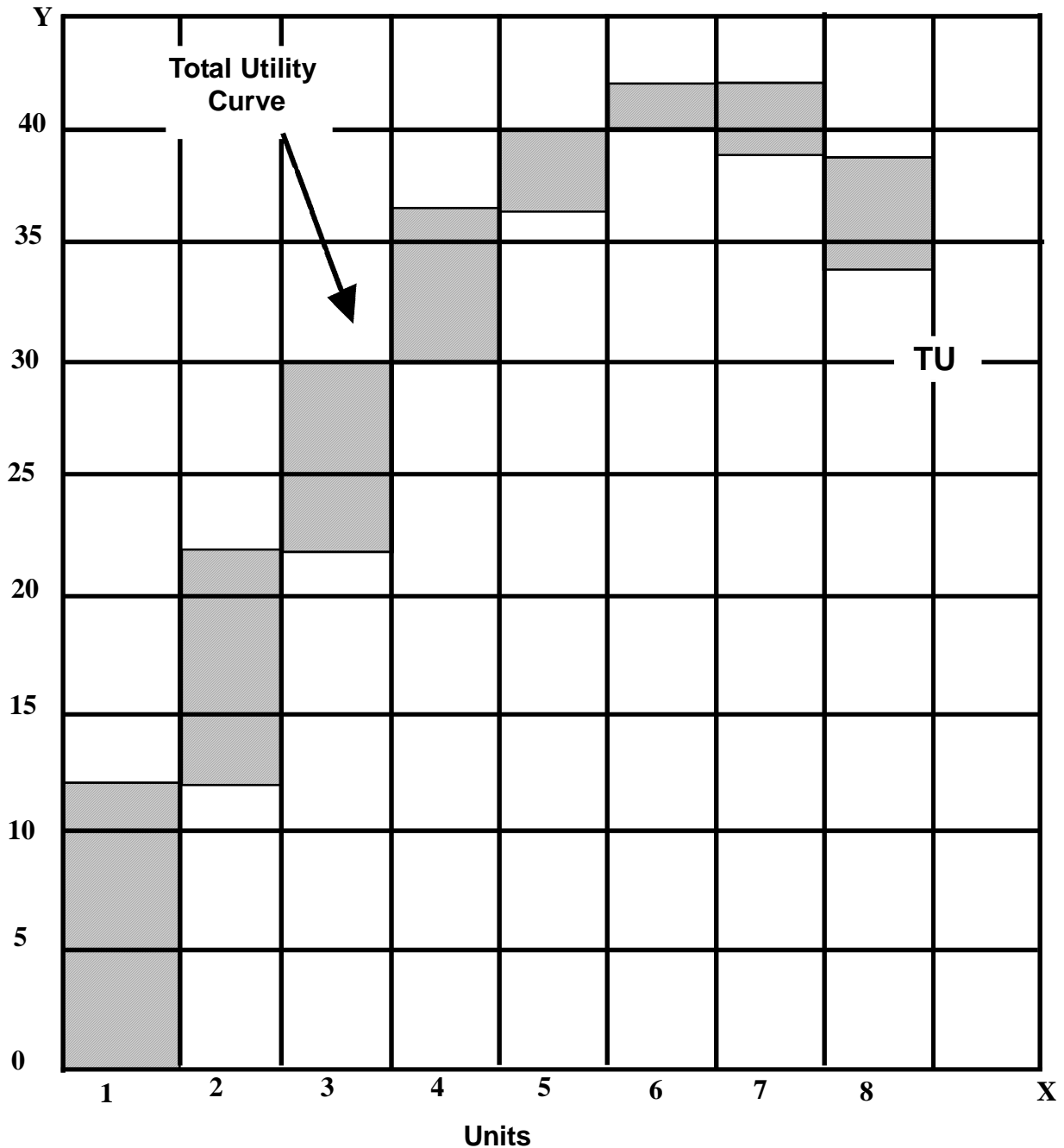
No. of Apples consumed per day	Total Utility (Utils)	Marginal Utility (Utils)
1	12	12
2	22	10
3	30	8
4	36	6
5	40	4
6	41	1
7	39	-2
8	34	-5

Consider the Table 2.1 where total and marginal utilities derived by a person from number of apples consumed per day, when one apple is consumed the total utility derived by that person is 12 utils. As this is the first apple the marginal utility is also 12 utils. With the consumption of second apple, the total utility rises to 22, but marginal utility falls to 10. Thus it can be seen from the table,

as the consumption of apples increases to six, marginal utility from the additional apples goes on diminishing. In the same fashion, when the apples consumed per day increases to seven, the seventh apple gives negative utility. As far as total utility is concerned it is increasing at a decreasing rate and after the sixth apple, it is also diminishing.

2.3.2. Diagrammatic Representation:

Figure 2.1 graphically represents the data presented in Table 2.1. Marginal Utility Curve (MU) goes on decreasing upto sixth unit and becomes negative afterwards. The Total Utility curve (TU)



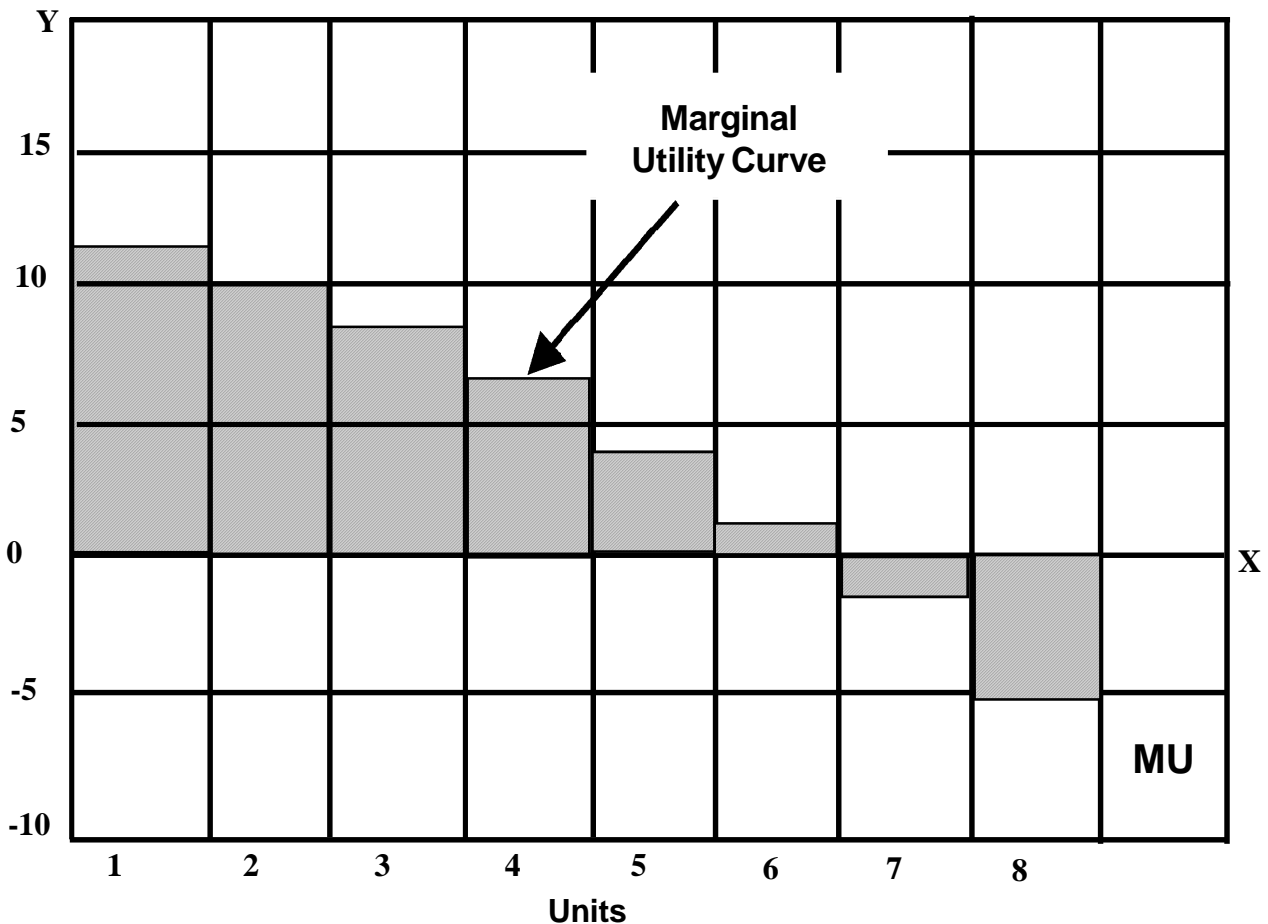


Figure 2.1

reaches highest point at the sixth unit and decrease afterwards. Thus it can be concluded that as more and more units of a commodity are consumed, its utility goes on diminishing, Marginal Utility diminishes immediately but total utility diminishes after a certain time.

2.3.3 Exceptions to the Law:

The Law of Diminishing Marginal Utility is called the universal law. But in certain cases the law does not apply. That utility increases with an increase in the stock of a commodity consumed. Such instances are called exceptions in the theory of diminishing marginal utility. Frankly speaking these exceptions are not genuine. They are only superficial.

(i) Rare Collections: People will have certain hobbies like stamp collection, coin collection etc; Here the extra collection gives more pleasure. Hence marginal utility increases. However, here we have to remember that different stamps or coins are treated as different commodities and not a homogeneous commodity.

(ii) Drunkards: It is stated that this law does not apply to drunkard. As he goes on consuming more and more glasses of liquor, his craving for liquor increases.

(iii) Money: It is stated that this law, does not apply in the case of money. An increase in the stock of money, increases the purchasing power and satisfaction. People can enjoy more comforts and happiness with more money.

(iv) Music and Poetry: In the case of entertainments like music, poetry, this law does not apply. If a person goes on listening to music or poetry, his utility increases. But there will be a limit for that also.

2.3.4 Uses of the Law:

The Law has a good number of uses and applications in both economic theory and policy. (i) It helps in determining the prices of commodities. This concept solved the problem of value paradox. The water-demand paradox was solved with the aid of the marginal utility theory. (ii) This Law helps in deriving law of diamond. **Marshallian** concept of consumer's surplus is also based upon the law of diminishing marginal utility. (iii) This law is also useful in the field of fiscal policy. In the modern welfare state, the governments redistribute income so as to increase the welfare of the people. This law demonstrates transfer of income from the rich to the poor which will increase the economic welfare of the society. (iv) This law also governs our daily expenditure. We stop further purchases at a point where marginal utility equals price (v) This law also forms the basis of theory and practice of taxation.

2.4 Law of Equi-Marginal Utility:

The law of diminishing utility applies to one commodity at a time. Generally, consumer buys more than one commodity at a time with his given income. Now the problem is how to allocate given money on various goods he wants. The Law of Equi-Marginal Utility provides us with some solution. It is also called Law of Substitution.

Every prudent person wants to make the best use of his resources. This is necessary because resources are scarce in relation to wants. Every consumer aims at getting the maximum possible satisfaction.

A consumer spends his given money income on various goods he wants. If he buys more units of a single commodity the additional units bring him diminishing satisfaction. Instead of that, he substitutes additional units of that commodity for another commodity which brings more satisfaction. It is through this process of substitution, he buy number of commodities and gets maximum satisfaction.

2.4.1 Consumer's Equilibrium:

Equilibrium means a state of balance. When forces acting in opposite directions are exactly equal, the object on which they are acting is said to be in a state of equilibrium. We use this concept often in economic analysis.

Consumer's equilibrium can be explained through the law of Equi-Marginal Utility. Equilibrium is defined as a situation in which the consumer gets maximum satisfaction. Owing to multiplicity of wants and scarcity of means, wants are competitive. We have therefore more urgent and less urgent wants. When we are planning to buy a little more or a little less of a commodity, in our mind, we are only trying to balance the marginal utility of those commodities.

Let us assume, that there are only two goods A and B on which a consumer has to spend a given income. Here the consumer's behaviour will be governed by two factors : (i) the marginal utilities of the goods and (ii) the prices of two goods. The law of Equi-Marginal Utility states that the consumer will distribute his money between the goods in such a way that the utility derived from the last rupee spent on each good is equal. In other words, consumer is in equilibrium position, when marginal utility of money expenditure on each good is the same. We get maximum satisfaction only when marginal utilities have been equalised, through the process of substitution.

A consumer will go on purchasing a good until the marginal utility of the good equals market price. In other words, the consumer will be in equilibrium in respect of the quantity of the good purchased, where marginal utility of the good equals its price. His satisfaction will be maximum only when marginal utility equals price. Thus the 'marginal utility equals price' is the condition of equilibrium. Consumer's equilibrium can be explained through a simple formula namely

$$E = \frac{MU}{P}, \text{ where E means equilibrium, MU means marginal utility and P means Price.}$$

2.4.2 Statement of Law:

The Law of Equi-Marginal Utility can therefore be stated thus: 'the consumer will spend his money income on different goods in such a way that marginal utility of each good is proportional to its price'. That is the consumer is in equilibrium in respect of purchases of two goods A and B. The

formula used in this analysis is $MU_E = \frac{MUA}{P_A} = \frac{MUB}{P_B}$. That is the $\frac{MU_{ofA}}{P_A}$ must be equal to

$\frac{MU_{ofB}}{P_B}$. If $\frac{MU_{ofA}}{P_A}$ is greater than $\frac{MU_{ofB}}{P_B}$, then the consumer will substitute 'A' good for 'B'

good. As a result of this substitution, the marginal utility 'A' will fall and marginal utility of 'B' rises. This substitution will be carried up to the point where the marginal utilities of both the goods become equal. That is why this law is also called law of substitution and law of maximum satisfaction.

2.4.3 Illustration and Diagrammatic Representation:

Take for example a consumer has Rs.5 and spends on two commodities X and Y. When he wishes to spend his amount on X only or Y only, he will have two separate diminishing marginal utility curves for X and Y. But he will not spend all the money one commodity only. It is assumed that he spends his scarce resource of Rs.5 on two commodities namely X and Y, to get maximum satisfaction. The following table illustrates the level of satisfaction the consumer get from two commodities X and Y when the price of X is Rs.2 and Y is Rs.3.

Table 2.2
Marginal Utility of X and Y products

Money Spent	MU of X (Units)	MU of Y (Units)
1	40	35
2	35	30
3	30	25
4	25	20
5	20	15

The above table is diagrammatically represented in Figure 2.2.

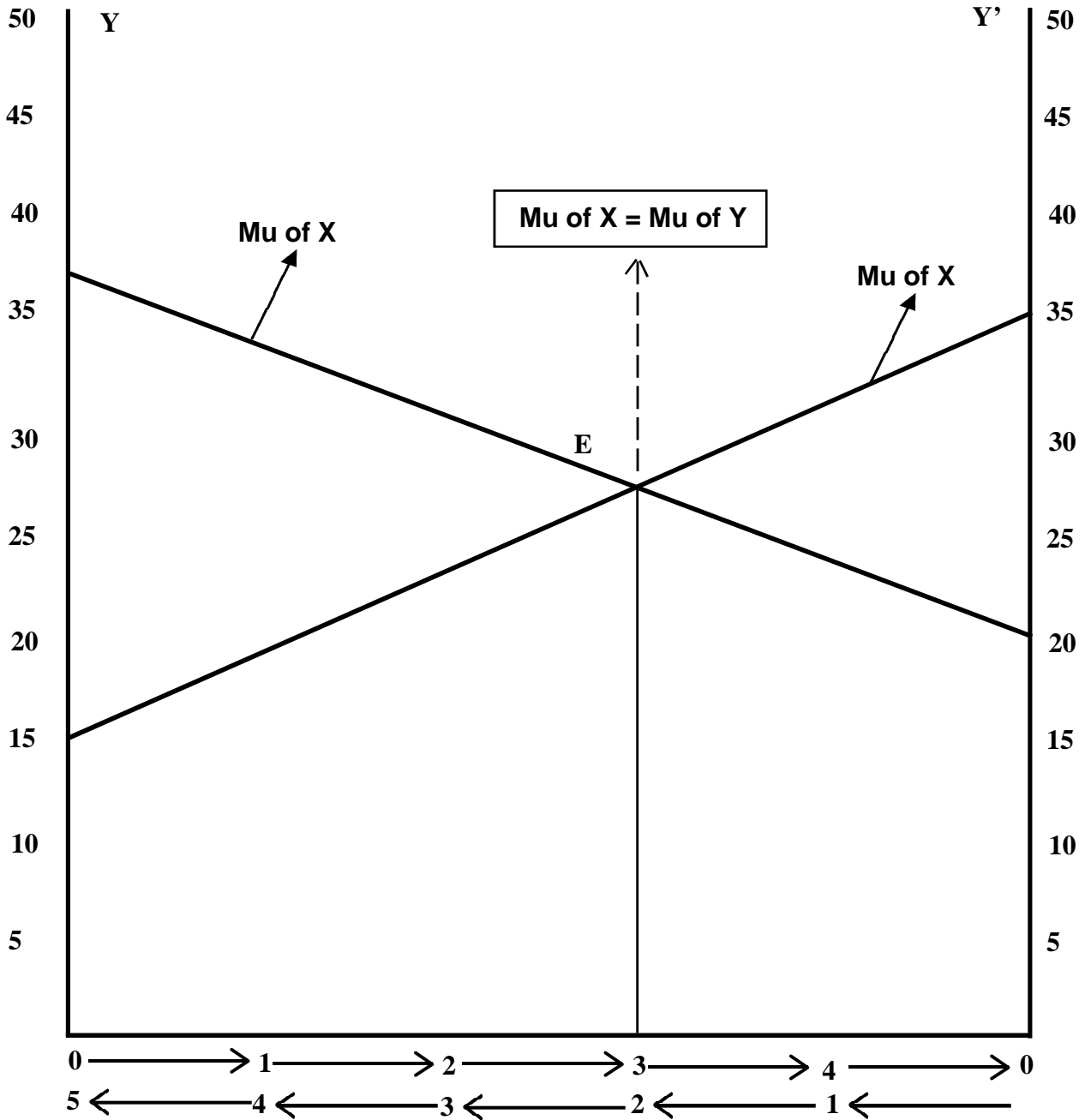


Figure 2.2

We can observe from the Figure 2.2., that the consumer attains Equilibrium at point E. At this point he spends Rs.3/- on X commodity and get 30 units of satisfaction and by spending Rs.2/- on Y commodity, he gets equal satisfaction of 30 units. Point E is the intersecting point of MU of X and MU of Y. With the available income of Rs.5/- the best combination of two commodities X and Y can be consumed to equal unit of satisfaction viz., 30 units by spending Rs.3/- on 'X' and Rs.2/- on 'Y'.

Thus, the Law of Equi-Marginal Utility clearly states that:

$$\frac{\sum MU_{ofX}}{Pr ice_{ofX}} = \frac{\sum MU_{ofY}}{Pr ice_{ofY}} = K \text{ (Constant)}$$

Where 'K' stands for marginal utility of money.

This means that the ratios of the marginal utilities of the two commodities and the ratio of the prices of two commodities are equal or the marginal utility of money is constant.

2.4.4 Limitations of the Law:

Like many other laws, the law of Equi-marginal Utility also is a mere statement of a tendency. A rational consumer follows the law in allocating his expenditure to various goods. But many people will not follow this law and therefore they may not obtain maximum satisfaction. This may be due to the following reasons.

- (i) In order to apply this law, the consumer has to calculate and compare the marginal utilities of various commodities. This exercise of calculating and comparing is not possible for all consumers. Since time is short and due to habits and other forces, he is compelled to buy different commodities in an irrational way. Thereby he does not bother to attain equilibrium.
- (ii) Even the prudent consumer goes through a certain amount of thinking only in the case of big expenditure. He will ignore the law when making small purchases.
- (iii) Even for educated and rational consumers, measurement of marginal utilities of different commodities in cardinal terms is difficult. They cannot be measured in objective terms.
- (iv) Ignorance of consumers imposes another limitation. The consumers may not be aware of other more useful alternatives. Hence no substitution takes place and the law of substitution does not operate.
- (v) Another limitation arises from the fact that goods are not divisible into small bits to enable consumers to equalise their marginal utilities. Some goods like house, car etc, are indivisible.
- (vi) As there will be no definite budget period in the case of individuals, the application of this principle is rendered difficult.

2.4.5 Uses of the Law:

The Law of Equi-Marginal Utility has a very wide application. The law is applicable to all branches of the economic theory. The following are some of its uses:

- (i) It is used in consumption. It helps the consumer in deriving maximum satisfaction from the consumption of various goods.
- (ii) In the field of production, it is used to optimize the productive resources. And it helps in maximizing the profit.
- (iii) The principle has an important bearing on the determination of value. As the consumer substitutes less scarce goods for the more scarce ones, the scarcity of the latter is thus relieved, and its price comes down.
- (iv) The Law of substitution proves useful in the distribution of national dividend among the various agents of production.
- (v) Public expenditure of a government conforms to this law. It helps the government in maximising the welfare of the community.
- (vi) In all over exchanges, this principle works, Exchange is nothing else but substitution of one thing to another.

2.5 Self-Assessment Questions:

2.5.1 Essay Questions:

1. Explain the law of diminishing Marginal Utility?
2. Explain the Law of Equi-Marginal Utility and show how it is useful in determining consumer's equilibrium.

2.5.2 Short - Questions:

1. What is consumer's equilibrium?
2. Distinguish between marginal and total utility?

2.6 Reference Books:

1. H.L. Ahuja : Business Economics Micro
2. A. Asimakopulos : Micro Economics
3. Bhattacharya & Chakrabarti : Fundamentals and Business Economics.

Dr. P.C. Sai Babu

Lesson - 3

INDIFFERENCE CURVE APPROACH

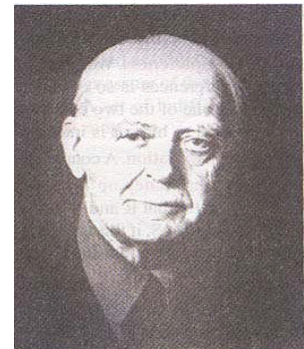
3.0 Objectives:

After completing this lesson, the student should be able to:

- * know what is indifference schedule
- * plot indifference curves
- * understand the properties of indifference curves
- * explain what is consumer's equilibrium and various factors that affect it.

Structure:

- 3.1 Introduction
- 3.2 Indifference Schedule
- 3.3 Indifference Curves
- 3.4 Marginal Rate of Substitution
- 3.5 Properties of Indifference Curves
- 3.6 Consumer's Equilibrium
- 3.7 The Income Effect
- 3.8 The Price Effect
- 3.9 Substitution Effect
- 3.10 Self-Assessment Questions
 - 3.10.1 Essay Questions
 - 3.10.2 Short Questions
- 3.11 Reference Books



Sir J.R. Hicks
(1904-1989)



R.G.D. Allen

3.1 Introduction:

As mentioned in the previous chapter, we will take up 'Indifference Curve Approach' in this chapter to study the consumer behaviour. The utility analysis discussed in the previous chapter suffers from a number of weaknesses. The most important weakness of that approach was related to its cardinal measurement of utility. To overcome this weakness, modern economists have developed an alternative approach based on indifference curve analysis. This analysis states that utility is measurable only in principle, but its magnitude cannot be assigned real numbers. Thus this concept is based on the assumption that utility cannot be measured in absolute terms.

The real elaboration of the indifference curves was made by **Hicks**. This indifference curve analysis is also known as substitution analysis. Here the diminishing marginal rate of substitution (MRS) is the basic concept.

The great merit of indifference curve analysis is that it leads to ordinal measurement of utility. Here the consumer need not assign specific amounts to the utility he derives from the consumption of a good. He can simply compare the different utilities or satisfactions and say that one level of satisfaction is equal to or lower than or higher than another. It is sufficient if the consumer is able to rank his preferences consistently. Thus ordinal measurement of utility has a greater element of realism than the cardinal measurement of utility. That is why indifference curve analysis is superior to the utility analysis. Ordinal system refers to measuring the satisfaction on the basis of grades or ranks.

Generally consumers buy goods in combinations. A prudent consumer exercises lot of discrimination in his purchases. He substitutes one commodity, partly or wholly for another. All the time, he is striving to reach an equilibrium position, where he derives maximum satisfaction.

A consumer possesses a definite scale of preferences for goods and services. Each scale of preference consists of a number of alternative combinations of two or more goods. These combinations give him same amount of satisfaction. He is therefore, found indifferent towards these combinations. Such combinations of commodities as between which an individual is indifferent are called indifferent combinations.

3.2 Indifference Schedule:

On the basis of a consumer's scale of preferences, we can draw indifference curves. For the purpose of drawing an indifference curve, we require an indifference schedule. An indifference schedule is a schedule of various combinations of the two commodities that will equally be acceptable to the consumer. According to **Prof. Watson** - "An indifference schedule is a list of combinations of two commodities, the list being so arranged that a consumer is indifferent to combinations preferring none of any other".

All combinations in the indifference schedule give the consumer the same level of satisfaction. He is indifferent among them. It means he will not insist on any one combination over the other.

A list of combinations of goods which give the consumer same level of satisfaction is drawn below:

Table 3.1

Indifferent Schedule				
Combinations	Apples (X)	Bananas (Y)	MRS x U	Level of satisfaction
1	1	15	----	I
2	2	11	4 : 1	I
3	3	8	3 : 1	I
4	4	6	2 : 1	I
5	5	5	1 : 1	I

In the above schedule, the consumer starts with one apple and 15 bananas. The consumer gives up 4 bananas in order to get second apple. The second combination consists of 2 apples and

11 bananas. In order to get additional apple, he goes on giving up bananas. The giving up of bananas for the sake of additional apple also goes on decreasing. All these combinations give the consumer the same level of satisfaction. Hence, he is said to be indifferent to any one of them.

If X and Y are two goods the amount of Y to be sacrificed for every increasing unit of X is called the MRS x Y. This concept is explained in following pages.

3.3 Indifference Curves:

On the basis of consumer's scale of preferences, we can draw indifference curves. An indifference curve represents satisfaction of a consumer from two commodities. It is drawn on the assumption that for all possible points on an indifference curve, the total satisfaction remains the same. Hence the customer is indifferent to as to the combinations buying on an indifference curve.

In figure No.3.1 an Indifference Curve (IC) is drawn by plotting the various combinations of indifference schedule given in Table 3.1. The A,B,C,D,E points on the indifference curve indicate different combinations of the two goods. But all these combinations are of equal importance to the consumer. Therefore the consumer is indifferent to them. An indifference curve represents a particular level of satisfaction, but all the points in the indifference curve represent the same level of satisfaction.

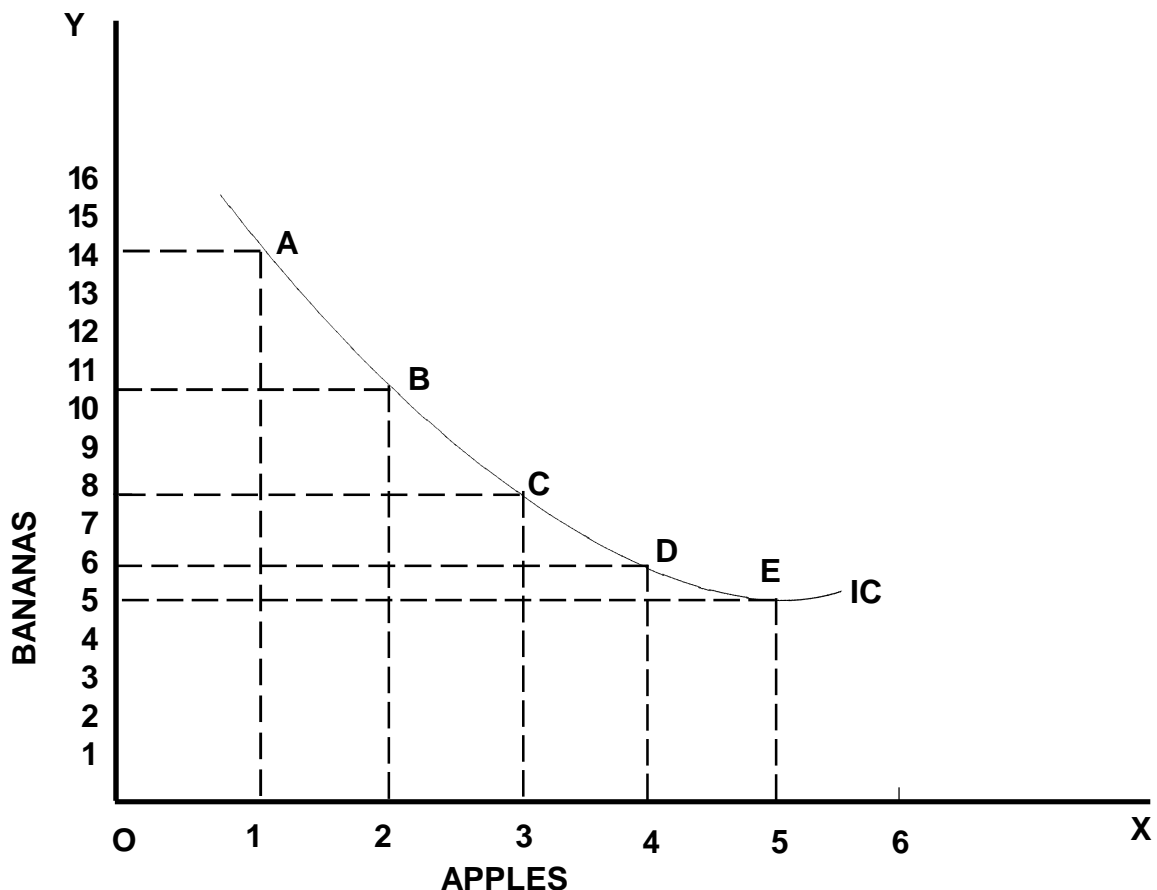


Figure 3.1

We can draw similar indifference curves showing combinations of apples and bananas which represent greater and lesser satisfaction than that shown on Indifference Curve (IC). We have drawn five indifference curves in Figure No.3.2.

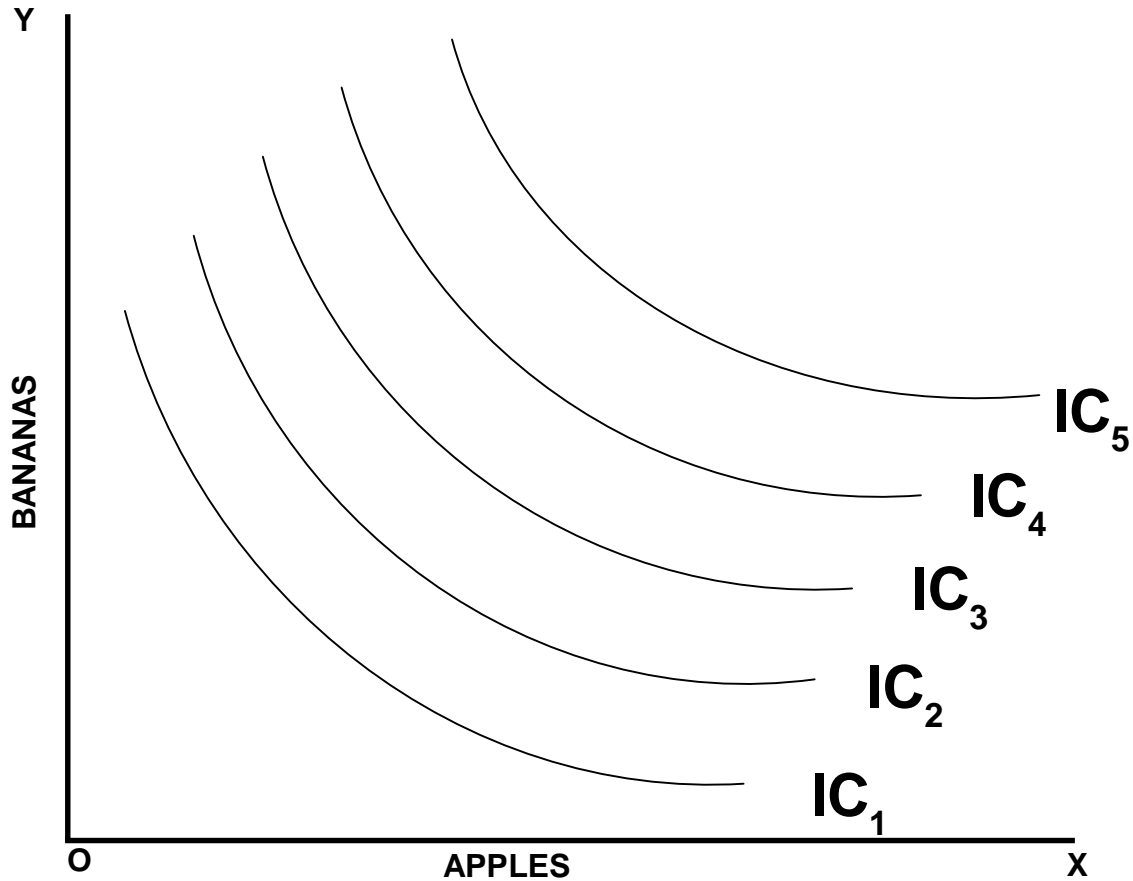


Figure 3.2

Indifference Curve IC_1 represents a lower level of satisfaction as compared with indifference curves IC_2 , IC_3 , IC_4 and IC_5 . But all combinations of apples and bananas on IC_1 are equally preferred. But they are less preferred to all the combinations at various points on IC_2 . We cannot say how much greater satisfaction does IC_2 represent than IC_1 . That is the aggregate utilities are rankable and not measurable. A set of indifference curves is called an 'indifference map'.

The indifference curve technique is based on the assumptions viz., (i) A consumer buys two goods in combinations (ii) He draws scale of preferences on the basis of different levels of satisfactions and ranks them (iii) The technique is based on ordinal system of measurement and (iv) The consumer formulates the scales of preferences independently of market price.

3.4 Marginal Rate of Substitution:

The concept of marginal rate of substitution forms an important tool of indifference curve analysis. As we have seen above, the consumer exchanges apples and bananas. We can also work out the rate at which this substitution takes place. This is nothing but marginal rate of substitution.

As we have seen in the demand schedule given in Table 3.1, in the second combination the consumer substitutes 4 bananas for one additional apple. At this stage, the consumer's marginal rate of substitution is 4:1 (Four bananas for one apple). So also in the third combination, the sacrifice comes down from 4 to 3. That means, he sacrifices only 3 bananas for one additional apple. In the fourth combination, the sacrifice further comes down from 3 to 2. Thus the marginal rate of substitution goes on decreasing. The downward slope of the indifference curve is entirely due to diminishing marginal rate of substitution. This marginal rate of substitution concept is almost similar to law of diminishing marginal utility.

As the consumer has an increasing stock of one commodity, its marginal utility falls. If the stock of that commodity decreases, its marginal utility rises.

3.5 Properties of Indifference Curves:

Now we will discuss the properties or attributes of indifference curves.

(i) Indifference curve slope downward to the right. That is they are negatively sloped. It means when the amount of one commodity is more, the amount of the other commodity is less. The negative slope or downward slope of indifference curve is due to marginal rate of substitution as discussed in the previous paragraphs. Indifference curve cannot be a horizontal straight line, nor it can be a horizontal straight line, nor it can be vertical straight line nor sloping upwards as shown in figure 3.3. It has to slope down to the right due to marginal rate of substitution.

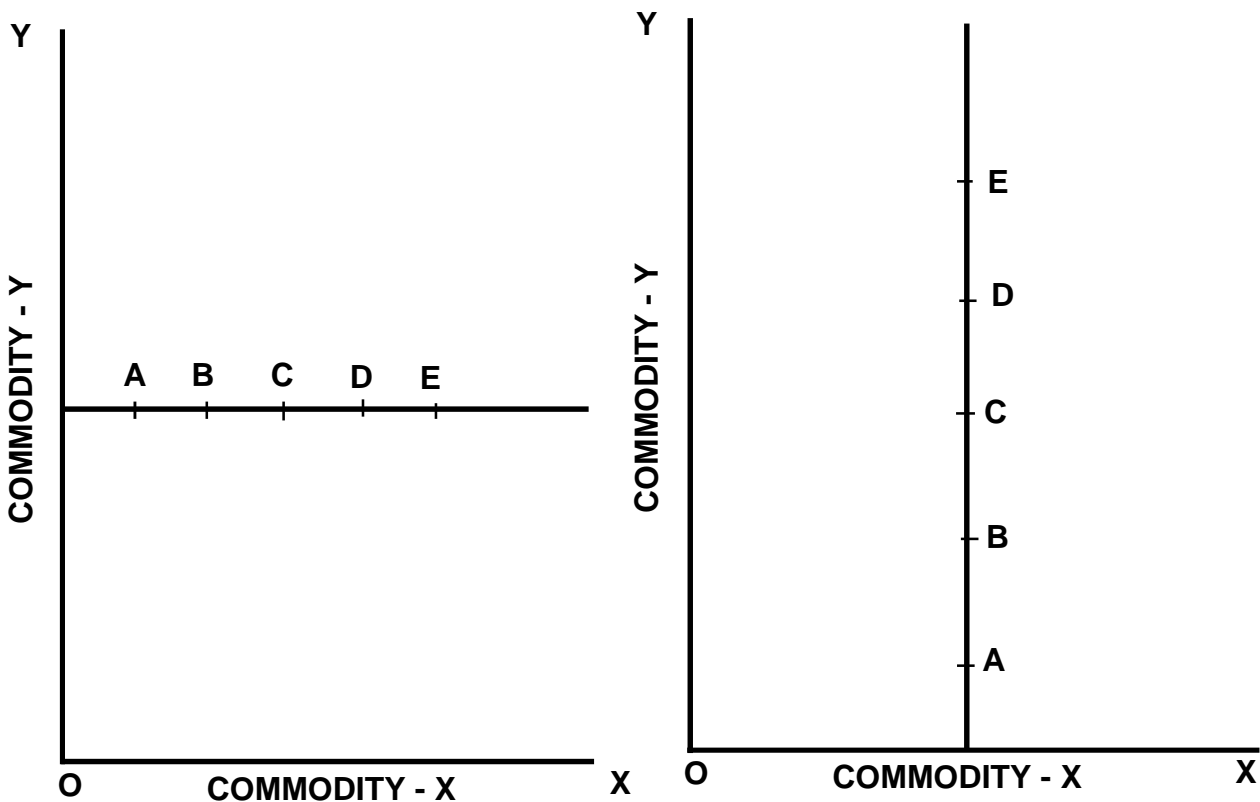


Figure 3.3

(ii) The second property of indifference curves is that no two such curves will ever cut each other. It means only one indifference curve will pass through a point in the indifference map. Indifference curves represent different levels of satisfaction. How can one level be equal to two different levels. It follows therefore that indifference curves cannot cut each other as shown in Figure 3.4.

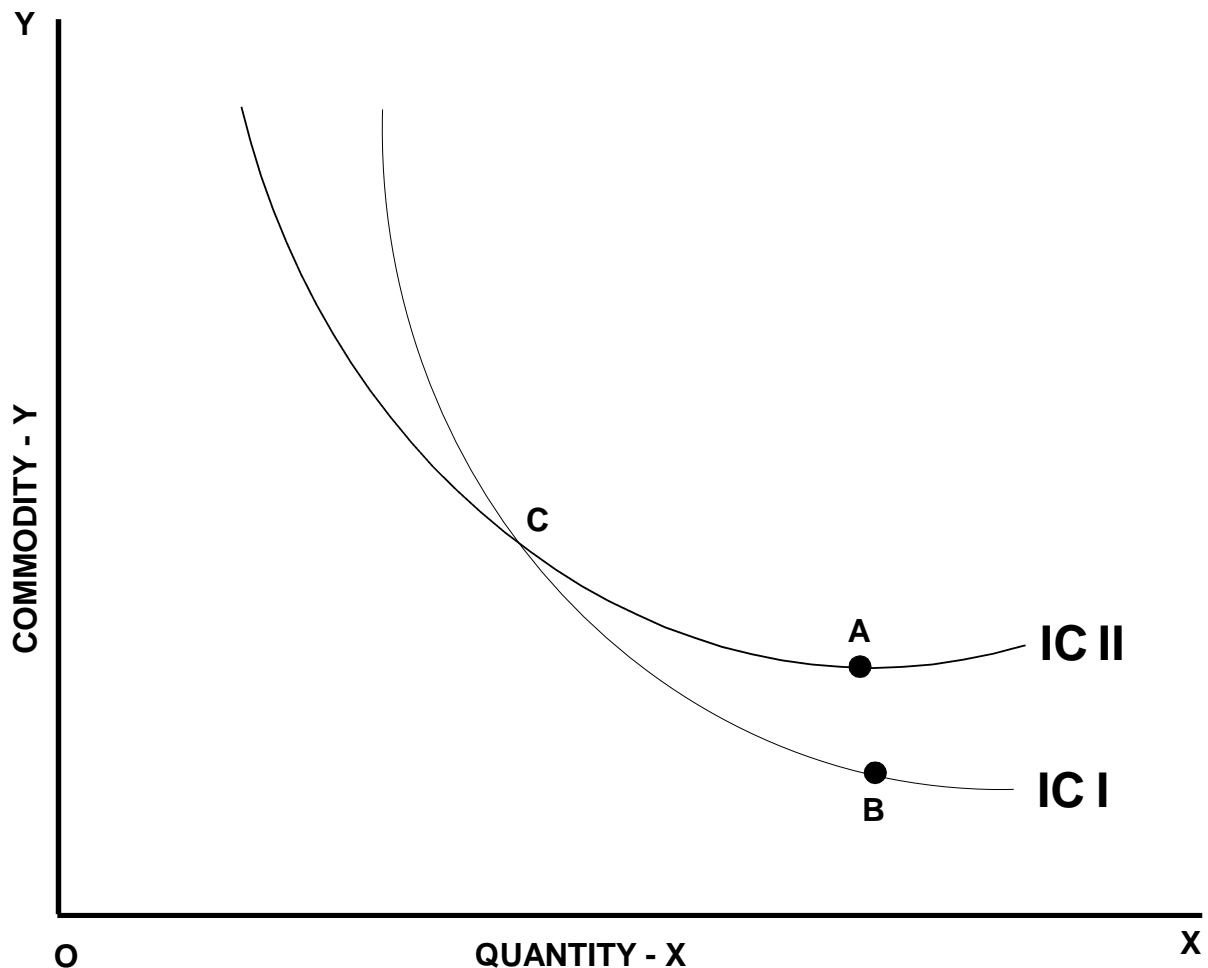


Figure 3.4

(iii) The third property of indifference curves is that they are normally convex to the origin. It means indifference curve is relatively flatter in its right hand portion and relatively steeper in the left hand portion. This is again due the fact that it is based on the principle of diminishing marginal rate of substitution. Indifference curves can never be concave to the origin. They are always convex to the origin as shown in Figure 3.5.

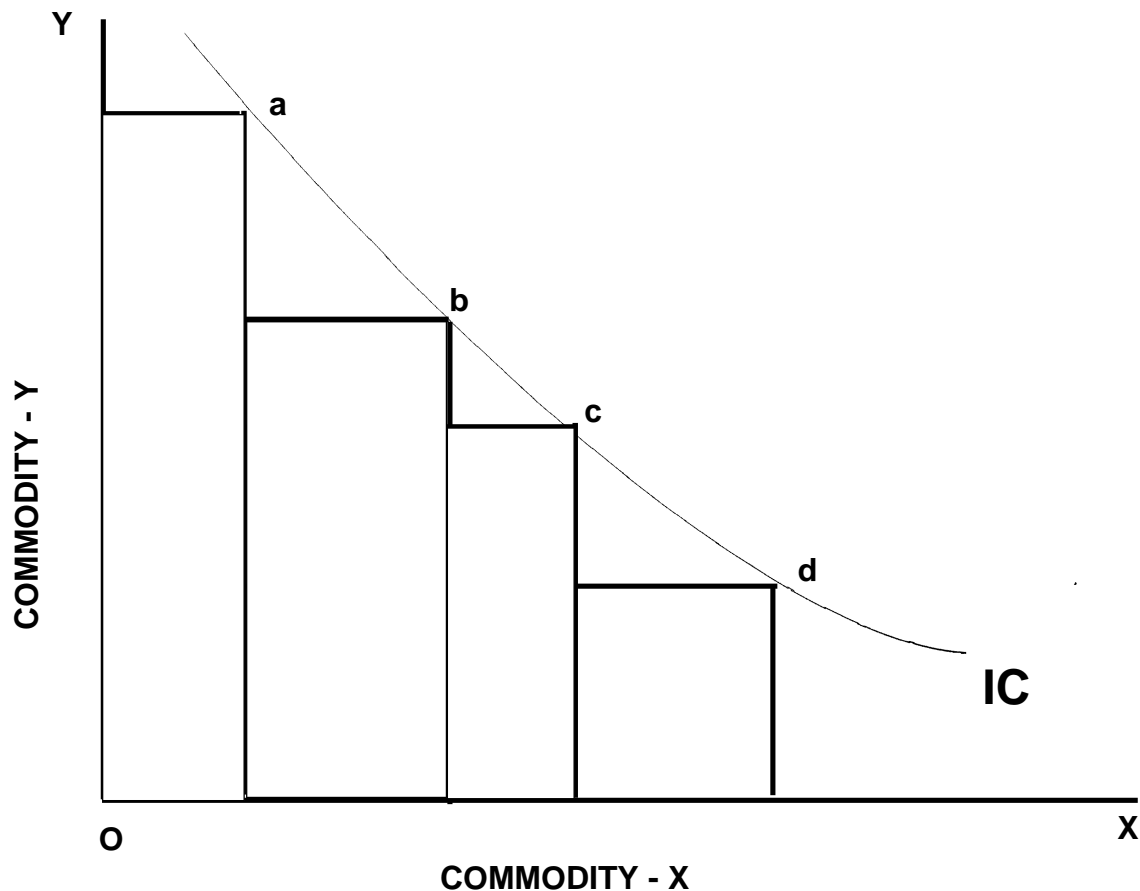


Figure 3.5

(iv) A higher level of indifference curve represents a higher level of satisfaction than a lower indifference curve. It means the combinations which lie on a higher indifference curve will be preferred to the combinations which lie on a lower indifference curve. This was clearly explained in previous figure 3.2.

3.6 Consumer's Equilibrium:

Indifference curve technique is used as an important tool to analyse consumer's equilibrium. A consumer is said to be in equilibrium when he gets maximum satisfaction from the purchase of two commodities. As explained above a higher indifference curve shows a higher level of satisfaction than a lower one. Therefore, a consumer in his attempt to maximise his satisfaction will try to reach highest possible indifference curve. But in his pursuit of buying more and more goods to obtain more satisfaction, he has to work under two constraints. First he has to pay the prices for the goods and second he has a limited money income with which to purchase the goods. Thus how far he would go in for his purchases depends upon the prices of goods and his money income. So, in order to explain consumer's equilibrium, there is also need for introducing into the indifference diagram, the budget line which represents the prices of the goods and consumer's money income.

The budget line has been variously named by different authors. The budget line or price line represents different combinations of goods which a consumer can buy within a given income after knowing their respective prices.

Let us assume that a consumer has set apart Rs.10 to buy the two commodities the respective market prices are - apple Rs.2 per unit, banana 50 paise per unit. If he spends all his income on bananas, he can buy 20 bananas. Or if he wants to buy only apples, he can buy 5 apples. Generally the consumer buys both the commodities.

The following Figure 3.6 explains this position.

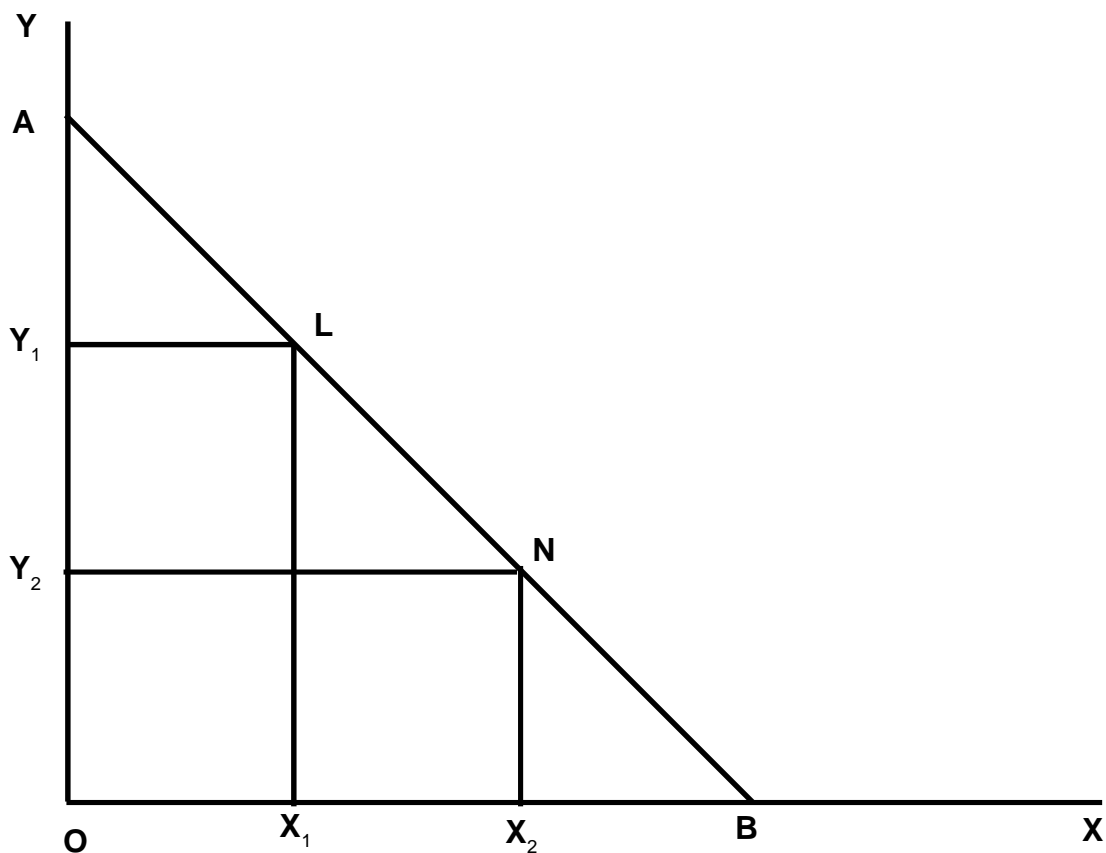


Figure 3.6

From the given amount the consumer can buy OA of Y Commodity, or he can buy OB of X commodity. If a straight line is drawn to join a point on the Y axis and B point on the X axis, we get A B line. This is called price line or budget line. The consumer can buy any combination that lies on price line.

If line money income of the consumer or prices of goods change, there will be shifts in price line. If the consumer's income increase, the price line shifts upward. If his income is reduced, the price line shifts downward. And the slope of the price line depends upon the ratio of the prices of two goods.

In order to explain how a consumer reaches equilibrium position, we shall make the following assumptions:

- (i) The consumer has an indifference map showing his scale of preferences for various combinations;
- (ii) He has a given and constant amount of money to spend on the goods;
- (iii) The prices in the market are given and constant;
- (iv) Each of the goods is divisible and homogeneous;
- (v) and the consumer acts rationally.

Taking the above assumptions into consideration, consumer's equilibrium can be explained with the help of Figure 3.7.

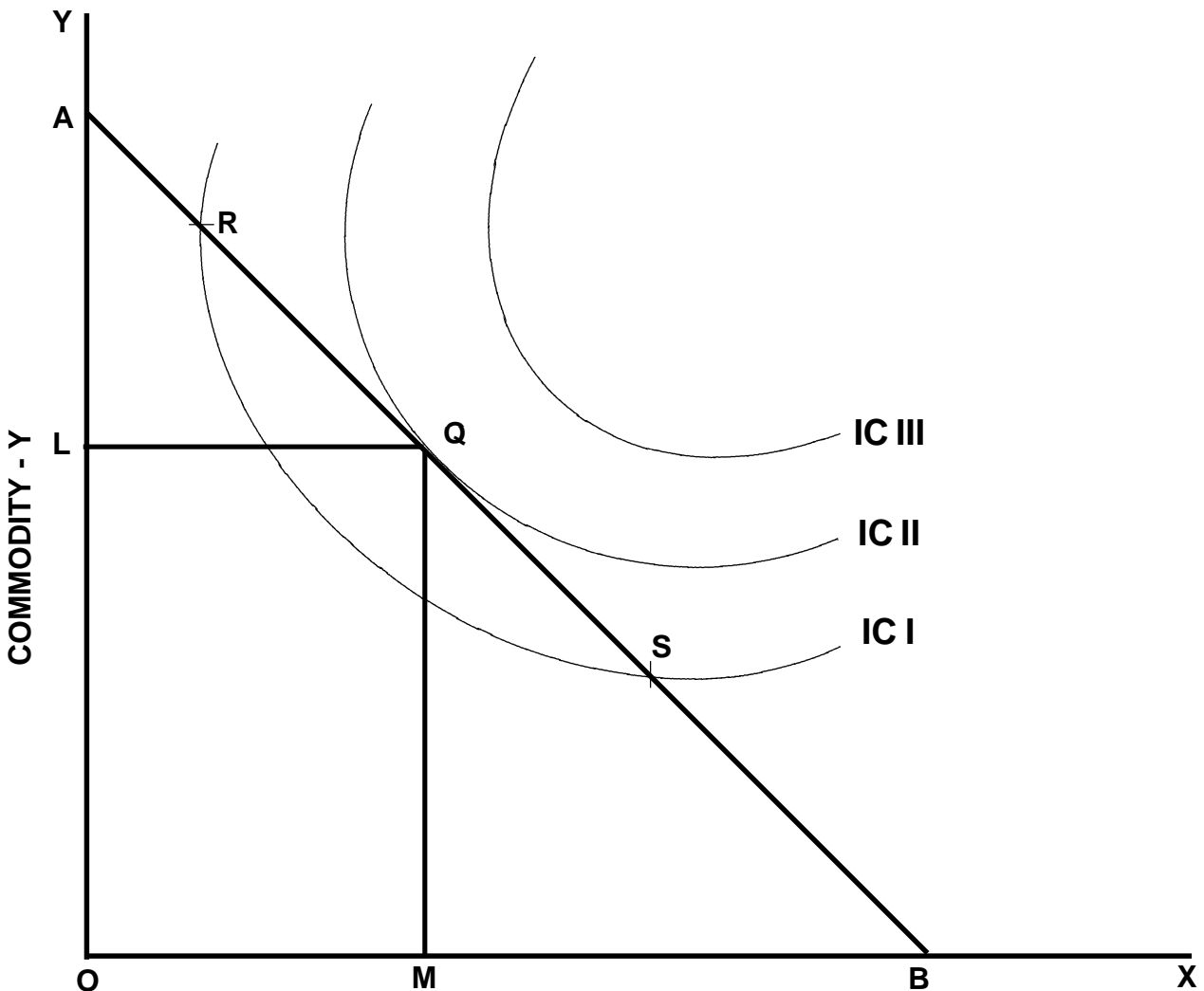


Figure 3.7

Three indifference curves are shown in the above diagram. AB is the price line. The indifference curves show consumer's scale of preferences between various combinations of two goods. The price line shows various combinations which the consumer can buy with his given money income and prices of two goods.

The consumer can purchase either OB of X commodity or OA of Y commodity with his money income, the consumer cannot reach IC III. He has to reach IC II. The price line AB touches the IC II at the point 'Q'. The point 'Q' is the equilibrium point. At 'Q' point, the price line AB will be tangent to IC II. The consumer can buy the combination of goods at points 'R' and 'S'. But they are on the lower indifference curve. Therefore he cannot attain equilibrium. So he will prefer the combination at Q. This combination will give him maximum satisfaction.

Therefore most important condition for consumer's equilibrium is that the price line is tangent to indifference curve. Again at the point of tangency, the indifference curve must be convex to origin. These are two essential conditions for consumer's equilibrium.

3.7 The Income Effect:

Let us consider the effect on consumer's equilibrium of a change in consumer's income, relative prices of commodities remaining the same. This is called income effect. The **Marshallian** utility approach implies that demand for a commodity is independent of consumer's money income. But the indifference curve analysis helps us to understand as how much the consumer's demand for a commodity changes in response to a given change in the income of the consumer.

With a given amount of money to spend and prices are given, the consumer attains equilibrium at a point where the price line is tangent to indifference curve. Now, we have to see what happens when the money income of the consumer rises. Naturally he will buy more. Given the prices and his tastes remaining the same, he will allot more and more money to buy the goods. It means he goes to a higher indifference curve. A new price line is also formed due to increase in consumer's money income. The point of tangency of the price line on the new indifference curve is equilibrium point.

The income effect has been explained with the help of the following diagram:

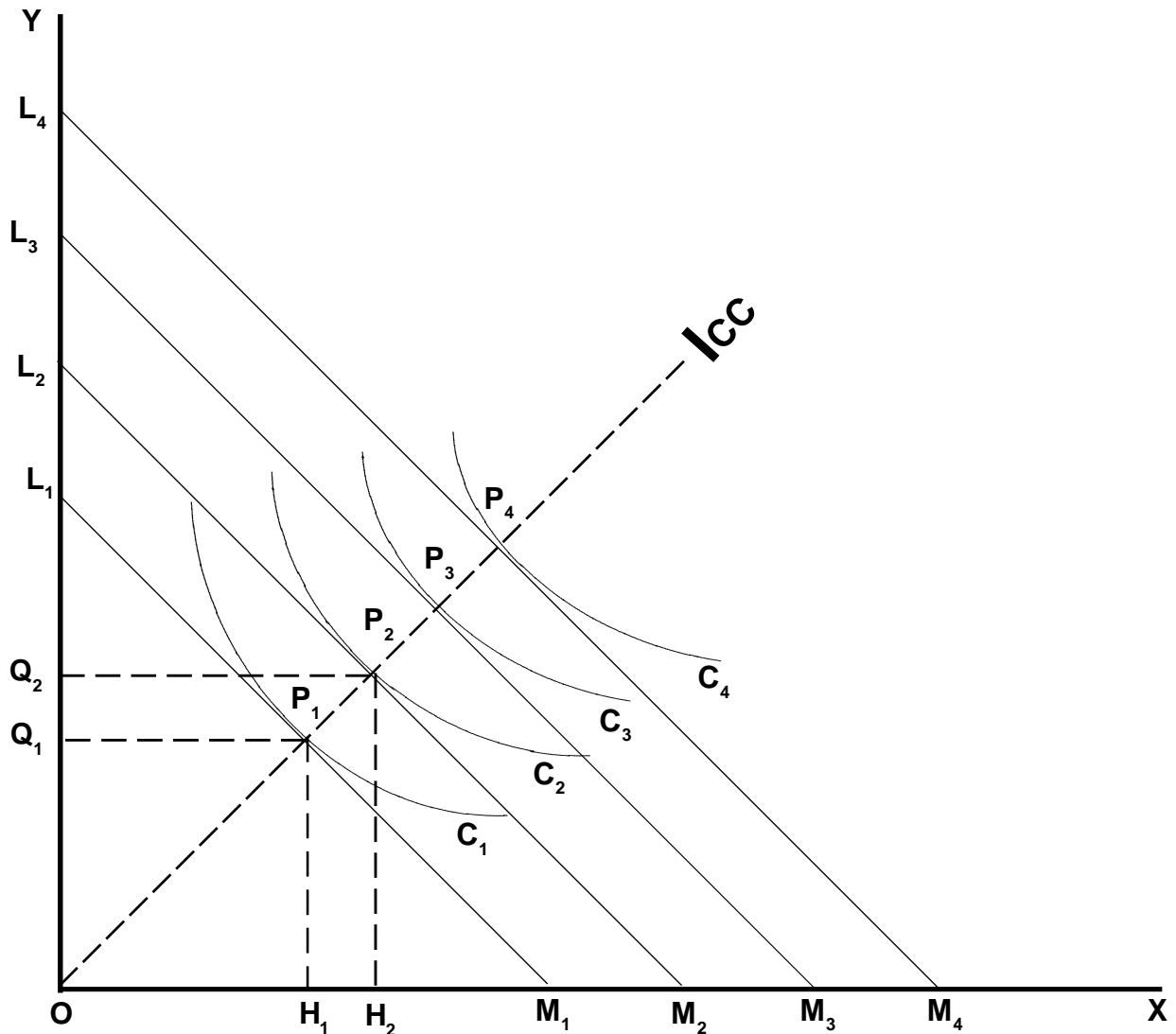


Figure 3.7

With the price line L_1, M_1 , the consumer is in equilibrium at point P_1 . If the consumer's income increases, his new price line is L_2, M_2 . As a result of this increase in income, the consumer will move to a new equilibrium position at the point ' P_2 '. On a higher indifference curve C_2 , he will be buying OH_2 of commodity X and OQ_2 of commodity Y. Thus the consumer will get on to a higher level of satisfaction as a result of an increase in his income.

If his income for there increases, his new price line becomes L_3, M_3 and he will be in equilibrium at point ' P_3 ' on an indifference curve C_3 and so on for further increases in income.

If the points of P_1, P_2, P_3, P_4 etc are joined together by a line passing from the origin, we get what is called Income Consumption Curve (ICC). The ICC shows how the consumption of two goods is affected by change in income. An income consumption curve traces out the income effect as the consumer's income changes, with given relative prices of two goods.

3.8 The Price Effect:

If the consumer reacts to changes in the price of a good, his money income and tastes and preferences remaining the same, the effect is called Price Effect. The price effect shows the reaction of the consumer due to changes in the price of a good.

The price effect has been explained with the help of the following diagram.

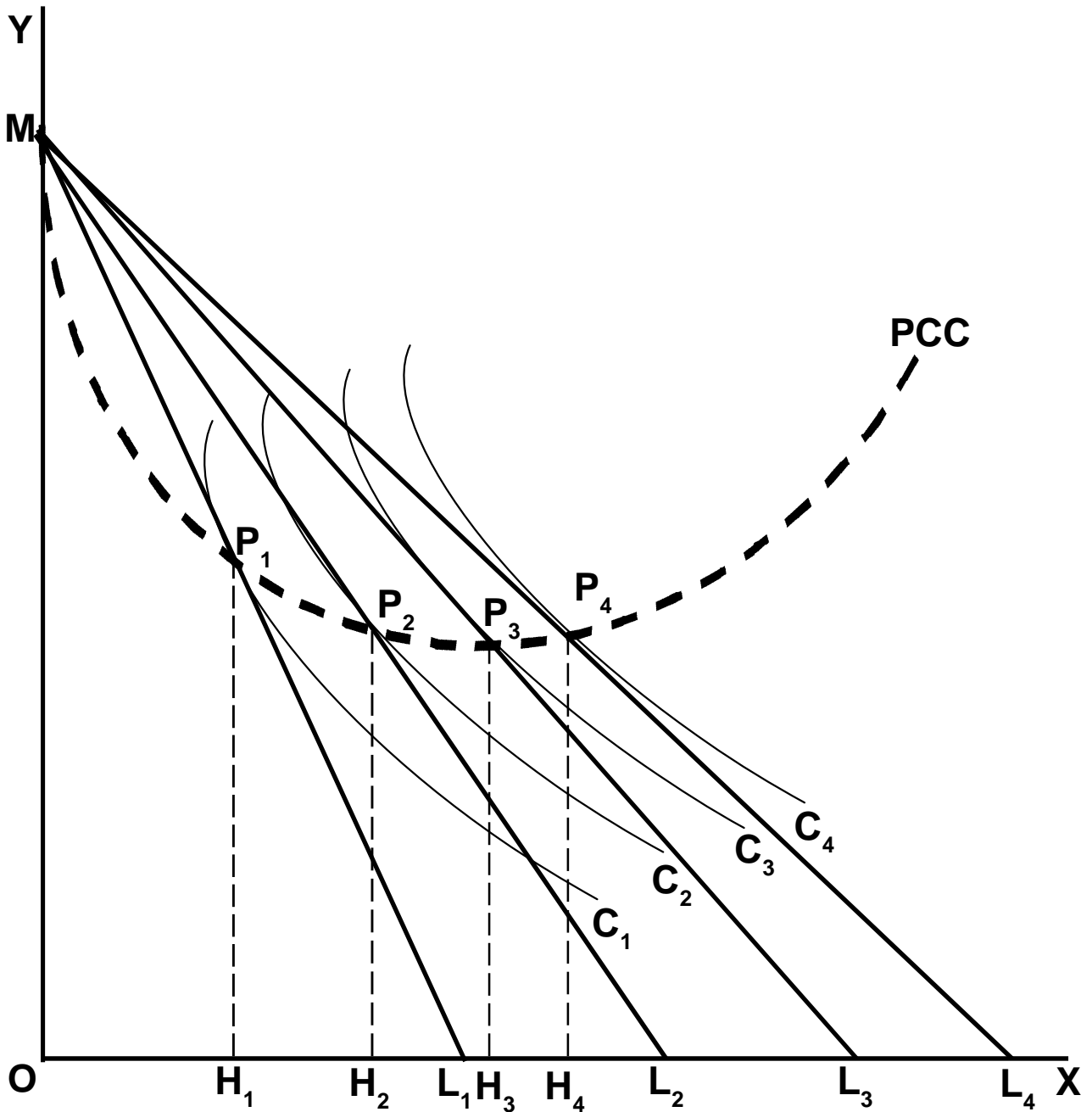


Figure 3.9

Let us see how the consumer's equilibrium shifts as a result of a change in the price of one of the goods, while his income and the price of the other good remains the same. With his given income the consumer is in equilibrium at point 'P₁' as shown in the above diagram. Suppose the price of X falls, there will be a new price line ML₂ and the consumer will be in equilibrium at point P₂ on the higher indifference curve C₂. In this position, he will be buying OH₂ of commodity X. If the price of X falls further, so that the relevant price line is ML₃ and the new equilibrium point will be P₃ and he will be buying OH₃ of commodity X. In the same fashion, we can discover other points of equilibrium for every other price at which X might be sold. When all points such as P₁, P₂, P₃, P₄ are joined together, we have the Price Consumption Curve (PCC) of the consumer for X commodity. This shows the price effect. It shows how the consumption of commodity 'X' changes, as its price changes, the consumer's income and price of 'Y' remaining the same.

3.9 Substitution Effect:

When the price of commodity changes, the real income of the consumer or purchasing power of consumer also changes. When the price of a good falls, the real income of the consumer rises. Instead of retaining the real income, the consumer can buy more units of a good of which price has risen. The gain in real income is compensated by rise in the purchase of a dearer good. This is called substitution effect.

When a price of a good, say X, falls, real income of the consumer would increase. In order to find out the change in the quantity of X purchased, which is attributable only to the change in the relative price of X, the consumer's money income must be reduced by an amount so as to cancel out the gain in real income that results from price decrease. This is necessary to know the effect of only a change in relative prices, consumer's income remaining the same. The amount by which the money income is reduced is called compensating variation of income. Hence the consumer should be neither better off nor worse off than before.

Even after compensating the gain in real income, the consumer would still buy more of X because X has become relatively cheaper. This increase in the amount purchased of X, because of the fall in its relative price, is the substitution effect. Thus the substitution effect can be defined as a change in the quantity demanded as a result of a change in relative price after the consumer has been compensated for a change in real income.

The substitution effect is explained with the help of the following diagram.

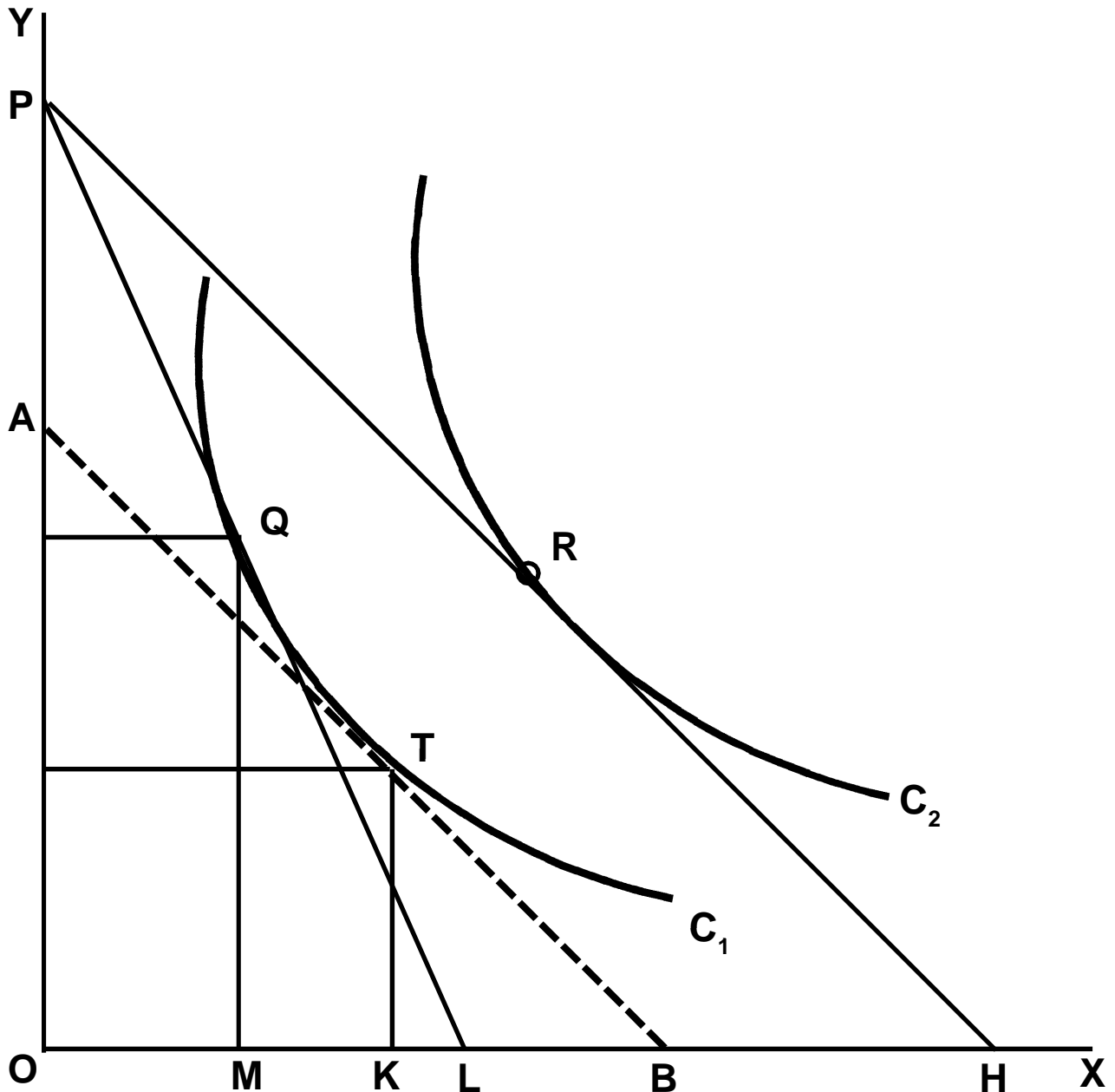


Figure 3.10

In this diagram, the consumer is in equilibrium at point Q, where the given price line PL is tangent to indifference curve C_1 . when the price of X falls, while the price of Y remains the same, the price line will shift to PH and the consumer will be in equilibrium at R, where the new price line PH touches the indifference curve C_2 . To find out the substitution effect, we draw a hypothetical price line AB parallel to the price line PH, so that it should touch the indifference curve C_1 . In terms of this diagram, BH or AP is the amount of money income that should be taken away from the consumer so that the gain in real income which results from the fall in price of X is cancelled out. The consumer gets the same satisfaction at points Q and T and he is on the same indifference curve. At the point

T, the consumer buys MK more or X than at Q as X is now relatively cheaper. This MK is the substitution effect which involves movement from Q to T.

Indifference curve analysis has been put into application in many cases. It helps in formulating the law of demand without assuming constancy of marginal utility of money. This technique is used to explain exchange of goods between two individuals. It is also used to analyse the effect of subsidies on consumers. Another important application of indifference curves is to judge the welfare effects of direct and indirect taxes on individuals. It is also used in analysing the theory of Index Numbers.

3.10 Self-Assessment Questions:

3.10.1 Essay Questions:

1. Describe the consumer's equilibrium with the help of indifference curves.
2. Explain the importance of indifference curve technique.
3. Explain the properties of indifference curves.

3.10.2 Short - Questions:

1. What are the indifference curves.
2. Construct an indifference schedule and indifference curve.
3. What is marginal rate of substitution.
4. Distinguish between ordinal system and cardinal system of measurement.

3.11 Reference Books:

1. H.S. Agarwal : *Micro-Economics*.
2. M.L. Jhingan : *Micro Economic Theory*.

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whose case the negative income effect is, very large which more than offset the substitution effect. In these type of goods, quantity demanded varies directly with price. After the name of **Giffen**, such goods, in whose case, there is a direct price-demand relationship are called Giffen goods. Thus in the case of Giffen goods, when there is a rise in the price of a commodity, its quantity demanded increases and vice-versa. Here the demand curve will slope upward to the right and not downward. This is called Giffen paradox.

(iii) Future Rise in Prices:

There are some other exceptions to the law of demand which are only apparent and not genuine. One of the false exceptions relate to the changes in the expectations of people regarding the prices of commodities in future. If the people came to know that owing to failure of rainfall or occurrence of drought or any war, supplies are affected, they would buy more at higher prices. If the prices of foodgrains are increasing, the people would buy and stock them, expecting that prices would rise still higher. This is contrary to the law of demand. But this peculiar phenomenon is only temporary one.

(iv) Business Cycle:

During the periods of business cycle also, same thing happens. Demand increases at higher prices, decreases at lower prices. This is due to change in the incomes of the people. During the period of prosperity, they buy more and during depression, they buy less.

(v) Speculations:

In the speculative market, a rise in prices of shares is followed by large purchases. So also when the prices of shares fall, people do not buy them, hoping that the prices would fall further.

In these exceptional cases, the demand curve slope left to right upward.

4.7 Self-Assessment Questions:

4.7.1 Essay Questions:

1. Explain law of demand?
2. What are the exceptions to the law of demand?
3. Explain the causes for the downward sloping of the demand curve?
4. Explain the shifts in demand.

4.7.2 Short-Questions:

1. Explain the concept of Giffen Paradox?
2. What constitutes demand?
3. What is expansion and contraction of demand?
4. What are Veblen's goods.
5. Explain demand function.

4.8 Reference Books:

1. H.L. Ahuja : *Business Economics Micro*
2. P.N. Reddy and H.R. Appanniah : *Principles of Business Economics*
3. Agarwal : *Micro Economics*

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LESSON - 5**ELASTICITY OF DEMAND****5.0 Aims and Objectives**

We have already studied that demand for a commodity depends on its price. The change in price of a commodity will affect the demand of the commodity in different ways. Similarly commodities may also change from time to time. The demand for various commodities change according to time. For example, the demand for various consumer good in summer and winter is not same. The change in the price causes a change in the demand for that commodity. The magnitude of change is studied in elasticity of demand. The aim of this lesson is to analyse Elasticity of demand, various concepts connected to it, types of elasticity of demand, importance and other interlinked concepts of elasticity of demand.

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5.1 Introduction

From the Law of Demand it is understood that other things remaining constant, when price increases, demand decreases and when price decreases, demand increases. But to understand the proportional changes causes in the demand due to changes in price we have to study the concept of elasticity of demand. In case of some goods little change in price results in more change in demand and sometimes greater changes in price results little change in the demand for the good. For a producer or a businessman it is necessary to know about elasticity of demand of various goods so that they can fix up prices for various good and earn profits.

5.2 Demand Elasticity – Definition

The concept of elasticity of demand is generally related with the name of Alfred Marshall. The difference in consumer response in quantity demanded to change in price is expressed with the concept of elasticity of demand.

According to Alfred Marshall, “The elasticity or responsiveness of demand in a market is great or small, according as the amount demanded increases much or little for a given fall in price, and diminishes much or little for a given rise in price.”

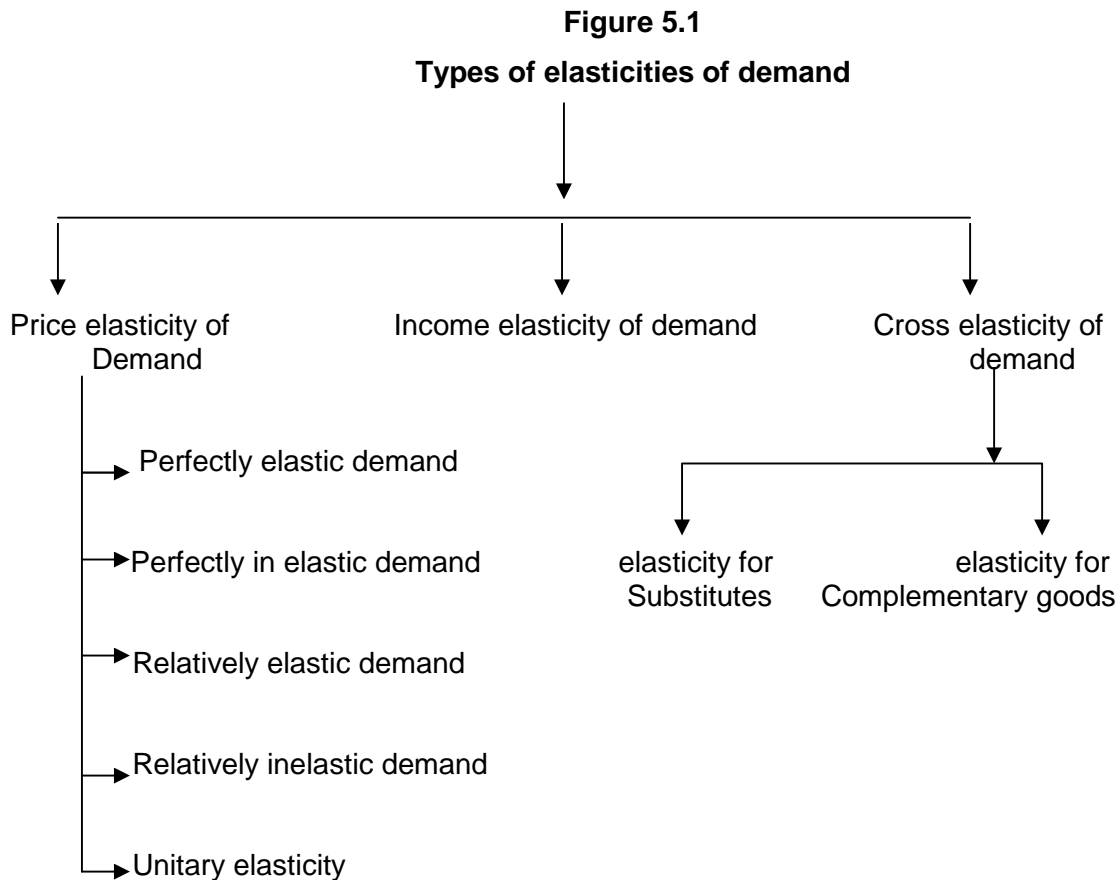
In the words of A.L.Meyers, “The elasticity of demand is a measure of relative change in the amount purchased in response to relative change in price on a given demand curve.”

According to R.G.Lipsey, “Elasticity of demand may be defined as the ratio of the percentage change in the quantity demanded to percentage change in price.”

Mrs. Joan Robinson has defined it as, “The elasticity of demand at any price or at any output, is the proportional change of amount purchased in response to a small change in price, divided by the proportional change of price.”

5.3 Types of Demand Elasticity

In the modern analysis of consumer behaviour, the following elasticities of demand are considered important – (1) Price elasticity of demand, (2) Income elasticity of demand and (3) Cross elasticity of demand. These are further classified into various types which is explained through the following figure 5.1.



5.4 Price Elasticity of Demand

Keeping other things constant if the price of a commodity changes and as a result of this change the demand also changes, this is called as price elasticity of demand. Price elasticity of demand relates to the responsiveness of quantity of commodity demanded to the changes in its price. The change in demand for a given change in price may be different in different commodities and for different people. It can be expressed as –

Price elasticity of demand (Ed) = proportionate changes in quantity demanded

Proportionate changes in price

= changes in demand / initial demand

changes in price / initial price

$$= \frac{\Delta Q / Q}{\Delta P / P} = \frac{\Delta Q}{Q} \div \frac{\Delta P}{P}$$

$$= \frac{\Delta Q}{Q} \times \frac{P}{\Delta P}$$

$$= \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

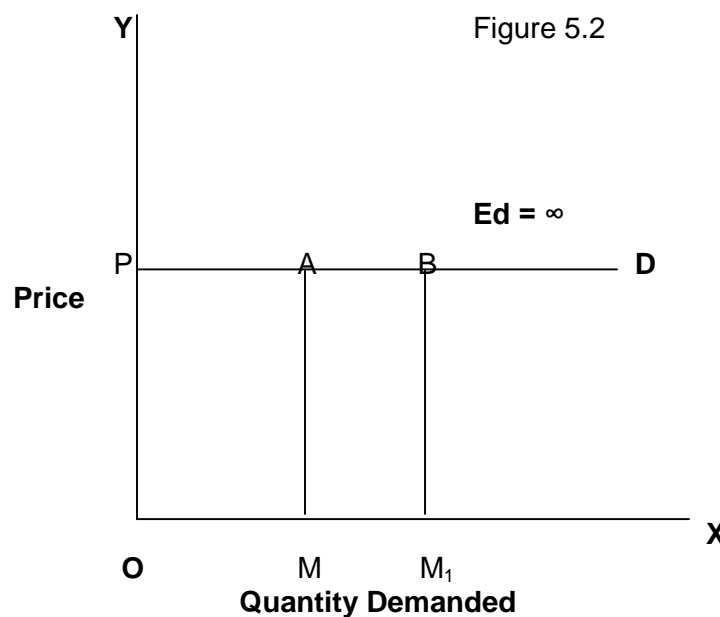
$$\therefore Ed = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

Price elasticity of demand is of five types namely –

1. Perfectly elastic demand ($Ed = \infty$)
2. Perfectly inelastic demand ($Ed = 0$)
3. Relatively elastic demand ($Ed > 1$)
4. Relatively inelastic demand ($Ed < 1$)
5. Unitary elasticity ($Ed = 1$)

5.4.1 Perfectly elastic demand

A small change in the price leads to an infinite change in the quantity demanded, it is known as perfectly elastic demand or infinite elasticity of demand. Even when the price remains constant the quantity demanded increases. Here the demand curve is horizontal to the X-axis as shown in Figure 5.2. Numerical it is represented as $Ed = \infty$.



$$Ed = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q} = \infty$$

$$\Delta P = 0$$

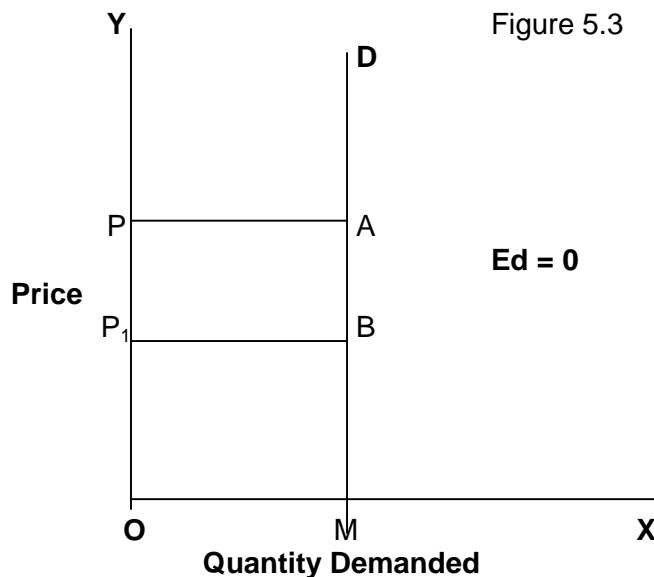
$$Ed = \frac{MM_1}{0} \times \frac{OP}{OM} = \infty$$

$$\therefore Ed = \infty$$

Perfectly elastic demand has theoretical importance and not practical. It is used only in the economic theory – as the demand curve of a firm in perfect competition.

5.4.2 Perfectly Inelastic Demand

Irrespective of change in the price of a commodity if the demand remains constant or unchanged it is called perfectly inelastic demand. The demand curve is a straight line parallel to Y-axis as shown in figure 5.3. Numerical it is represented as $Ed=0$. Salt is the best example for perfectly inelastic demand. The demand for salt remains unchanged whatever may be the price.



$$Ed = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q} = 0$$

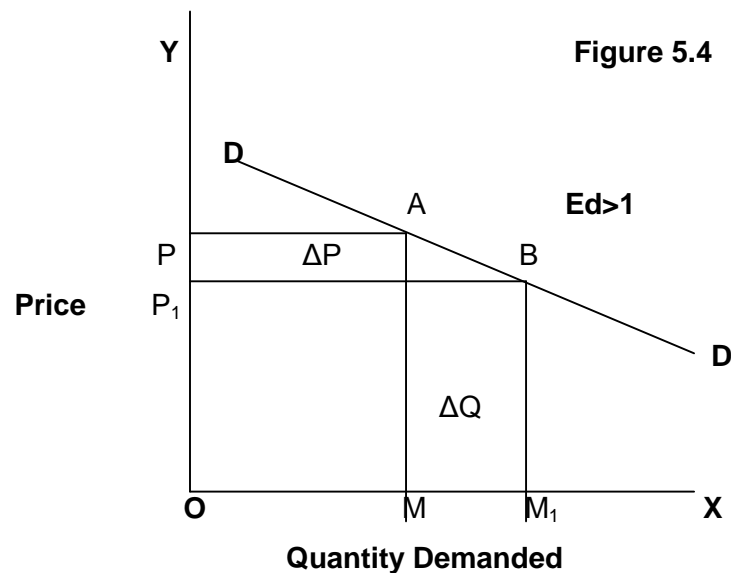
$$\Delta P = 0$$

$$Ed = \frac{0}{PP_1} \times \frac{OP}{OM} = 0$$

$$\therefore Ed = 0$$

5.4.3 Relatively Elastic Demand

The proportionate change in the quantity demanded is greater than the proportionate change in the price in case of relatively elastic demand. Numerically it is expressed as $E_d > 1$. Normally all the comforts and non-essential good have this type of elasticity. The demand curve will be more flat as shown in Figure 5.4.



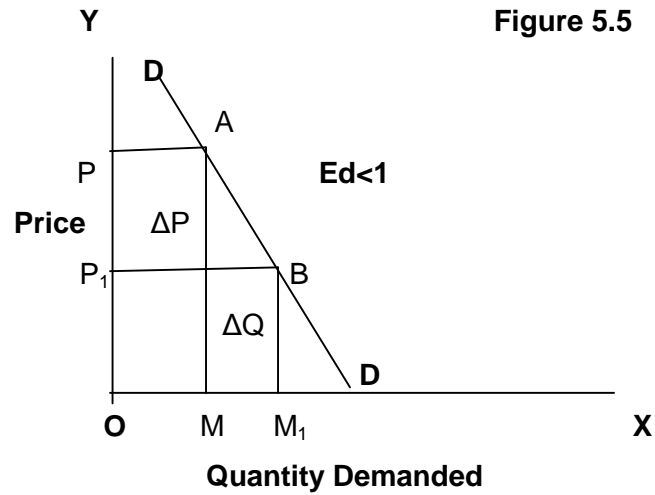
From the diagram it is very clear that change in demand (ΔQ) is greater than the changes in price (ΔP). A small change in price $P \rightarrow P_1$ resulted in a greater change in quantity demanded MM_1 .

$$E_d = \frac{OP_1BM_1}{OPAM} > 1$$

$E_d > 1$

5.4.4 Relatively Inelastic Demand

In case of relatively inelastic or less elastic demand, a substantial change in the price brings a very little change in quantity demanded. Hence proportionate change in price is more than the proportionate change in quantity demanded. Numerically it is expressed as $E_d < 1$. All the essential and necessary goods generally have relatively inelastic demand. The demand curve is steeper as shown in Figure 5.5. From the diagram it is very clear that change in demand (ΔQ) is less than the changes in price (ΔP). A small change in price $P \rightarrow P_1$ resulted in a greater change in quantity demanded MM_1 .



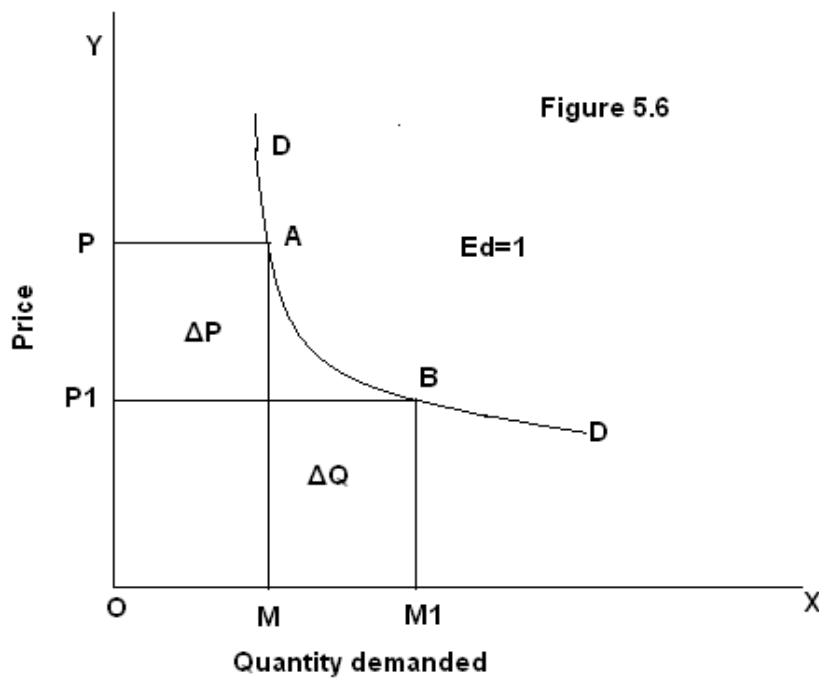
From the diagram it is very clear that change in price (ΔP) is greater than the change in quantity demanded (ΔQ).

$$Ed = \square OP_1BM_1 < \square OPAM$$

$\therefore Ed < 1$

5.4.5 Unitary Elasticity

Proportionate changes in quantity demanded is equal to (leads to) proportionate change in price is called unitary elasticity of demand. Numerically it is expressed as $Ed = 1$. Demand curve here is rectangular hyperbola as shown in Figure 5.6.



$$Ed = \square OP_1BM_1 = \square OPAM$$

$$\therefore Ed = 1$$

5.5 Methods of Measuring Elasticity of Demand

There are various methods of measuring elasticity of demand. The following are the methods for measuring elasticity –

1. Gradient Method or Slope of the demand curve
2. Percentage method
3. Point method
4. total outlay method or total expenditure method
5. Arc method

5.5.1 Gradient method or according to the slope of the demand curve

In this method the elasticity is measured on basis of the slope of the demand curve. If the demand curve is parallel to the X axis, it is considered to be perfectly elastic demand. If the curve is parallel to Y axis then is perfectly inelastic demand. If the demand curve is flatter, it is relatively elastic and if the curve is steeper then it is relatively in elastic demand. If the demand

curve is the shape of rectangular hyperbola then it is considered to be unitary elasticity. But with this method we cannot accurately judge the elasticity. Some critics believed that this method only useful to understand the slope of the demand curve and not to measure the elasticity. So as to rectify such loopholes in measuring elasticity, other efficient methods are suggested for measuring the elasticity of demand.

5.5.2 Percentage Method

This method is considered to be very easy and satisfying for measuring elasticity of demand. The following formula is used for measuring the elasticity-

$$\begin{aligned}
 E_d &= \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}} \times 100 \\
 &= \frac{\frac{\text{Change in demand}}{\text{Initial demand}} \times 100}{\frac{\text{Change in price}}{\text{Initial price}} \times 100} \\
 &= \frac{\frac{\Delta Q}{Q} \times 100}{\frac{\Delta P}{P} \times 100}
 \end{aligned}$$

To understand this method in detail let us consider some examples. If the price of one Kg of tomatoes is Rs. 10 a consumer is willing to buy 5Kgs at this price. If the price of tomatoes falls from Rs.10 to Rs.6 then the demand would increase from 5Kgs to 6Kgs. On basis of the above formula we can calculate the elasticity of demand of tomatoes in the following method –

$$\begin{aligned}
 E_d &= \frac{\frac{\Delta Q}{Q} \times 100}{\frac{\Delta P}{P} \times 100} \\
 &= \frac{1/5 \times 100}{4/10 \times 100} = \frac{20}{40} = 0.5
 \end{aligned}$$

$$\therefore E_d < 1$$

So, elasticity of demand for the tomatoes is relatively inelastic in nature.

Let us take another example. If the price of tomatoes reduces from Rs.10 to Rs.6 then the consumer's demand would increase from 5kgs to 10kgs. In this condition the elasticity of demand would be –

$$\begin{aligned} E_d &= \frac{\frac{\Delta Q}{Q} \times 100}{\frac{\Delta P}{P} \times 100} \\ &= \frac{5/5 \times 100}{4/10 \times 100} = \frac{100}{40} = 2.5 \end{aligned}$$

$$\therefore E_d > 1$$

So, elasticity of demand for the tomatoes is relatively elastic in nature.

Let us take one more example to understand this concept. If the price of tomatoes reduces from Rs.10 to Rs.6 as a result the demand would increase from 5kgs to 7kgs. Then the elasticity of demand would be –

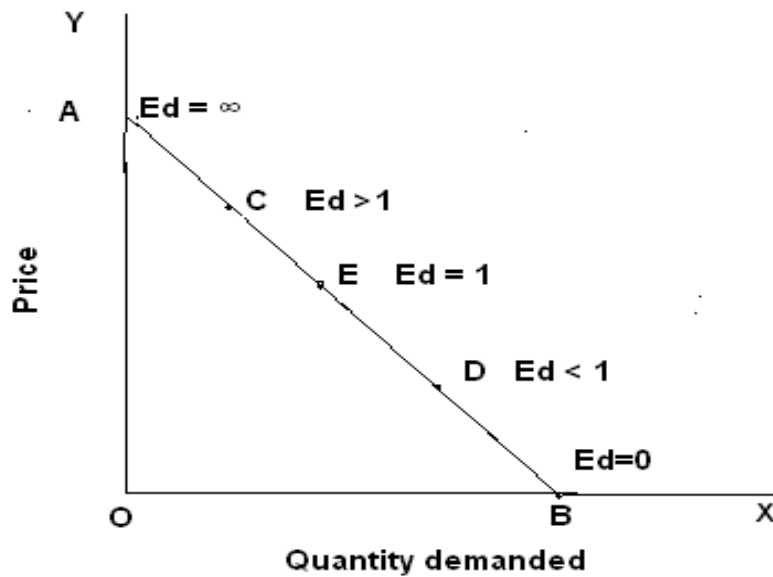
$$\begin{aligned} E_d &= \frac{\frac{\Delta Q}{Q} \times 100}{\frac{\Delta P}{P} \times 100} \\ &= \frac{2/5 \times 100}{4/10 \times 100} = \frac{40}{40} = 1 \end{aligned}$$

$$\therefore E_d = 1$$

So, elasticity of demand for the tomatoes is unitary in nature.

5.5.3 Point Method

This method is introduced by Marshall. In this method elasticity of demand is measured at a point on the demand curve as shown in Figure 5.7



At point C elasticity of demand is

$$\begin{aligned} \text{Ed} &= \frac{\text{Lower segment of demand curve from the point of C}}{\text{Upper segment of demand curve from the point of C}} \\ &= \frac{\text{CB}}{\text{CA}} \end{aligned}$$

At point D $\text{Ed} = \frac{\text{DB}}{\text{DA}}$

At point E $\text{Ed} = \frac{\text{EB}}{\text{EA}}$

Let us assume that the length of the demand curve AB is 10 cms. Then elasticity at various points on the demand curve can be calculated in the following way.

At point A $\text{Ed} = \frac{\text{AB}}{0} = \frac{10}{0} = \infty$

At point C $\text{Ed} = \frac{\text{CB}}{\text{CA}} = \frac{7.5}{2.5} = 3$
 $\therefore \text{Ed} > 1$

At point E $\text{Ed} = \frac{\text{EB}}{\text{EA}} = \frac{5}{5} = 1$
 $\therefore \text{Ed} = 1$

$$\text{At point D} \quad E_d = \frac{DB}{DA} = \frac{2.5}{7.5} = 0.3$$

$$\therefore E_d < 1$$

$$\text{At point B} \quad E_d = \frac{0}{AB} = \frac{0}{10} = 0$$

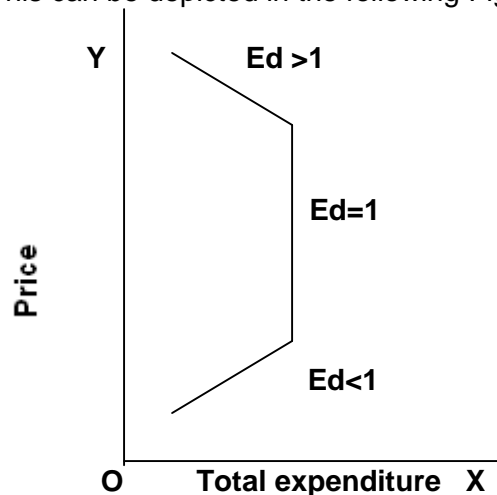
$$\therefore E_d = 0$$

Therefore on a straight demand curve the elasticity of demand can vary from zero to infinite.

5.5.4 Total Outlay Method or Total Expenditure Method

Under this method, three variables namely quantity demanded, price and total expenditure of the commodity are taken. Price elasticity of demand is measured as equal to unity, greater than unity as and less than unity. In case of $E_d > 1$, an increase in price leads to decrease in the total expenditure and a decrease in price leads to an increase in the total expenditure. In case of $E_d = 1$, with an increase or decrease in price, the total expenditure remains equal. In case of $E_d < 1$ an increase in the price leads to and increase in the total expenditure and a decrease in price leads to a decrease in total expenditure. This can be depicted in the following Figure 5.8

Price (Rs)	Quantity demanded (kgs)	Total Expenditure (Rs)
10	100	1000
9	120	1080
8	140	1120
7	160	1120
6	180	1180
5	200	1000
4	240	960



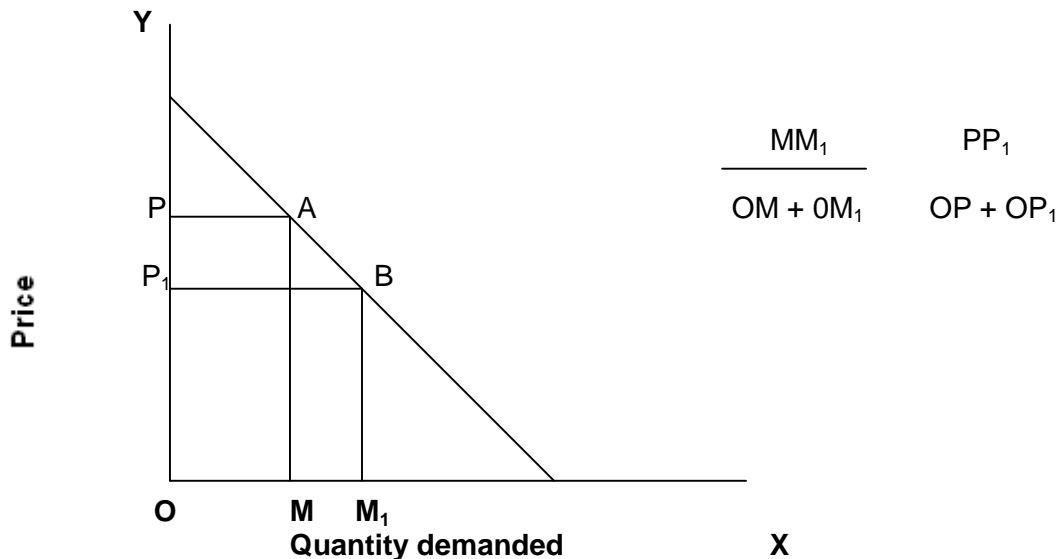
5.5.5 Arc Method

This is one of the methods for measuring elasticity of demand. It is also known as proportionate method. It can be calculated by the formula below –

$$E_d = \frac{\text{Change in demand}}{\frac{\text{Initial demand} + \text{present (changed) demand}}{2}} \times \frac{\text{Initial price} + \text{present (changed) price}}{\text{Changed in price}}$$

$$= \frac{\text{Change in demand}}{\text{Initial demand} + \text{present demand}} \times \frac{\text{Initial price} + \text{present price}}{\text{Changed in price}}$$

This can also be explained through the following Figure 5.9



5.6 Income Elasticity

Income elasticity refers to the responsiveness of quantity demanded to changes in income of the consumer. If the income increases quantity demand also increases. If income decreases, then quantity demanded also decreases. In case of normal goods the demand increases with the increase in the income and decreases with the decrease in the income. But in case of inferior goods the elasticity of demand is negative i.e. if the income increases the demand for such good reduces and if income decreases then the demand will increase. The income elasticity can be explained by the following formula –

$$\begin{aligned} \text{Income elasticity of demand} &= \frac{\text{Proportionate changes in quantity demanded}}{\text{Proportionate changes in consumer's income}} \\ &= \frac{\Delta Q / Q}{\Delta Y / Y} \end{aligned}$$

Income elasticity can vary between infinite and zero as in the case of price elasticity of demand.

5.7 Cross Elasticity of Demand

Cross elasticity of demand means the responsiveness of quantity demanded of say X good to the change in the price of its related Y good, which may be substitute or complementary good.

It can be expressed in the formula give below –

$$\text{Cross elasticity of demand} = \frac{\text{Proportionate changes in quantity demanded X}}{\text{Proportionate changes in price of Y}}$$

$$= \frac{\Delta Q_x / Q_x}{\Delta P_y / P_y}$$

If the commodities are substitutes the value of the coefficient is positive i.e. if the prices of y good increases then demand for x also increases and if the price of y decrease then demand for x decreases. If the commodities are complementary then the value of the coefficient is negative i.e. if the price of y increases then demand of x will reduce and if the price of y reduces then the demand for x will increase. Cross elasticity of demand can vary between infinite and zero.

5.9 Determinants of Price Elasticity of Demand

The nature or degree of elasticity i.e. whether the elasticity of demand for a commodity is more or less elastic depends upon the following factors –

1. **Nature of the commodity** – Elasticity of demand depends upon the nature of the commodity, whether it is a necessity or luxury good. In the case of necessities the demand is inelastic and for the luxuries it is elastic.
2. **Existence of Substitutes** – If there are many substitutes for a commodity, the demand for that commodity is elastic and if there are few or no close substitutes, the demand is inelastic.
3. **Number of uses of the commodity** – If the commodity has many uses, the demand for it is elastic and if the commodity has one or two uses the demand is less elastic.
4. **Possibility of postponement** – If the purchase of the commodity can be postponed, the demand for the commodity is elastic, if the purchase cannot be postponed, the demand is inelastic.
5. **Time element** – In the short run the elasticity of demand will be less and in long run it will be more.
6. **Complementarity of goods** – In case of such goods the elasticity can be elastic or inelastic.
7. **Level of Price** – At higher levels of prices the demand is more elastic and at lower levels it is less elastic.
8. **Proportion of Total expenditure** – If the consumers spend more portion of his income on a particular good then the price elasticity of that good will be more and for those goods in which the portion of income spent is less is inelastic.
9. **Income of consumer** – The elasticity of demand for the rich is less elastic and in case of the poor it is more elastic.

10. **On basis of taste, habits and preference of the consumer** – A consumer might be accustomed to use one brand of a good, even if the price of the good increases; he may not reduce its consumption. (e.g.) A person drinks only Bru coffee, even if the price of Bru increases, he may not reduce its consumption.

5.10 Importance of Price Elasticity of Demand

Elasticity has both theoretical and practical importance.

1. **To the traders** – If the demand for the good is inelastic, the trader charges a higher price. Contrary to this if the demand for the commodity is elastic he will charge a lower price.
2. **Discriminating monopoly** – In discriminating monopoly, when the monopolist is to charge different price in different markets, higher price is fixed in relatively inelastic market and lower price is fixed in relatively elastic market.
3. **To the Finance Minister** – The Finance minister's taxation policy is based on the nature of elasticity. If the commodity is a necessity, it has inelastic demand and so with an increase in the tax on such a commodity he will be certain of the revenue that can be collected.
4. **In International Trade** – Much foreign exchange is earned by exporting goods which have elastic demand. Small reduction in the price of goods gives good amount of foreign exchange. This concept is useful for adjusting the terms of trade. The concept of elasticity of demand has immense value in economic analysis also.
5. **Declaration of Public utilities** – Elasticity of demand is useful in declaring certain essential service such as the supply of water, power, etc. as public utilities. These are the essential service with relatively inelastic demand. So their control is taken over by the government.
6. **Devaluation** – Devaluation is the deliberate reduction in the value one currency in relation to the other currencies of the world. Devaluation of a currency takes place when there is a fundamental disequilibrium in the balance of payments. The success of devaluation in correcting the disequilibrium in balance of payments depends on the elasticity of demand for exports and imports. It will succeed when the exports and imports have elastic demand and fails when they have inelastic demand.

7. **Monopoly pricing** – The fundamental rule in monopoly pricing is that a monopolist will always fix the price at a point where the elasticity of demand is either equal to unity or greater than unity but never less than unity.
8. **Pricing of joint products** – For more elastic products producers fix lesser price and for the relatively inelastic products they fix a higher price. Thus the elasticity of demand has not only theoretical use but also practical uses.
9. **Wage determination** – If the demand for the labour in the firm is elastic then wages will be less because there is no fear of lockouts and strikes from the side of the labourers. So there is no problem. But if the demand for the labour is inelastic then the firm will have the fear of strikes and to avoid such situation they will have to increase the wages.
10. It also helps in explaining the concept of **paradox of poverty amidst plenty**.

5.10 Summary

The degree of responsiveness in quantity demanded to change in price is expressed with the concept of elasticity of demand. It can be three types – price, income and cross elasticities. A small change in the price leads to an infinite change in the quantity demanded, it is known as perfectly elastic. Irrespective of change in the price of a commodity if the demand remains constant or unchanged it is called perfectly inelastic demand. The proportionate change in the quantity demanded is greater than the proportionate change in the price in case of relatively elastic demand. If the case is reverse then it is relatively inelastic. The various methods of measuring elasticity are - Slope of the demand curve, Percentage method, Point method, total outlay method, Arc method.

5.11 Self Assessment

1. What is elasticity of demand and how many types are there?
2. What are the various types of price elasticity of demand?
3. Explain the methods of measuring the elasticity of demand?
4. What are the determinants of elasticity of demand and explain its importance.

5.12 References

1. Stonier and Hague : A Text Book of Economic Theory
2. Sundaram K.P.M : Business Economics
3. Ahuja H.L : Principles of Micro Economics
4. Agrawal.H.S : Modern Micro Economics
5. Dewett.K.K : Advanced Economic Theory

Dr. (Smt.) M. Syamala

Lesson 6

PRODUCTION FUNCTIONS

6.0 Objectives:

The objectives of this lesson are:

- * To Introduce Production Function
- * To understand basic concepts in production function
- * To understand how production decisions are taken in the long-run.

Structure:

- 6.1 Introduction
- 6.2 Production Function
- 6.3 Types of Production Functions
- 6.4 Returns to a Factor
- 6.5 Total, Average and Marginal Physical Products
- 6.6 Law of Diminishing Returns/Law of Variable Proportions
 - 6.6.1 Assumption
- 6.7 Three Stages of Production
- 6.8 Summary
- 6.9 Key Words
- 6.10 Self-Assessment Questions
- 6.11 References

6.1 Introduction:

Production of goods and services is an important economic activity in any country. If nothing is produced, nothing can be consumed. Every nation tries to produce as much as possible with the use of as few resources as possible. The resources used in the production are owned by households and each household wants to get as much for its resource as possible in the form of remunerations for offering its resources.

Production refers to the transformation of inputs or resources into outputs or goods and services. Inputs are the resources used in the production of goods and services. The terms 'inputs' and 'factors of production' are used interchangeably. The factors of production used in production are broadly classified into land, labour, capital and entrepreneurship. Broadly, inputs are divided into two categories - fixed and variable inputs. A fixed input is the one whose quantity cannot be varied during the period under consideration. Examples are plant and equipment.

Variable inputs are those whose quantity can be changed during the period under consideration. Raw materials, labour, transportation etc., are examples of variable inputs. Production is the act of converting or transforming inputs into output. In the production process, a firm combines various inputs in different quantities and proportions to produce different levels of outputs.

Factors of Production:

Production of wealth is done by factors of production. These factors of production have been divided into four : Land, Labour, Capital and Organisation.

Land represents free gifts of nature. It includes agricultural land, building sites, mines, fisheries, forests etc. Only those free gifts which are subject to human ownership and control are included under 'Land'.

Labour represents human element in production. It includes physical and mental effort. All efforts undertaken to earn income is called labour. Labour includes all workers from street sweepers to professors and engineers.

Capital represents man made instruments of production-machines, plants, tools, factory buildings etc. All wealth which is used to produce wealth is called capital.

Organisation consists of combining factors and undertaking uncertainties of modern production. The organiser starts production units. He controls production. He decides what to produce and how much to produce. He bears risks and uncertainties of production.

Production is carried on by these four factors of production. Land supplies raw material. Labour works on it with the help of tools and implements. The organiser organises production. Land and labour cannot produce any thing without capital. Labour cannot create utilities without capital. All these four factors are equally important.

6.2 Production Function:

The term "Production Function" refers to the relationship between the inputs and the outputs produced by them.

Definition: A production function refers to the functional relationship, between physical units of inputs and output of a firm, per unit of time and under the given technology.

The production function is purely a technological relationship which expresses the relation between output of a good and the different combinations of inputs used in its production. The production function can be depicted as in fig.6.1.

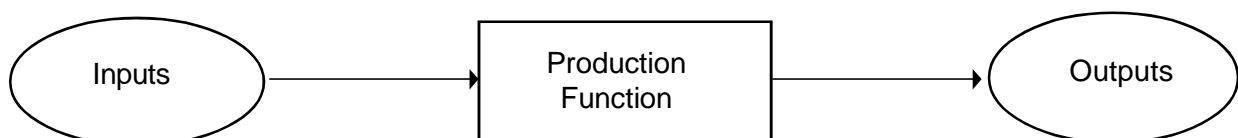


Figure 6.1

Inputs are transformed into outputs via a set of production processes that constitutes the production process. Mathematically, the production function can also be shown as

$$Q = f(x_1, x_2, \dots, x_k)$$

where Q = Output ; x_1, \dots, x_k = Inputs used

A production function can be stated in the form of a statement or a table or schedule or mathematical equation.

Assumptions of Production Function: 1. Technology is invariant, 2. Firms utilise their inputs at maximum levels of efficiency.

The production function in the form of a schedule is presented Table 6.1. It shows two inputs : Labour (x) i.e. the number of men hired and Capital (y) i.e. size of machine and the output (Q) i.e. the number of tonnes produced with the various combinations of inputs.

Table 6.1 Production Function

Capital (y) - Size of Machines (in horse power)	250	1000	1500	2000
Labour (X) No. of workers				
1	2	20	32	26
2	4	48	58	88
3	8	88	110	100
4	12	110	120	110
5	32	120	124	120
6	58	124	126	124
7	88	126	128	128
8	100	126	130	132
9	110	126	130	132
10	104	124	130	134

The relationship between the amount of various inputs used in the production process and the level of output is called a production function. Production functions describe only efficient levels of output, that is, the output associated with each combination of inputs is the maximum output possible with that set of inputs, given the existing level of technology. Production Functions may be presented in tabular, graphic, or algebraic form, and may consists of one, two or more variable inputs.

6.3 Types of Production Functions:

In order to analyse the relationship between factor inputs and outputs, economists classify time periods into short run and long run.

The short-run is that period of time over which the input of only one factor can be increased, the other factors of production cannot be varied. This function is also called single variable production function or law of variable proportion.

Long-run Production Function or Returns to scale. Long run is defined as a period of time during which the quantities of all inputs are adjusted in response to changes in output.

In Economic theory we are concerned with three types of production functions, viz.,

1. Production function with one variable input
2. Production function with two variable inputs, and
3. Production function with all variable inputs.

6.4 Returns to a Factor:

In economic theory, we are interested in two types of input-output relation. **First**, we study the production function when the quantities of some inputs are kept constant and quantity of one input are varied. This type of input-output relations which forms the subject matter of the law of diminishing returns which is also called law of variable proportions. **Secondly**, we study the input-output relation by varying all inputs. The latter forms the subject-matter of the law of returns to scale. The concept of returns to a variable factor is relevant for the short-run, because in the short-run some factors such as capital, equipment, machines, land remain fixed and factors such as labour, raw materials are increased to expand output. Thus the short-run production can be written as

$$Q = f(L, K)$$

Where Q stands for output, L for labour and K for capital which is held constant in the short-run.

The concept of returns to a factor is concerned with the study of how output (Q) changes when the amount of a variable factor, such as labour, is increased. We will first explain some concepts of physical product that are generally used for the study of returns to a variable factor i.e. short-run production function,

The following hypothetical numerical table illustrates the operation of the law of diminishing returns.

TABLE 6.2

Number of Workers	Total Product	Average Product	Marginal Product
1	10	10	10
2	22	11	12
3	36	12	14
4	52	13	16
5	66	13.2	14
6	76	12.7	10
7	82	11.7	6
8	85	10.6	3
9	85	9.5	0
10	83	8.3	-2

Table 6.2 illustrates several important features of typical production function with one variable input. Here both average product (AP) and marginal product (MP) first rise, reach a maximum and then decline. Average product is the product for one unit of labour. It is arrived at by dividing the total product (TP) by the number of workers. $AP = TP \div \text{No. of Workers}$. Marginal product is the additional product resulting from additional labour. $MP = \Delta TP \div \Delta L$ It is found out by dividing the change in total product by the change in the number of workers. The total output increases at an increasing rate till the employment of the 4th worker. The rate of increase in the marginal product reveals this. Any additional labour employed beyond the 4th labour clearly faces the operation of the law of diminishing returns. The maximum marginal product is 16 after which it continues to fall, ultimately, becoming negative. Thus when more and more units of labour are combined with other fixed factors the total output increases first at an increasing rate, then at a diminishing rate and finally it becomes negative.

6.5 Total, Average and Marginal Physical Products:

Regarding physical production of factors, there are three concepts:

1. Total Product
2. Average product and
3. Marginal product.

Total Product (TP): Total Physical product of a factor is the amount of total output produced by a given amount of a variable factor, keeping the quantity of other factors such as capital, land fixed. As the amount of the variable factors increases, the total output increases. But the rate of increase in total physical product varies at different levels of employment of a factor. In the fig.6.2 we can see the total product curve. In the beginning total product curve rises at an increasing rate i.e., the

shape of the TP curve is rising in the beginning, after a point that product curve starts rising at a diminishing rate as the employment of the variable factor is increased.

Average Physical Product (AP): Average physical product of a variable factor (labor) is the total physical output (Q) divided by the amount of labour employed with a given quantity of capital (fixed) used to produce a product. Thus

$$AP_L = \frac{Q}{L} \quad \text{where } AP_L \text{ represents the average physical product of labour.}$$

Q represents the total output produced by using a given quantity of labour employed. L stands for the Quantity of labour employed.

Marginal Product : The marginal product of labour is defined as the change in total product per unit of change in labour. That is

$$M P_L = \frac{\Delta Q}{\Delta L}$$

Marginal physical product of a variable factor is the addition to the total production by the employment of an extra unit of factor. Suppose when ten workers are employed to produce bags in a factory and they produce 200 bags for month. If, eleven workers are employed, and as a result total product increases to 214 bags, then the eleventh worker has added 14 bags to the total production. Thus 14 bags are the marginal physical product of the eleventh worker.

In general, if employment of labour increases by ΔL units yielding increase in total output by ΔQ units, the marginal physical product of labour is given by

$$\frac{\Delta Q}{\Delta L}, \text{ i.e. } M P_L = \frac{\Delta Q}{\Delta L}$$

6.6. Production with One Variable Input (or) Short-run Production Function or Law of Variable Proportions (or) Law of Diminishing Returns:

Introduction: In economics, the production function with one variable input is illustrated with the well-known law of variable proportions. The law of variable proportion is one of the fundamental laws of economics. It is also called as the Law of Diminishing Marginal Returns.

Law of Variable Proportions: Law of variable proportions occupies an important place in economics. This law examines the production function with one factor variable, keeping the quantities of other factors fixed. The law of variable proportion has played a vital role in the history of economic thought and occupies an equally important place in modern economic theory. It is stated as the proportion of one factor in a combination of factors increased, after a point, first the marginal and then the average product of that factor will diminish. It may also stated "As the quantity of a variable input usage goes on increasing, marginal productivity of that input eventually diminishes and becomes zero".

6.6.1 Assumptions of the Law of Variable Proportions/Diminishing Returns:

- 1) The state of technology is assumed to be given and unchanged. If there is a change in technology, then marginal and average product may change.
2. There must be some inputs whose quantity are held constant.
- 3) The law is based upon the possibility of varying the proportions in which the various factors can be combined to produce a product. The production function with fixed inputs and with one variable input is illustrated in Figure 6-1.

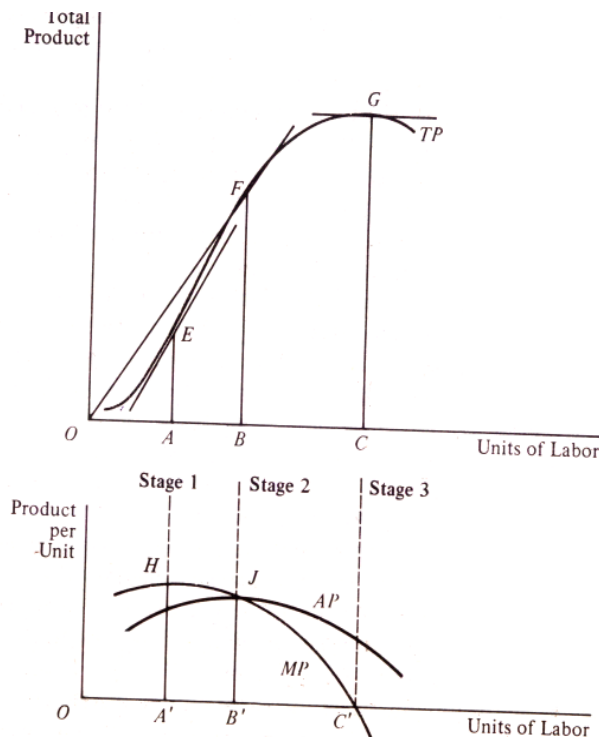


Fig.6.2 : Variable Proportions

The curve of total product (TP) rises first at an increasing rate and then at a diminishing rate to its maximum after which it declines. The slope of the TP curve $\Delta TP / \Delta L$ (where L is labour) is marginal product. The slope of the curve continuously varies; at any point the slope is measured by drawing a tangent line at the point. Figure 6-2 shows three points of tangency. At point E, slope is a maximum. In the lower panel of the diagram, point H is the maximum of the curve of marginal product (MP). At point G, the slope of TP is zero; MP is zero at point C' in the lower panel.

At point F, the tangent line is drawn from the origin. The slope of TP at point F is FB/OB . But FB/OB is also the average product (AP) of OB workers that is, their total product FB divided by their number OB. Point F has still another meaning - here, average product per worker is at a maximum. The steepest line that can be drawn from the origin to any point on TP is the line OF. The slope of this line is equal to the slope of the tangent at this point. The equality of MP and AP is shown at point J in the lower panel.

Table 6-3 is intended as a guide to the study of Figure 6.1.

TABLE 6.3 Properties of the Curves of Total Product, Marginal Product and Average Product

Figure 6.2	Total Product	Marginal Product	Average Product
Stage 1: To Point E	First increases at increasing rate	Increases	Increases
At points E and H	Then the rate of increase switches from increasing to diminishing	At a maximum, and begins to diminish	Continues to increase
Stage : 2 At points F and J	Continues to increase at diminishing rate	Continues to diminish	At a maximum (=MP) and then begins to diminish
At points G and C'	Eventually reaches a maximum and begins to diminish	Becomes zero	Continues to diminish
Stage : 3: To right of points G and C'	Diminishes	Is negative	Continues to diminish

6.7 Three Stages of Production:

The short-run production function can be divided into three stages of production. In fig. 6.3 we divided the graph into three parts. Labeled as stage 1, stage 2, and stage 3.

Stage 1: Stage 1 includes the region from the origin to the level of labour input at which the average product of labour reaches its maximum. In this stage, the TPP curve rises first at an increasing rate and at a diminishing rate in stage 2. Through out stage 1, average product (AP) is rising. Law of increasing return is in operation at this stage.

State 2: It includes the region between the maximum point on the average product function and the point at which marginal product falls to zero. During this stage, both marginal and average products are falling, but both are positive. Law of diminishing returns starts operating from second stage onwards. TP continues to increase but at a dimishing rate. Stage 2 comes to an end where TP becomes maximum and MP becomes zero.

Stage 3: It is the entire region for which the marginal product of labour is negative. MP becomes negative at labour input rate beyond L_3 . This corresponds to the point where the total product curve reaches a maximum. 'Marginal becomes zero when total reaches maximum.

RATIONAL DECISIONS IN STAGE 2: No firm will choose to operate either in Stage 1 or stage 3. In stage 1 the marginal physical product is rising i.e. each additional unit of the variable factor is contributing to output more than the earlier units of the factor, Therefore it is possible for the firm to

keep on increasing the use of labour. In stage 3, marginal contribution to output of each additional unit of labour is negative, therefore, it is advisable not to use any additional labour. Thus, stage 2 is the only relevant range for a rational firm in a competitive situation.

6.8 Summary:

Production refers to the transformation of inputs or resources into outputs or goods and services. The production function is an engineering or technological concept that specifies the maximum rate of output obtainable with given rates of inputs of capital and labour. The short run is that period of time for which the rate of input use of a least one factor of production is fixed. In the longrun, the input rates of all factors are variable. The firm operates in the short run but plans in the long runs. The concept of returns to a factor is concerned with the study of how output (Q) changes when the amount of a variable factor, such as labor is increased marginal product is the change in output associated with a one-unit change in the variable input. Average product is the rate of output produced per unit of the variable input employed. Law of variable proportions occupies an important place in economic theory. This law examines the production function with one factor variable, keeping the quantities of other factors as constant.

6.9 Key Words:

Production Function

Short Run Production Function

Long-Run Production Function

Total Product

Average Product

Marginal Product

Law of Diminishal Returns.

6.10 Self-Assessment Questions:

1. What is a production function? What is its useful non in the analysis of the firms production.
2. What is the law of Diminishing Returns? Why does it operate? How does it help in short run between decisions making?
3. Explain the law of variable proportions.
4. Bring out the relationship between the average and marginal products of labor.
5. State and explain the law of diminishing returns. What are its causes and effects.
6. Are diminishing returns to a factor insuitable? Explain.

6.11 References:

1. It L. Ahuja. Advanced Economic Theory, S. Chand & Co.,
2. Roger D. Blais, Lawrence W. Kenney; Micro Economics, Johen Weleg & Son.
3. D.D. Chaturvedi, S.L. Gupta, Sumitra Pal, Business Economics Galgotria Pusha.
4. V.L. Mote, Samuel Paul, G.S. Gupta. Maagerial Economics Tata McGraw A.P,
5. H. Gaig Peterson, W. Cris Lewis. Managerial Economic Pearson Eucation A.P.

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Lesson 7

THE PRODUCTION FUNCTION WITH TWO VARIABLE INPUTS

7.0 Objective:

The objectives of this lesson are

- Introduce methods to approach the problem of efficient resource allocation in production.
- Study the least cost combination of factor inputs.

Structure:

- 7.1 Introduction
- 7.2 Production Function with Two Variable Inputs
 - 7.2.1 Isoquants
 - 7.2.1.1 Types of Isoquants
 - 7.2.2 Properties of Isoquants
- 7.3 Marginal Rate of Technical Substitution
- 7.4 Iso Cost
- 7.5 Determination of Least cost combination of inputs
- 7.6 Economic Region of Production
- 7.7 Summary
- 7.8 Key words
- 7.9 Self-Assessment Questions
- 7.10 References

7.1 Introduction:

In the last lesson we explained the production with a single variable factor. In this lesson we are explaining the production function with two variable inputs.

Production means transformation of physical inputs into physical outputs. The functional relationship between physical inputs and physical output of a firm is known as production function. Algebraically production function can be written as

$$Q = f(a, b, c, d, \dots)$$

Where Q stands for the quantity of output, a, b, c, d, etc., stand for the quantities of factors A, B, C, D respectively. In economic theory, we are interested in two-types of input-output relations of production function. **First**, we study the production function when the quantities of some inputs are kept constant.

Second, we study the input-output relations by varying all inputs. This form the subject matter of the law of returns to scale. Since in the long run all factors can be varied, the concept of return to scale relates to long-run production function.

Production function can be represented in various forms. It can be represented by tables, mathematical equations, total, average and marginal curves, or when two factors have to be explicitly shown, it can be represented by Isoquants. A production function with two variable inputs can be represented with the help of Isoquants and Isocost Curves.

7.2 Production Function with Two Variable Inputs:

The previous lesson focused on how output changed when one input was changed and all others were held constant. Now, we will look at what happens to output if we change both capital and labor.

A firm may increase its output by using more of two variable inputs that are substitute for each other e.g., labor & capital. If both, capital and labor are variable, a different set of analytical techniques is applied to determine the optimal input rates. There are two methods to approach the problem of efficient resource allocation in production.

They are, **firstly**, output maximization – to maximise the production for a given rupee outlay on labor and capital and **secondly**, Cost minimization – to minimise the rupee outlay on labor and capital necessary to produce a specified rate of output. If only labor and capital are variable inputs then selection of optimal factor combinations will depend upon.

- Technical possibilities of factor substitution (Isoquants) and
- Prices of factors of production (Iso Cost lines)

7.2.1 Isoquants:

Isoquants are a geometric representation of the production function. An isoquant is a curve representing the various combinations of two inputs that produce the same amount of output. A firm may increase its output by using more of two variable inputs that are substitute for each other e.g., labor & capital. There may be various technical possibilities of producing a given output by using different factor combinations. The technical possibilities of producing an output level by various combinations of the two factors can be graphically represented by Isoquants. It is also known as Iso-Product Curve, Equal Product Curve or Production

Indifference Curve. Table 7.1 shows how different combinations of labor and capital result in the same output.

Table 7.1 Labor & Capital Inputs in Relation to Output

Combination	Labor (Units)	Capital (Units)	Output Units)
A	1	10	100 units
B	2	6	100 units
C	3	3	100 units
D	4	1	100 units

From the above table, we can see there are four combinations of inputs (Capital & Labor) which give the same output i.e., 100 units. It can be seen that output is same either by employing 4L+1C or by 3L+3C or by 2L+6C or by 1L+10C. This relationship when shown graphically, results in the isoquant. Figure 7.1 displays an Isoquant diagram.

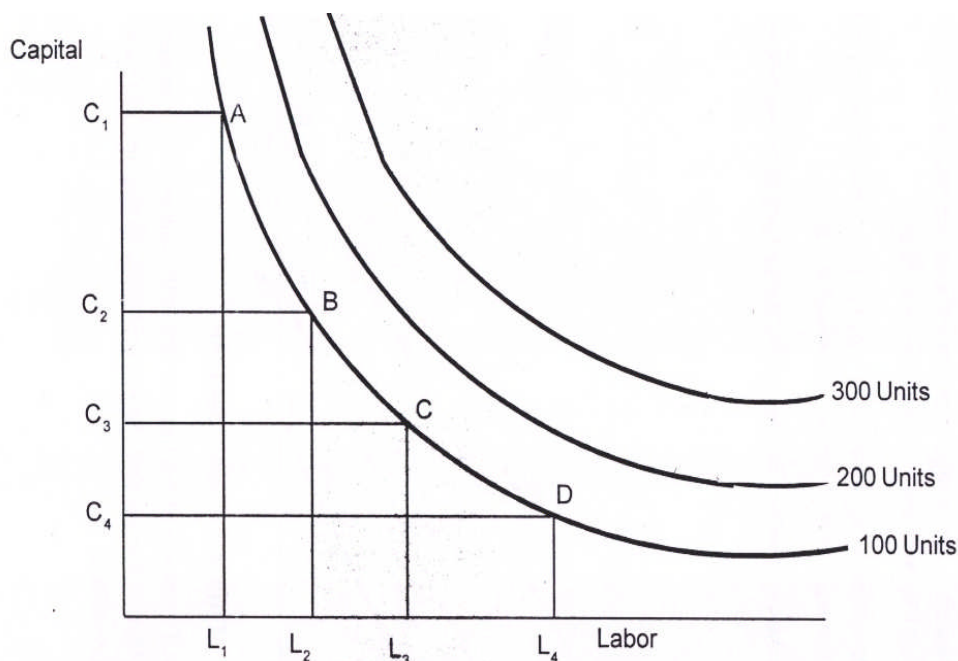


Figure 7.1 : Isoquant

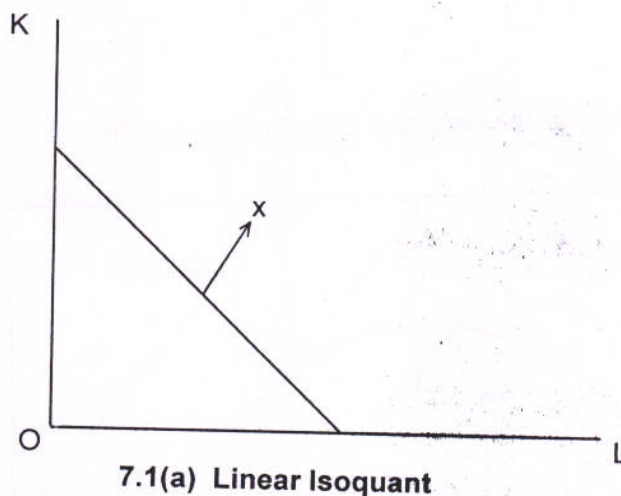
Definition: An Isoquant is a locus of combinations of capital and labour that can produce a given level of output. For a movement along an isoquant, output remains same. Output is 100 at point A or B or C or D.

Isoquant Map: In Fig.7.1, the isoquants for 100,200,300 etc. are called Isoquant map. The higher the isoquant, the more the output it represents. For a movement across the isoquants, output varies.

7.2.1.1 Types of Isoquants:

Isoquants may assume various shapes depending on the elasticity of substitutability of factors under consideration. They are linear isoquant, Input-output isoquant, Kinked isoquant, and smooth convex isoquant.

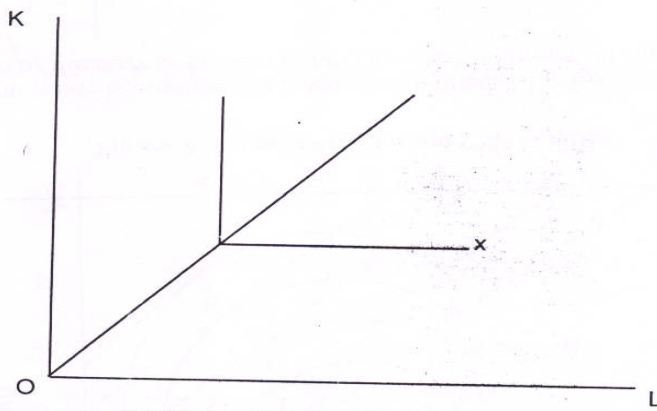
1. Linear Isoquant: Linear isoquant assumes perfect substitutability between factors of production. Figure 7.1(a) shows the linear isoquant shape. A given commodity may be produced by using only capital, or only labor or by also infinite combination of K & L.



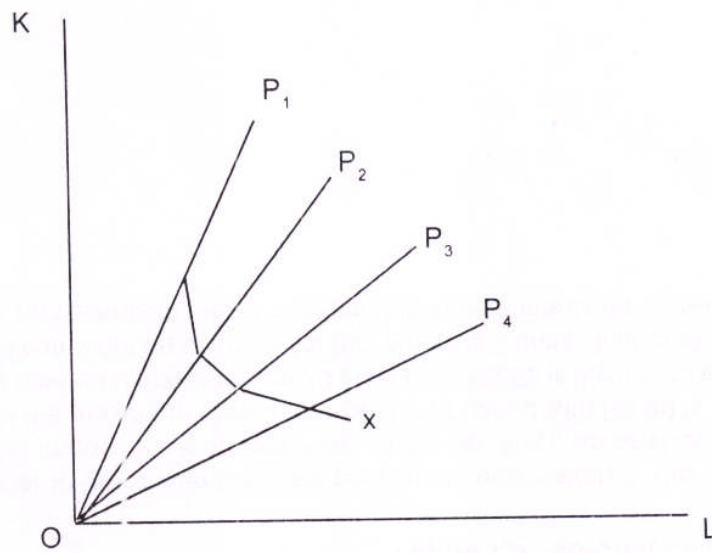
2. Input-Output Isoquant: If there is a strict complementary between the input, then it is called as input-output isoquant. It is also known as the “Leontief” isoquant. Figure 7.1(b) shows the shape of Input-Output isoquant. If inputs are to be used in a fixed proportion to produce a given quantity of output then it takes the shape of right angle. Ex: 3 cups of wheat flour and 1 cup of sugar are required to prepare one cake, then 6 cups of wheat flour and 2 cups of sugar are required for preparing 2 cakes.

3. Kinked Isoquant: Kinked isoquant assumes limited substitutability of capital and labor. It is also called activity analysis isoquant or linear programming isoquant. Figure 7.1(c) shows the shape of kinked isoquant or linear programming isoquant. Substitutability of factors is possible only at the kinks.

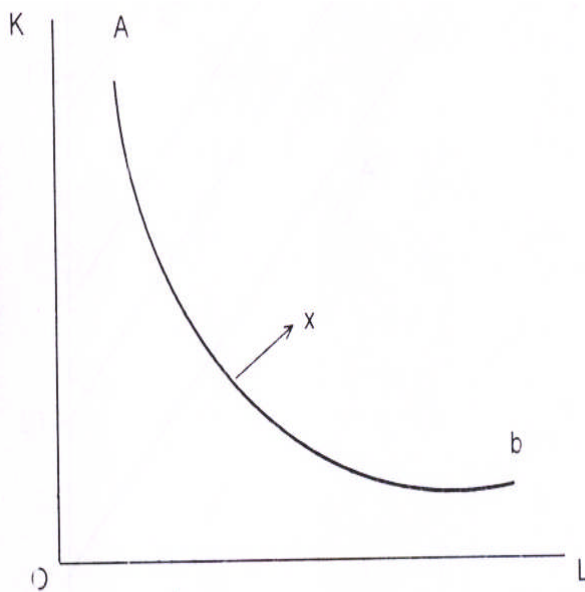
4. Smooth Convex Isoquant: This form assumes continuous substitutability of capital and labor only over a certain range, beyond which factors cannot be substituted for each other. Such an isoquant appears as a smooth curve convex to the origin. Kinked isoquants are more realistic. Figure 7.1(d) shows the shape of smooth convex isoquant. The curve is steep at the top, flat at the bottom and it has a bend towards origin



7.1(b) Input-Output Isoquant



7.1(c) Kinked Isoquant



7.1(d) Smooth Convex Isoquant

7.2.2 Properties of Isoquants:

1. Isoquants slope downward from left to right i.e. negatively inclined. It implies that if more of one factor is used, less of the other factor is needed for producing the same same level of output.
2. A higher isoquant represents higher output. It means with the same amount of one input and the greater amount of the second input, higher output will result.
3. Isoquant is convex to the origin. It means that its slope declines from left to right along the curve.
4. No, two isoquants intersect each other.

7.3 Marginal Rate of Technical Substitution:

Marginal rate of technical substitution indicates the rate at which factors can be substituted at the margin without altering the level of output. Marginal rate of technical substitution of labor for capital may defined as the number of units of capital which can be replaced by one unit of labor, to maintain the same level of output. Table 7.2 shows Equal Product Combinations of Labor and Capital.

Table 7.2 Equal Product Combinations of Labor & Capital

Factor combination	Units of Labor	Units of Capital	MRTS of $\frac{\Delta K}{\Delta L}$ L or K
A	1	20	--
B	2	15	5
C	3	11	4
D	4	8	3
E	5	6	2
F	6	5	1

The marginal rate of technical substitution (MRTS) of capital for labor is the absolute value of the change in capital that results from a one unit change in labor, when output is held

constant $MRTS_{KL} = \frac{\Delta K}{\Delta L}$

Thus, the $MRTS_{KL}$ at any point on an isoquant is equal to **the slope of the isoquant** at that point. As we move down an isoquant towards right, the MRTS of L for K diminishes. Figure 7.2 shows the diminishing marginal rate of technical substitution between labor and capital.

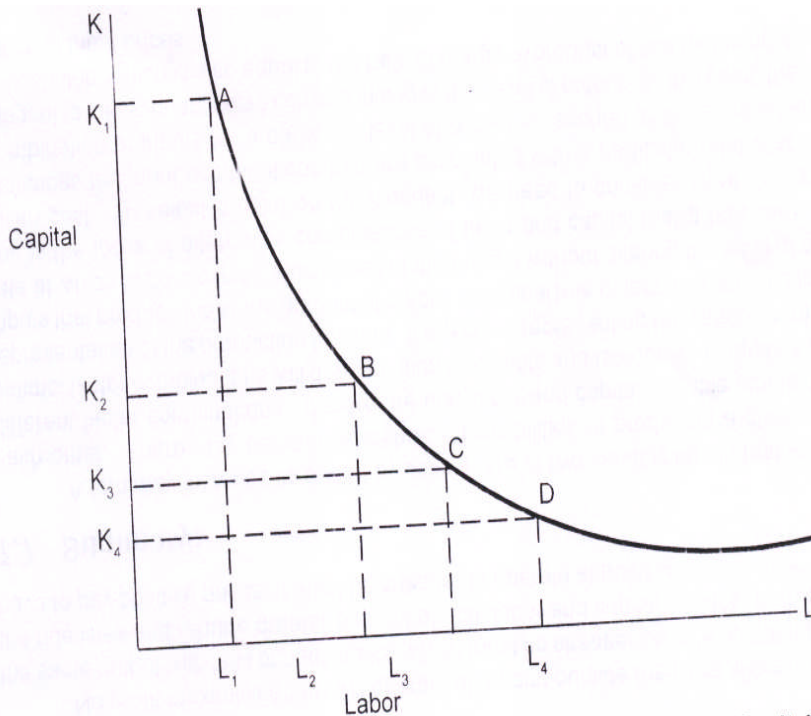


Figure 7.2 : Marginal Rate of Technical Substitution for Capital

$$\text{Slope of an isoquant} = MRTS_{KL} = \frac{\Delta K}{\Delta L}$$

Imagine A and B are very close and a movement from A to B involves loss of output due to giving up of ΔK units of capital and gain of output due to addition of ΔL units of labour. By definition output at A and B, must be the same i.e. 100 units. The loss of output is the foregone Marginal Product of the Units of the capital that are given up ($MP_K \cdot \Delta K$). The gain in output is the extra produce of labour, that is the Marginal Product of the additional units of labour ($MP_L \cdot \Delta L$).

$$\text{Loss of output} = \text{Gain in Output}; \Delta K \times MP_K = \Delta L \times MP_L$$

$$\text{Therefore } \frac{\Delta K}{\Delta L} = \frac{MP_L}{MP_K}$$

Thus, the slope of an isoquant, at any point, is equal to the ratio of the marginal product of labour and capital.

7.4 Isocost:

The isoquant is a physical relationship that denotes different ways to reduce a given rate of output. Cost of labor and capital should be considered to determine the optimal input

combination. The isocost lines provide this information. The isocost line is the locus of alternative combinations of labor and capital that a firm can purchase with a given monetary cost. Since the input prices are assumed constant, they are linear and parallel to each other. Let us take a numerical example. A firm wants to spend Rs. 50 and the price of labour per unit is Rs.5 and price of capital per unit is Rs.10. What are the different ways in which the given amount can be spent on the two inputs?

1. If the entire amount is spent on labour, then 10 units of labour and 0 units of capital can be purchased.
2. Instead, if the entire amount is allotted to capital alone then 5 units of capital and zero units of labour can be bought. The other possible combinations in which the amount can be spent is given below:

Possible Ways	Units of Labour	Units of Capital
(1)	10	0
(2)	8	1
(3)	6	2
(4)	4	3
(5)	2	4
(6)	0	5

If the same data is plotted on a graph, the resultant curve is called isocost curve.

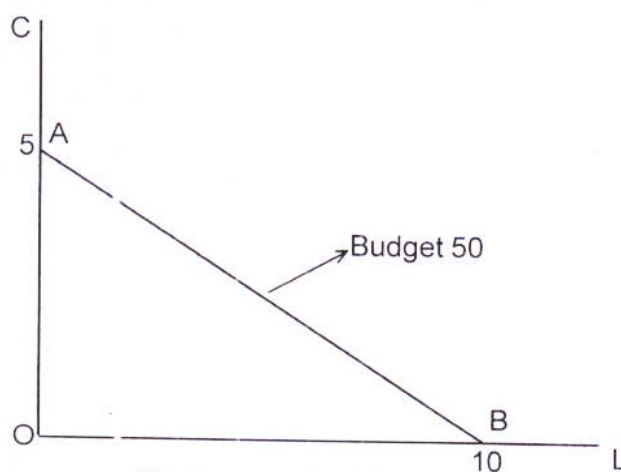


Fig.7.3 Iso Cost Line

Given the per unit prices of capital (r) and labor (w) the total (c) on capital (k) and labor (L) used is

$$C = rk + wL$$

By solving for k as a function of L we get $k = \frac{c}{r} - \frac{w}{r}L$

for example if Price of Labor is 2 and capital =3 and Budget =30

If the firm has Rs.30, then it has three options.

1. To spend entire money on capital from which 10 can be obtained as shown by point A in the figure 7.4.
2. To spend entire money on labor on which 15 units can be obtained as shown by point B in the figure 7.4
3. To spend on both labor and capital as shown by any point on the line AB. The isocost line AB indicates all the possible combinations of labour and capital that can be hired given a total expenditure by the firm of 30 and the prices of the two inputs.
4. If the firm were willing to spend a higher amount, say Rs.60, it could hire any of the combinations of inputs indicated by the isocost line labeled Rs.60 or A_1, B_1 .
5. Isocost lines further to the right reflect higher costs; those further to the left reflect lower cost.

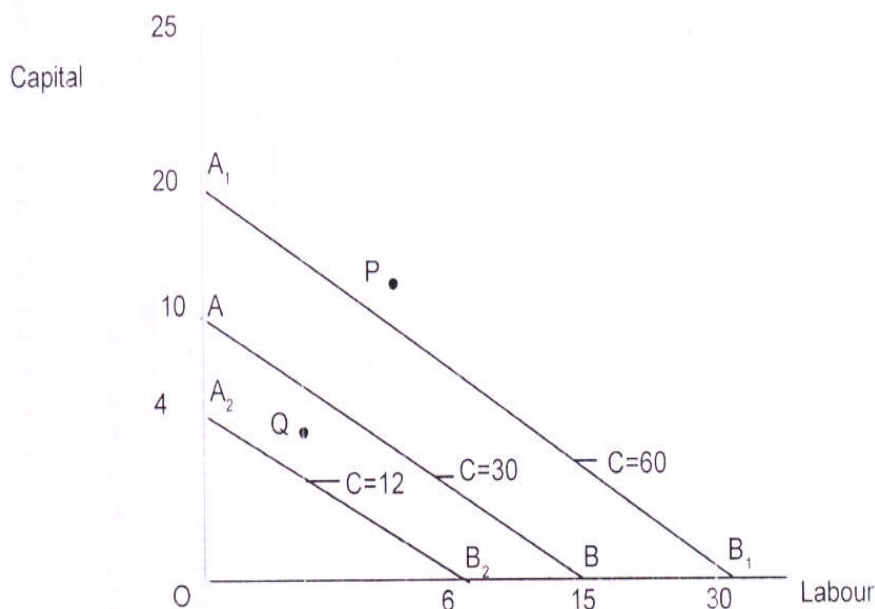


Figure 7.4 Iso Cost Line

Slope of an isocost line: The slope of isocost line is the ratio of the input prices. The slope of an isocost line is P_L/P_C , which is the ratio of the price of labor to the price of capital-when labour is on the x-axis. For any isocost line

$$\frac{\text{quantity of capital}}{\text{quantity of labor}} = \frac{\text{expenditure}}{P_C} \div \frac{\text{expenditure}}{P_L} = \frac{P_L}{P_C}$$

Point P is outside the budget of the producer and at point Q the capacity is under utilized. If the budget is increased to Rs. 60, the isocost line becomes A_1, B_1 .

7.5 Determination of Least Cost Combination of Inputs:

As we have already discussed the production function shows the different combinations of factors of production which can produce a given level of output. Economics have developed the concept of isocost (equal cost) line which shows all combinations of inputs that can be employed for a given cost.

In order to determine the least combination for a given output, we need to have the prices of factors of production for example, a production function for bags where the entrepreneur wants to produce 20 bags. Let the price of L Rs.9 per unit and the price of capital be Rs.6 per unit. Let us find the total cost of each of the six possible combinations of labor and capital for $Q=20$ Table 7.3 shows, the alternative combinations of labor and capital.

Table 7.3 Alternative Combinations of Labor and Capital

Alternative Combinations	Labor	Capital	Cost Rs.
1	3	20	$3 \times 9 + 20 \times 6 = 147$
2	4	13	$4 \times 9 + 13 \times 6 = 114$
3	5	10	$5 \times 9 + 10 \times 6 = 105$
4	6	8	$6 \times 9 + 8 \times 6 = 102$
5	7	6	$7 \times 9 + 6 \times 6 = 99$
6	8	5	$8 \times 9 + 5 \times 6 = 102$

There are two ways to determine the least cost combination of input for a give output, one way is to find the cost of each input combination and choose the one which has the least cost. The cost of each input combination is found by multiplying the price of each input by its

quantity and then total it. In our example, there are six alternative combinations of labor and capital to produce 20 bags. The cost of each of these combinations is presented in Table 7.3 combination 5 represents the least cost for producing 20 bags. Another way to determine the least cost combinations is geometrical in nature. We first draw iso-cost lines as follows. With a given sum of money C and only two factors of production labor and capital, the quantities of labor and capital one can purchase are given by

$$C = LP_L + KP_K$$

If a Businessman has Rs.99 at $P_L = \text{Rs.}9$, $P_K = \text{Rs.}6$, he can buy 11 units of labor with no capital, 16.5 units of capital with no labor, 7 units of labor and 6 units of capital, etc. The various combinations of labor and capital that he could buy with Rs.99 are represented by the line $C = 99$ in Fig.7.5. Line $C = 99$ is an isocost line. It is the locus of all those combinations of labor & capital which could be bought for Rs.99.

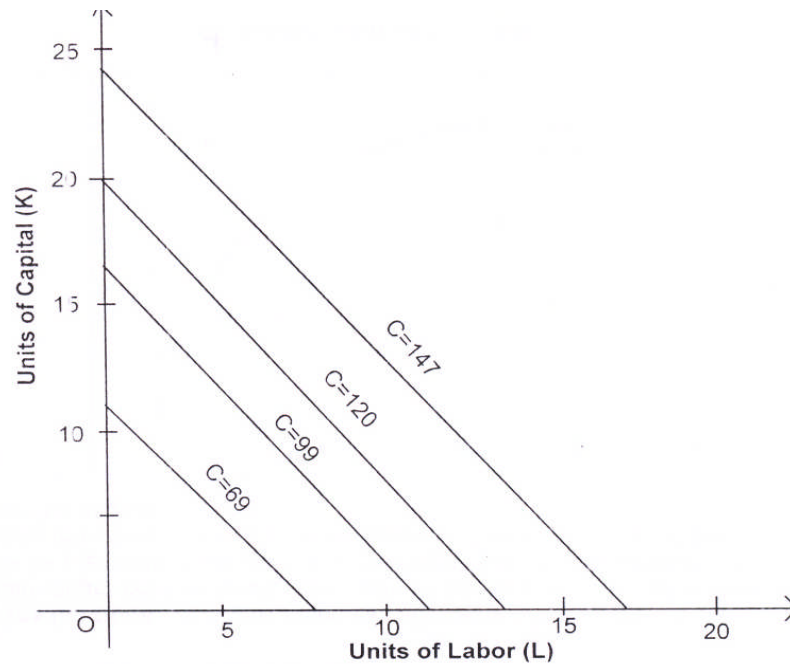


Figure 7.5 Iso-Cost Lines

In order to determine the least cost input combination or the maximum output for a given cost, we super impose the isoquant map on the isocost as shown in Fig.7.6. From the figure it is seen that the maximum output that can be obtained with Rs.99 is 20 bags, where the isocost line $C = 99$ is tangent to the isoquant 20 at point C. Rs.99 is the least cost of producing 20 bags and the least cost combination of inputs for this output is 7 units of labor and 6 units of capital. The line A,B,C,D,E represents the least cost combination of inputs for different levels of output.

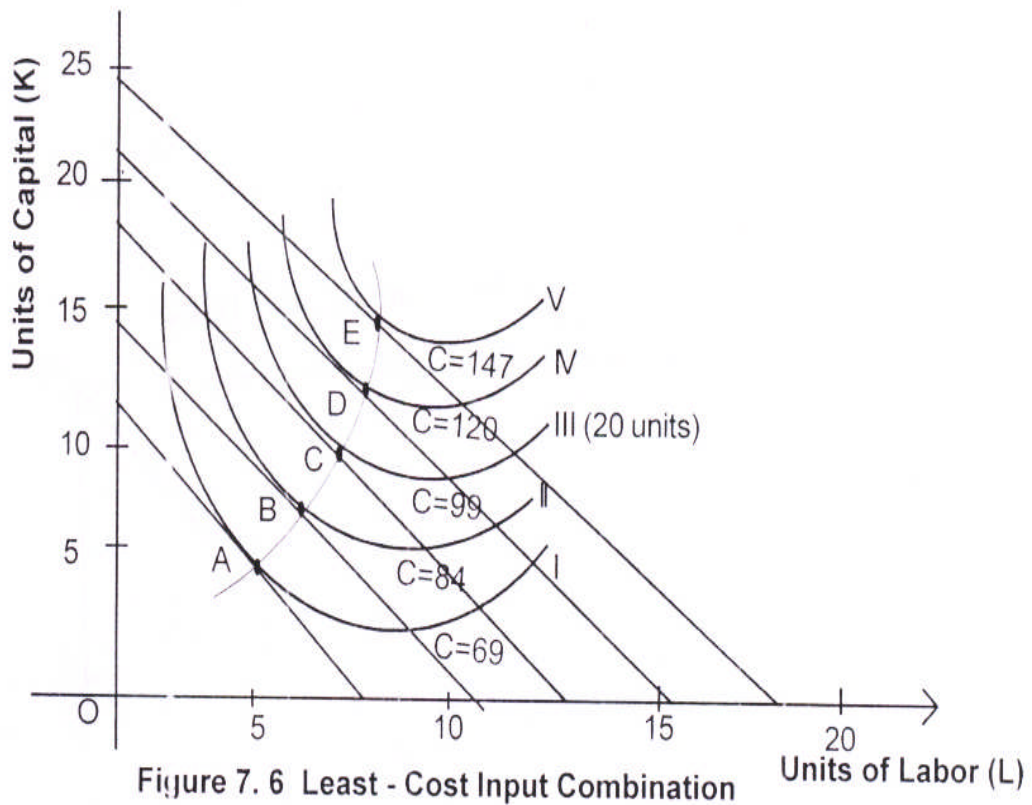


Figure 7.6 Least - Cost Input Combination

The firm wants to produce any given volume of output at least cost. The least cost of any output is given by the point of tangency of the isoquant to an isocost line at point C. This can be seen in Fig.7.7

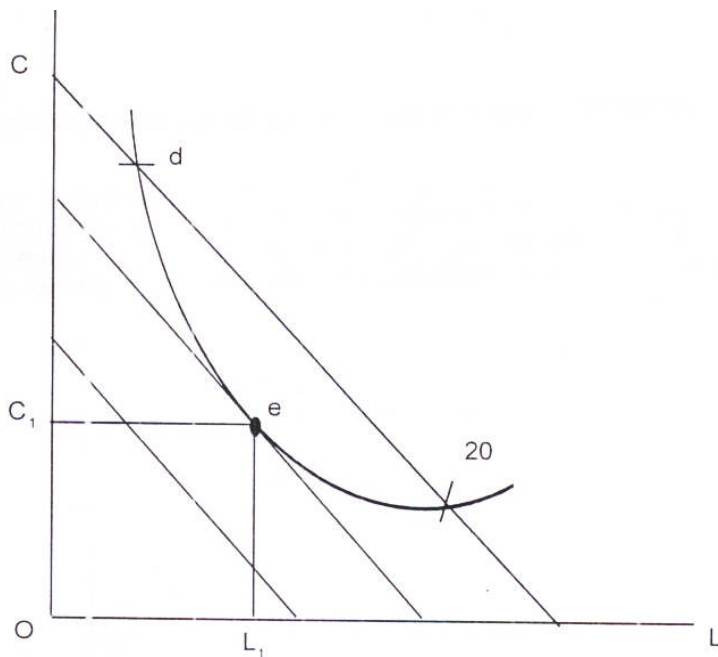


Fig. 7.7 Equilibrium with two variable inputs

The firm is said to be in equilibrium at point E. This is the least cost combination of inputs (OL and OC) any other point on the isoquant say D or E would be on an isocost line further to the right. That is any other point on the isoquant would represent the same amount of output, but at a higher cost. For example, take point D or E the labor and capital represented by D or E produce the same quality of output, as the labour and capital represented by C; but the isocost line for D or E lies further to the right than the isocost line shown for C. Tangency therefore means minimum cost. At the points of tangency, slopes are equal. The slope of the isocost lines is the ratio of the prices of the inputs. The slope of the isoquants is the ratio of the marginal products of the inputs. The slope is also the marginal rate of technical substitution between the inputs. Let C stand for capital and L for labor, Therefore,

$$\frac{P_L}{P_C} = \frac{MP_L}{MP_C} \quad \text{and} \quad \frac{MP_C}{P_C} = \frac{MP_L}{P_L}$$

7.6 Economic Region of Production:

In the long-run, a firm should use only those combinations of inputs which are economically efficient. A factor should not be used beyond a point, even if it is available free of cost, because it was result in negative marginal product for that factor. These input combinations are represented by the position of any isoquant curve which has a positive slope. It means that the firm will have use of both the inputs to maintain same level of production. In figure 7.8 we represent a production function through isoquants and measure labor along the x-axis and capital along the y-axis. It will be seen from the figure that above the line OA and below the line OB slope of the isoquant is positive which means that increases in both capital and labor are required to produce a given fixed quantity of output.

Above OA the MP_L is negative thus output will increase if less labor is used while the amount of capital is held constant. Below OB the MP_K is negative thus output will increase if less capital is used while the amount of labor is held constant. The lines OA and OB are called Ridge lines which bound a region in which marginal products of two factors are positive. The ridge line OA connects those points of the isoquants where marginal product of capital is zero ($MP_K = 0$). On the other hand the ridge line OB connects those points of isoquants where marginal product of labor is zero (MP_L). Thus the ridge lines separate the relevant negatively sloped portion of isoquant from the positively sloped portion. The negatively sloped portion within the ridge lines represents the relevant economic region of production. This refers to the second stage of production in the short run, where both MP_L and MP_K are positive but decrining.

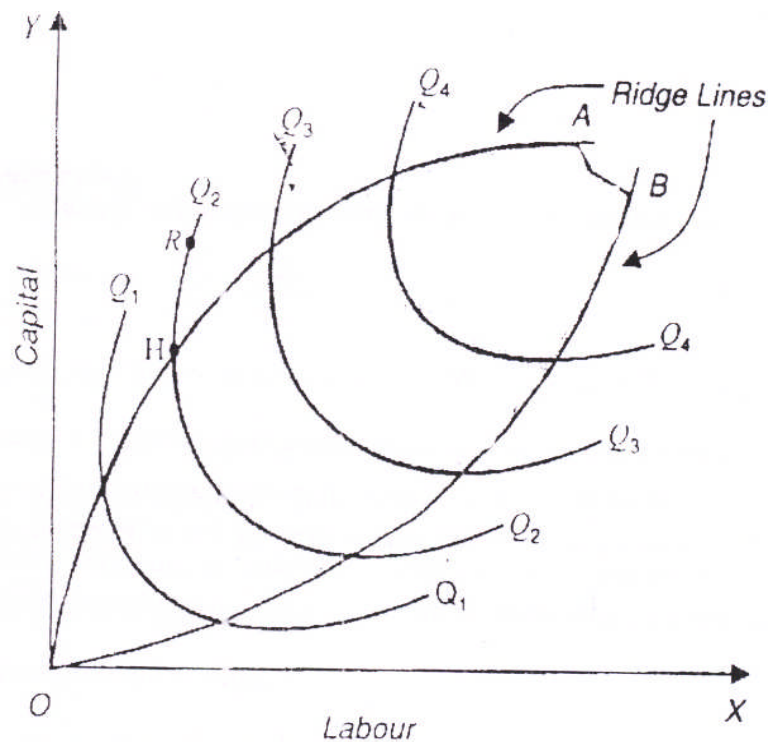


Figure 7.8 The Economic Region of Production

No profit maximizing firm will operate at a point outside the ridge line since it can produce the same output with less of both input; which must be cheaper point 'R' in the fig. 7.6 lines outside the ridge lines and require greater amount of both labor and capital. Since, both capital and labor have to pay positive prices, it must be cheaper to operate at point H.

7.7 Summary:

A firm may increase its output by using more of two variable inputs that are substitutes for each other. There may be various technical possibilities of producing a given output by using different factor combinations. If there are only labor and capital variable inputs, the selection of optimal factor combinations will depend upon isoquants and iso-costs. Isoquants are a geometric representation of the production function. It is a curve representing the various combinations of two inputs that produce the same amount of output. Marginal rate of technical substitution indicates the rate at which factors can be substituted at the margin without altering the level of output. Isocost line is the locus of alternative combinations of labor and capital that a firm can purchase with a given cost. To select a point on the isoquant, we need to consider input prices. The isocost describes the input combinations that are associated with a particular total cost. The least cost combination of inputs for a particular level of output is reached at the point where an isocost is tangent to the isoquant curve corresponding to that level of output. At this

point, the marginal rate of substitution, which is also equal to the ratio of marginal product of two factor input, is equal to the ratio of input prices.

7.8 Key Words:

Iso-Quants

Iso-Costs

Least Cost Combination of inputs

Economic Region of Productions

7.9 Self Assessment Questions:

1. What are isoquants? Explain the properties of isoquants.
2. Write short notes on Isoquants.
3. How is a least-cost combination arrived at with the help of isoproduct and isocost curves? Explain.

7.10 References:

1. Roger D. Blair, Lawrence W. Kenny, Micro Economics, John W. Ley & Sons
2. V.L. Mose, Samuel Paul, G.S. Gupta. Maganerial Economics, Tata McGra Hill
3. H.L. Ahuja, Advanced Economic theory, S. Chand & Co.,

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Lesson 8

PRODUCTION FUNCTION WITH ALL VARIABLE INPUTS OR RETURNS TO SCALE

8.0 Objectives:

- * To understand how production decisions are taken in the long-run.
- * To understand the concept of Linearly Homogeneous Production Function & Cobb-Douglas Production Function.

Structure:

- 8.1 Introduction
- 8.2 Increasing Returns to Scale
- 8.3 Constant Returns to Scale
- 8.4 Decreasing Returns to Scale
- 8.5 Linearly Homogeneous Production Function
- 8.6 Cobb Douglas Production Function
 - 8.6.1 Properties of Cobb-Douglas Production Function
 - 8.6.2 Essential Features of Cobb-Douglas Production Function
- 8.7 Summary
- 8.8 Key Words
- 8.9 Self-Assessment Questions
- 8.10 References

8.1 Introduction:

In general, the cost of producing and marketing products depends both on the amount of labor and capital employed and the array of different products and services produced.

The relationship of per unit costs to changes in these two factors are referred to as economics of scale and economics of scope.

The law of returns to scale always refers to the long run because in the long run all the factors of production vary. A given rate of input of capital and labor defines the scale of production. Proportionate changes in both inputs result in a change in that scale. The term returns to scale refers to the magnitude of the change in the rate of output relative to the change in scale.

Returns to scale are classified as follows:

- 1) Increasing Returns to Scale (IRS): If output increase more than proportionate to the increase in all inputs fig.8.1

- 2) Constant Returns to Scale (CRS): If all inputs are increased by some proportion, output will also increase by the same proportion. Fig. 8.2.
- 3) Decreasing Returns to Scale (DRS): If increase in output is less than proportionate to the increase in all inputs Fig.8.3.

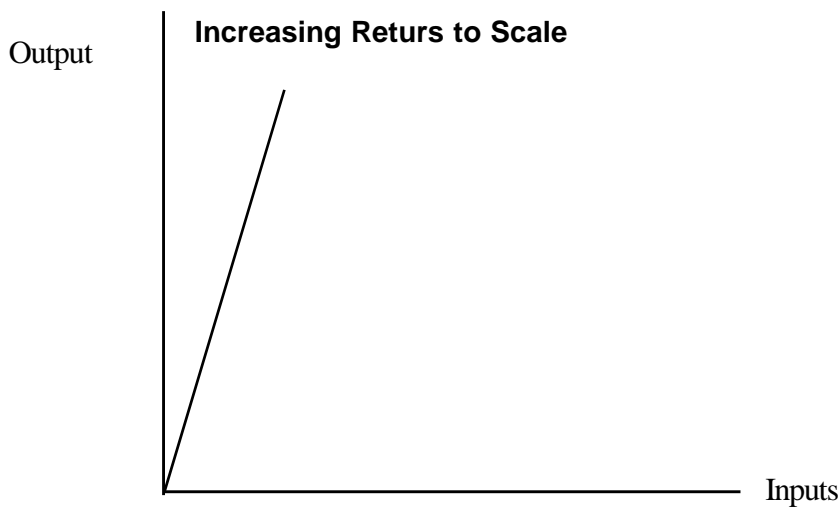


Figure 8.1 : Increasing Returns to Scale

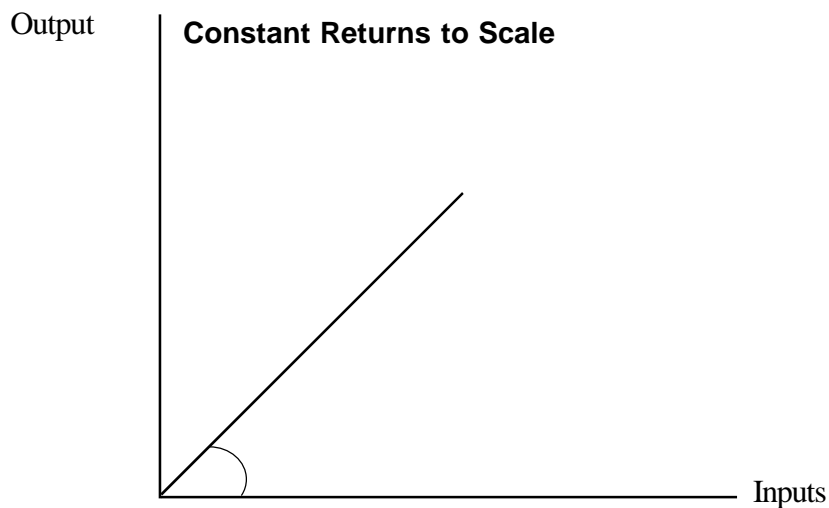


Figure 8.2 : Constant Returns to Scale

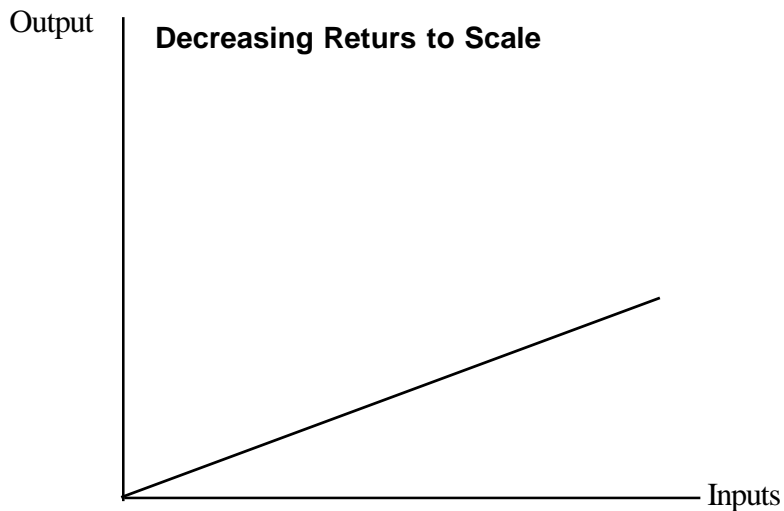


Figure 8.3 : Decreasing Returns to Scale

Alternatively, all the three input - output relations can also be shown in a single diagram as shown below in Fig.8.4.

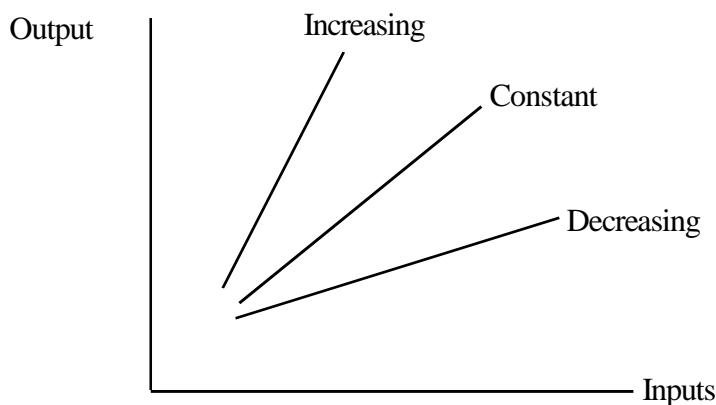


Fig.8.4: Increasing, constant and decreasing Returns

8.2 Increasing Returns to Scale:

IRS arises when the scale operation increase, a greater division of labor and specialisation can take place and more specialised and productive machinery can be used. As we stated above, Increasing returns to scale means that output increases in a greater proportion than the increase in input, for example, if all inputs are increased of 35% and output increases by 45% then the increasing returns to scale will be prevailing.

Factors Responsible for IRS:

Causes of increasing Returns to Scale:

1. Indivisibility of the Factors: Economists such as Joan Robinson, Kaldor, Lerner and Knight ascribe increasing returns to scale to the indivisibility of factors, for ex, some factors are available in large units and they can be utilised efficiently and some factors are indivisible and they are better utilised when output is increased from a small level to a large level.

2. Greater Possibilities of Specialisation of Labor and Machinery: According to Chamberlain, the returns to scale increase because of greater possibilities of specialisation of labor and machinery even if the factors were perfectly divisible.

3. Dimensional Economics: This point was emphasized by Professor Baumol. According to him increasing returns to scale his in dimensional relations, for example, a wooden box of 3 foot-cube contains a times greater wood than the wooden box of 'foot-cube. Because 3 foot-cube wooden box contains 9 times greater input.

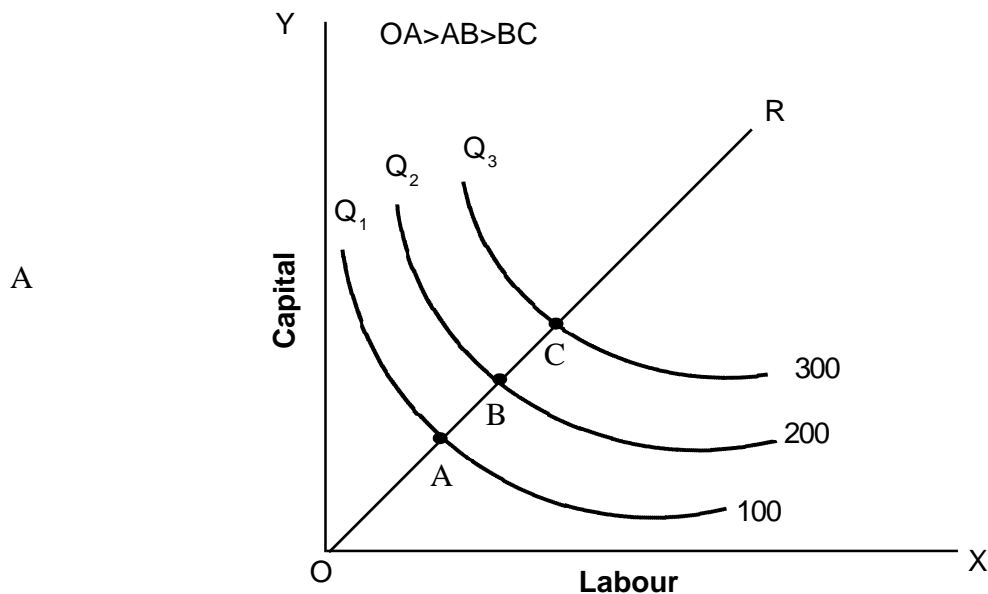


Figure 8.5 : Increasing Returns to Scale

Increasing returns to scale can be shown through isoquants. In fig.8.5 the successive isoquants Q_1 , Q_2 , Q_3 which represent 100, 200, 300 units of output, come closure.

Increasing return and the economies of scale are the two sides of the same coin. Hence the 'economies of scale' are presented below:

When a firm increases all the factors of production it enjoys some advantages of economies of production. The economies of scale are classified as;

1. Internal economies, and
2. External Economies

1. Internal Economies:

Internal economies are economies which are available to a particular firm and this will be different for different firms. This is due to the expansion of the size of the firm. Internal economies may be classified as:

(i) Technical Economies:

A large size firm can afford right type of machinery or various specialised machineries. A

small firm cannot afford modern highly specialised machines and reap the advantages of modern advanced technology. Though its installation involves a high cost, it helps to bring out more output at a lesser cost thus reducing the cost per unit.

(ii) Labour Economies;

When the firm expands its scale of operation it absorbs more and more workers with different qualifications. Thus these workers can be divided according to their qualification and skill and can be placed at the proper operations. This division of labour leads to specialisation which increases efficiency. Moreover, mechanisation of operations also help to reduce labour ratio.

(iii) Managerial Economies:

A large size firm can employ specially qualified persons to look after various sections like, production, financing, marketing, personnel etc. This specialisation in managerial staff increases the efficiency of management. Moreover the sales co-ordination through wholesale will be more effective and less cheap. Thus the large size firm can reap the advantage in both buying and selling.

(iv) Marketing Economies:

The large size firm can make bulk purchases of raw materials etc. at better terms. It can enjoy the discount on bulk purchasing which smaller firms cannot enjoy. It can appoint expert buyers and expert salesmen. It can secure the economies of large scale selling. An increase in production need not increase the advertisement expenditure. Moreover the sales co-ordination through wholesale will be more effective and less cheap. Thus the large size firm can reap the advantage in both buying and selling. (last of marketing economies)

(v) Economies in Transport and Storage:

The large size firm can borrow money at a cheaper rate. It can issue debentures and raise money from the public. As the large size firm can offer better securities it can secure credit from bank more easily and at better terms.

2. External Economies:

An individual firm is not responsible for this. When many firms in an industry expand in a particular area they all may share in some advantages. The expansion of all the firms in a region may make possible the development of transport and communication of that region. Cheaper systems of transportation like railway may be introduced. Better power supply can be ensured at a cheaper rate. New firms may be set up to supply raw materials. These are some of the external economies.

Diseconomies of Scale:

The economies of scale will not continue for ever. An expansion in size of the firm after a certain level will result in diseconomies only. Too much division of labour may bring in inefficiency. The increase in the number of workers may reduce the efficient use of machines and tools etc. The co-ordination of various processes also may prove difficult. Supervision may become inefficient. Red-tapism may increase. The proper maintenance of labour relations also may become difficult. The management altogether may show signs of inefficiency.

8.3 Constant Returns to Scale:

As we started above, the constant returns to scale leads to a proportionate increase in output, i.e. doubling of all inputs doubles the output. This can be shown through isoquants. In fig. 8.6, we can see that successive isoquants are equidistant from each other along each straight line drawn from the origin. The distance between the successive equal product curves being the same along any straight line through the origin.

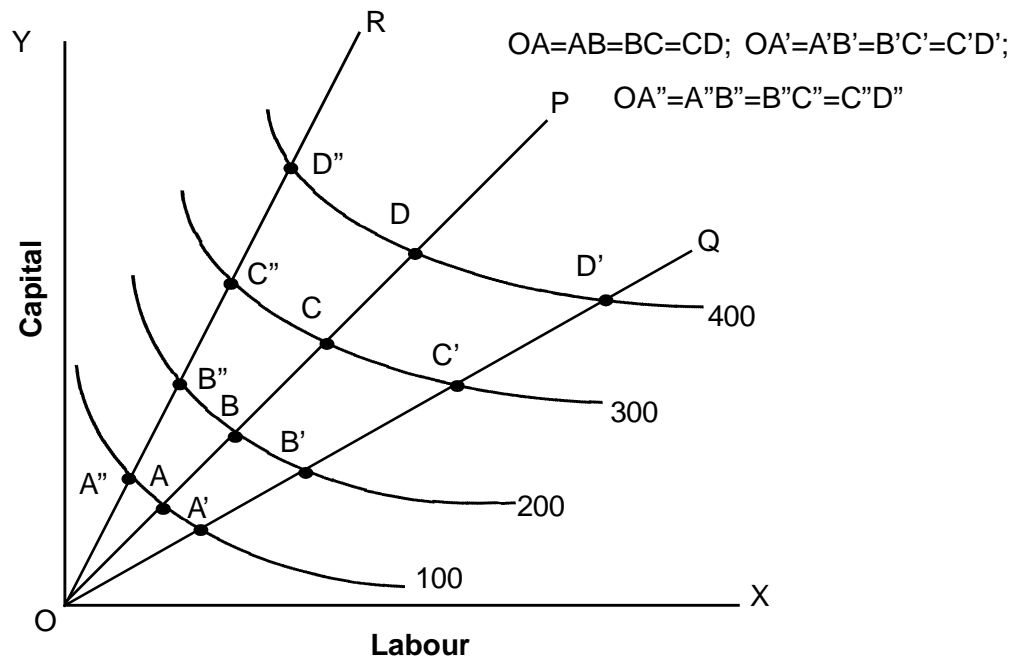


Figure 8.6 : Constant Returns to Scale

8.4 Decreasing Returns to Scale:

If increase in output is less than proportionate to the increase in all inputs, it is known as Decreasing returns to scale. When a firm goes on increasing its scale of operations eventually decreasing returns to scale will occur. Decreasing returns to scale can be presented with Isoquant map as shown in Fig. 8.7

For most production functions, returns to scale can be evaluated easily. Assume that output (Q) is a function of n inputs.

$$Q = f(x_1, x_2, \dots, x_n)$$

If all inputs are increased by a factor P , the new level of output Q^* can be written as

$$Q^* = P^r Q = f(Px_1, Px_2, \dots, Px_n) \text{ and } Q^* - Q = r = \text{increase in output.}$$

If $r > 1$, there are increasing returns to scale, If $r = 1$ there are constant returns to scale, and if $r < 1$, there are decreasing returns to scale.

In figure 8.8 we have an isoquant map for a production function that exhibits increasing, constant and decreasing returns to scale. Along the straight line from the origin, input proportions remains

constant. In other words, as we move along the straight line, we increase the inputs in the same proportions.

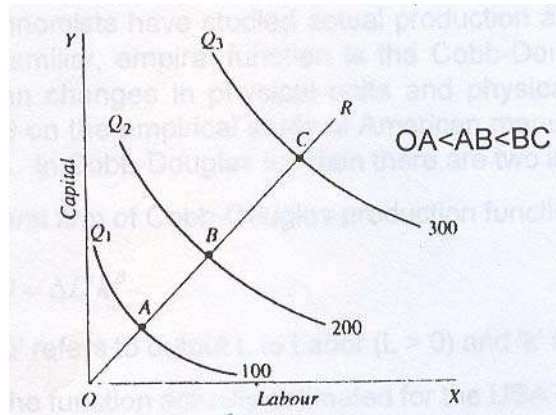


Figure 8.7 : Decreasing Returns to Scale

Initially, the production function has increasing returns to scale. As we move from point R to point d, inputs rise by 14 percent and output increases by 20 percent. Subsequent increases in output are associated with constant returns to scale. As we move from B to A, output and inputs increase by 14 percent. Constant returns to scale are also found as output increases to 90. When there are constant returns to scale, the average products remain constant. At higher output levels. The production function exhibits decreasing returns to scale. Inputs increase by 22 percent, but output increases by only 11 percent as we move from L to W.

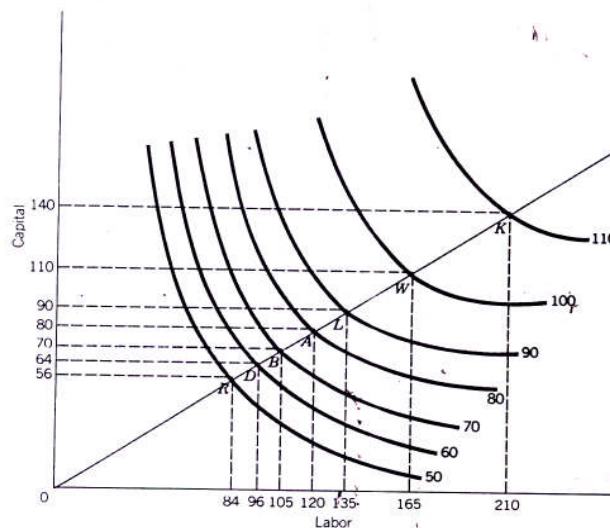


Fig.8.8: Increasing, Constant and Decreasing returns to scale

8.5 Linearly Homogeneous Production Functions:

There is a class of production function that exhibits constant returns to scale over the entry range of output. These production functions are called linearly homogeneous or homogeneous of degree one.

There are many examples of linearly homogeneous functions. But one important example is Cobb-Douglas function.

8.6 Cobb-Douglas Production Function:

Many economists have studied actual production and have used statistical methods but one important, familiar, empirical function is the Cobb-Douglas production function to find out relations between changes in physical units and physical outputs. Cobb-Douglas production function is based on the empirical study of American manufacturing industry by C.W. Cobb and Paul H. Douglas. In Cobb-Douglas function there are two inputs, labor and capital.

The general form of Cobb-Douglas production function can be expressed as

$$Q = \Delta L^\alpha k^B$$

Where 'Q' refers to output, L to Labor ($L > 0$) and 'k' to capital ($k > 0$)

The function actually estimated for the USA by Cobb and Douglas is

$$Q = 1.01 \cdot L^{0.75} k^{0.25}$$

or

$$\text{Log } Q = \text{Log } 1.01 + 0.75 \text{ Log } L + 0.25 \text{ Log } k$$

This is a linearly homogeneous production function indicating constant returns to scale. The Cobb-Douglas function shows that a 1 percent change in labor input (Capital remaining constant) is associated with a 0.75 percent change in output. Further, a 1 percent change in capital input (labor remaining constant) is associated with a 0.25 percent change in output.

Homogeneous production function of the first degree implies that if all factors of production are increased in a given proportion, output also increases in the same proportion. Hence, linear homogeneous production function represents the case of constant returns to scale for example. If there is an increase in inputs say 10%, then output also increases by 10% - which is called as linearly homogeneous of 1st Degree.

It is stated as

$$Q = kL^\alpha C^{1-\alpha}$$

$$\alpha = 0.75$$

$$Q = kL^{0.75} C^{0.25}$$

Where Q is manufacturing output of USA

L is labor

L^α labor contributes to 75% of manufacturing output in US

$C^{1-\alpha}$ Capital contributes the rest of 25% of output.

$$Q = kL^\alpha C^{1-\alpha}$$

If there is g increase in L and C.

$$\begin{aligned}
 Q &= k(gL/\alpha(gc))^{1-\alpha} \\
 &= kg^\alpha L^\alpha, g^{1-\alpha} .C^{1-d} \\
 &= k.L^\alpha .g^1, C^{1-\alpha} \\
 &= gk.L^\alpha, C^{1-d}
 \end{aligned}$$

We know that $= k.L^\alpha C^{1-\alpha} = Q$

$$Q = g.Q$$

Hence output also increased by g times.

8.6.1 Properties of Cobb-Douglas Production Function:

Cobb-Douglas production function applies to the entry manufacturing industry.

1. Returns to Scale: The sum of the components $(\alpha + \beta)$ in the Cobb-Douglas function seemed to be unity. This implies constant returns to scale.

2. Multiplicative Function: Cobb-Douglas function is a multiplicative function, the output becomes zero if any input takes the value zero. It implies that all the inputs considered in the function are necessary for the production process to take place.

3. Exponents α & β represent the labor and capital shares of output. It implies that not only do the factors share in total income tend to be constant.

4. Factor Intensity: In a Cobb-Douglas production function the factor intensity is measured by the ratio α/β . The higher is the ratio, the more labor intensive is the technique. Similarly, the lower is this ratio, the more capital intensive is the technique.

5. Marginal Rate of Technical Substitution: The marginal rate of technical substitution of labor for capital ($MRTS_{LK}$) is the rate at which the labor will be substituted for the capital at the margin.

6. Elasticity of Factor Substitution: The Elasticity of factor substitution (σ) is defined as the percentage change in the capital labor ratio (K/L) divided by the percentage change in the marginal rate of technical substitution.

$$(\sigma) = \frac{\text{Percentage change in } K/L}{\text{Percentage change in MRTS}}$$

8.6.2 Essential Features of Cobb-Douglas Production Function:

Some of the essential features of linearly homogenous production function with special reference to Cobb-Douglas function are

1. Average product of factors and Cobb-Douglas production function: The first important feature of Cobb-Douglas production function as well as linearly homogenous production function is that the average and marginal products of labor depend upon the ratio in which factors are combined for the production of a commodity.

2. Marginal Product of factors and Cobb-Douglas Production Function: The marginal product of a factor of a linearly homogenous function depends on the ratio of the factors and is independent of the absolute quantities of the factors used. The marginal product of labor from Cobb-Douglas production can be obtained as $Q = AL^a K^{1-a}$

3. Cobb-Douglas Production Function and Marginal Rate of Substitution: Marginal rate of substitution between factor is equal to the ratio of the marginal physical products of the factors. Therefore in order to derive marginal rate of substitution from Cobb-douglas production function. We need to obtain the marginal physical products of the two factors from the Cobb-Douglas production function.

4. Cobb-Douglas Production Exhibits Constant Returns to Scale: If the inputs of Labor (L) and Capital (k) are increased by a constant g, then the quantity of output will be increased to g.

5. Cobb-Douglas Production Function and Labor share in National Income: Cobb-Douglas production function has been used to explain labor share in national income.

8.7 Summary:

The law of returns to scale is concerned with the study of production function in the long-run. A change in scale means that all inputs or factors are varied in the same proportion, keeping the factor proportion constant. The concept of returns to scale refers to the change in output associated with proportionate changes in all inputs such returns are increasing, decreasing, or constant depending on whether output increases more than in proportion, less than in proportion or in proportion to the input changes. A linearly homogeneous production function has constant returns to scale, and its expansion path is a straight line.

8.8 Keywords:

Returns to Scale

Increasing Returns to Scale (IRS)

Constant Returns to Scale (CRS)

Decreasing Returns to Scale (DRS)

Linearly Homogeneous Production Function.

8.9 Self-Assessment Questions:

1. Discuss the law of returns to scale. When does a production function show increasing returns to scale?
2. Explain the law of constant returns to scale.
3. State and explain the law of diminishing returns.
4. The operation of the law of diminishing returns is due to the scarcity of the factors of production. Explain.
5. State and illustrate the Cobb-Douglas production function.

8.10 References:

1. H.L Ahuja, Advanced Economic Theory, S. Chand & Co.,
2. Atmanand. Managerial Economics; Excel Book.
3. Bharati Singh. Managerial Economics; Excel Book.
4. H.Graig Peterson, W. Cris Lewis; Managerial Economics, Pearson Education.

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Lesson 9

THEORY OF COST

9.0 Objectives:

The objectives of this lesson are

- * introduce Cost Concepts
- * define different types of costs
- * explain costs in short-run and long run

Structure:

- 9.1 Introduction
- 9.2 Cost Concepts
 - 9.2.1 Actual Costs and Opportunity Costs
 - 9.2.2 Explicit Costs and Implicit Costs
 - 9.2.3 Direct Costs and Indirect Costs
 - 9.2.4 Private Costs and Social Costs
- 9.3 Costs in Short-Run
- 9.4 Cost Output Relation
- 9.5 Costs in Long-Run
- 9.6 Summary
- 9.7 Key Words
- 9.8 Self-Assessment Questions
- 9.9 References

9.1 Introduction:

For an economist, a firm's total cost of production equals the value of all the inputs used in the production process. We call this value the opportunity cost of using those inputs. Opportunity cost is a very important concept in economics.

- * The theory of cost, together with the principles of demand and production, constitute three of the basic areas of managerial economics. This lesson focuses on the principles of cost theory integral to decisions about optimal price and output rates. In Managerial Economics, demand estimation and forecasting demand in the future form a very essential part of decision making. Another area is also of greatest importance to managerial economics U_2 the cost of production. The cost which a firm incurs in

the process of production of its goods and services is an important variable for decision making. Total cost together with total revenue determines the profit level of a business concerns. In order to maximise profits a firm tries to increase its revenue and lower its costs.

- * Study of costs is essential for making a choice from among the competing production plans. Since the productive resources are scarce with any firm and the use of these resources involves sacrifices or cost. The firm will have to analyse these sacrifices or costs whenever it decides to use the resources. Cost and revenue are the two major factors with which the profit-maximising firms need to deal carefully. It is the difference between revenue and cost that determines the firm's overall profitability. From decision making point of view, cost is even more important than revenue because the firm can influence cost easily than revenue.

9.2 Cost Concepts:

Costs play a very important role in managerial decisions involving a selection between alternative courses of action. There are several types of costs that a firm may consider relevant under different circumstances. Such costs include future cost, accounting cost, opportunity costs, implicit cost, fixed cost, variable cost, etc. for the purpose of decision making, it is essential to know the fundamental difference between these cost concepts.

9.2.1 Actual Costs and Opportunity Costs:

Actual costs are the costs which the firm incurs while producing or acquiring a good or a service (like the cost on raw material, labour, interest, etc.). These costs are the cost that are generally recorded in books of account, for example, actual wages paid, cost of materials purchased, interest paid, etc. These costs are also called the outlay costs or acquisition costs or absolute costs. On the other hand, opportunity costs are the returns from the second best use of the firm's resources which the firm forgoes in order to avail of the return from the best use of resources. The concept of opportunity cost occupies a very important place in modern economic analysis. For example, a farmer who is producing Rice, can also produce blackgram with the same factors. Therefore, the opportunity cost of any good is the next best alternative good that is produced opportunity costs also known as alternative costs.

9.2.2 Explicit Costs and Implicit Costs:

Explicit costs are those expenses which are actually paid by the firm and they are generally recorded in books of account while implicit costs are theoretical costs and represent the value of foregone opportunity but do not involve an actual cash payment. They generally not appeared in accounting statements, but they are considered relevant by economists while calculating the economic profits of the firm.

- * Explicit costs are those expenses that involve cash payments. These are the actual or business costs that appear in the books of accounts. Explicit cost is the payment made by the employer for those factors of production hired by him from outside. These

costs include wages and salaries part, payments from raw materials, interest on borrowed capital funds, rent on hired land, taxes paid to the government etc. Implicit costs are the cost of the factor units that are owned by the employer himself. It does not include cash payment and hence does not appear in the books of accounts. These costs are not actually incurred but would have incurred in the absence of employment of self-owned factors. Examples of implicit costs are depreciation and return on capital contributed by share holders.

9.2.3 Direct Costs and Indirect Costs:

Direct costs are also known as separable or traceable or Assignable costs. These costs can be directly attributed to the production of a unit of a given products. In other words, the costs which are directly and definitely identifiable are the direct costs on the other hand, Indirect costs are those which cannot be separated and clearly attributed to individual units of production. Since all the direct costs are linked to a particular product/process/department they vary with changes in them. All direct costs are variable. On the other hand, indirect costs may or may not be variable.

9.2.4 Private Costs and Social Costs:

Private Costs are those that accrue directly to the individuals or firms engaged in relevant activity. While social costs are borne by the society though generated by productive activity of the firm private cost refers to the cost of production incurred and provided for by an individual firm engaged in the production of a commodity. Private cost includes both explicit and Implicit cost. Social cost refers to the cost of producing a commodity to the society as a whole. It takes into consideration all those costs, which are borne by the society directly or indirectly.

9.3 Costs in Short-Run :

Total fixed and variable costs in the short run: There are some inputs or factors like labour, raw material etc., can be readily varied with the change in output. Such factors are called variable factors. There are some factors such as capital, equipment, building etc., which cannot readily varied. It requires long time to make variations in them. In the short run, by definition, some inputs are forced and while the others are variable. The short-run costs are (1) Fixed Costs and (2) Variable Costs.

* Economists often divide costs into the two groups (1) Fixed costs and (2) Variable Costs fixed costs are that part of the total cost of the firm which does not vary with output, e.g., expenditure on depreciation, rent of land and building etc.

Variable Costs are directly dependent on the volume of output for expenditure on labour, raw material etc.

The Cost distinction is based on the time element. Short-run is a period during which the physical capacity of the firm remains fixed. Any increase in output during this period is possible only by using the existing physical capacity more intensively. Short-run cost is that which varied with output when physical capacity remains constant.

Long run is a period of time during which output can be increased or decreased by changing all inputs. In long run there are no fixed inputs. Long run costs, are costs that vary with the size of plant and with other facilities normally regarded as fixed in the short run. In fact, in the long run there are no fixed inputs and, therefore no fixed costs, i.e. all costs are variable. The long run is defined as the period of time in which the quantities of all factors may be varied.

9.4 Cost-Output Relations:

Cost-output relations play an important role in determining the optimum level of production. The relation between cost and output is technically described as the cost function.

$$TC = f(Q)$$

where

TC = total cost

Q = Quantity production.

Considering the period the cost functions can be classified as

(a) Short Run Cost Function (b) Long run cost function

Short-Run Cost Function: It is defined as that period during which the physical capacity of the firm is fixed and during which output can be increased only by using the existing capacity more intensively. The cost concepts used here are

(1) Total Cost (2) Average Costs and (3) Marginal Cost

Total Cost is the sum of fixed and variable cost at each level of output

$$TC = TFC + TVC$$

Average Cost is the cost per unit of output, assuming that production of each unit of output incurs the same cost.

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

Marginal costs are the incremental or additional costs of producing one more unit of output.

$$\frac{\text{Change in TC}}{\text{Change in Q}} = \frac{\Delta TC}{\Delta Q}$$

Average Fixed Costs: Average fixed cost (AFC) is derived by dividing Total Fixed Cost (TFC) by the corresponding outputs (Q), that is

$$AFC = \frac{TFC}{Q}$$

Average Variable Costs: Average Variable Cost (AVC) is derived by dividing Total Variable Cost (TVC) by the corresponding output (Q).

$AVC = \frac{TVC}{Q}$ Where Q represents the total output produced. AVC declines initially, reaches a minimum and then increase again.

TABLE 9.1 : Cost - Output Relation

Q	TFC	TVC	TC	AFC	AVC	AC	MC
0	10	0	10	0	0	0	0
1	10	8	18	10	8	18	8
2	10	12	22	5	6	11	4
3	10	15	25	3.33	5	8.33	3
4	10	24	34	2.5	6	8.5	9
5	10	35	45	2	7	9	11
6	10	48	58	1.66	8	9.66	13
7	10	63	73	1.42	9	10.42	15
8	10	80	90	1.25	10	11.25	17
9	10	99	109	1.11	11	12.11	19
10	10	120	130	1	12	13	21

It will be seen from the table that average fixed cost is fixed per unit of output. Since total fixed cost is a constant quantity (10) average fixed cost falls as output increases.

From the figure 9.1, it will be seen that total fixed cost curve (TFC) starts from a point on the y-axis meaning thereby that the total fixed cost will be incurred even if the output is zero. The total variable cost curve raises upward showing thereby that as the output is increased, the total variable cost also increases. The TVC starts from the origin which shows that when output is zero the variable costs are also zero.

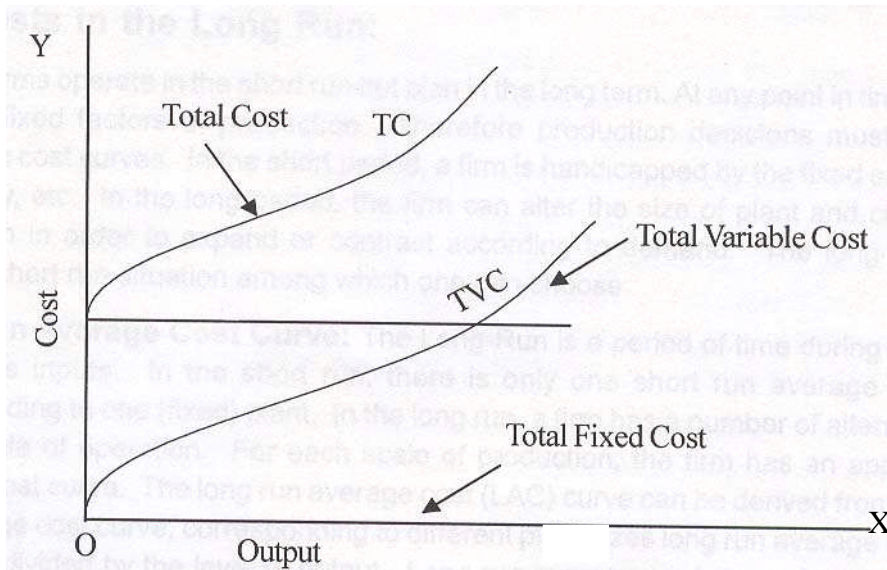
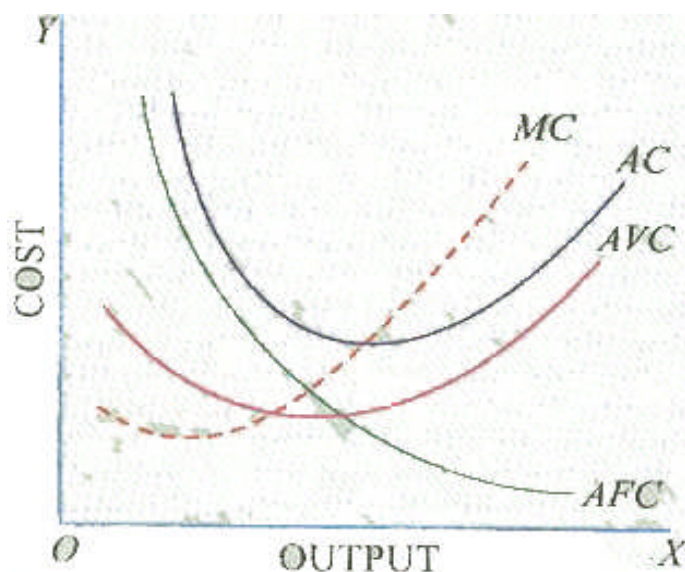


Figure 9.1 Short-Run Total Cost Curve

Total Cost curve (TC) has been obtained by adding up vertically total fixed cost curve and total variable cost curve. The shape of the total cost curve (TC) is exactly the same as that of total variable cost curve (TVC) because the same vertical distance always separates the two curves. Figure 9.2 shows the short-run Average and Marginal Cost Curves. It will be seen that average fixed cost curve continuously falls throughout.

AFC : AFC curve continues to fall as output rises from lower levels to higher levels. AFC curve is a rectangular hyperbola indicating the area of every rectangle formed by the curve at any point will be equal to every other rectangle formed on the same curve. AVC Curve initially declines reaches minimum as shown by point 3 and then rises. It is a 'U' shaped curve.

AC Curve: AC is the sum of AFC and AVC. It initially declines reaches minimum as shown by point 4 and then rises.



9.5 Costs in the Long Run:

Firms operate in the short run but plan in the long term. At any point in time, the firm has one or more fixed factors of production. Therefore production decisions must be based on the short-run cost curves. In the short period, a firm is handicapped by the fixed size of plant, capital, machinery, etc. In the long period, the firm can alter the size of plant and change the scale of production in order to expand or contract according to demand. The long-run consists of all possible short run situation among which one can choose.

Long-Run Average Cost Curve: The Long-Run is a period of time during which the firm can vary all its inputs. In the short run, there is only one short run average cost (SAC) curve corresponding to one (fixed) plant. In the long run, a firm has a number of alternatives with regard to the scale of operation. For each scale of production, the firm has an appropriate short run average cost curve. The long run average cost (LAC) curve can be derived from a number of short run average cost curve, corresponding to different plant sizes long run average cost is the long run total cost divided by the level of output. Long run average cost curve depicts the least possible average cost for producing various levels of output. To understand and derive long run average cost curve (LAC) let us take three short run cost curves of three plants. These are also known as plant curves. In the short run the firm can be operating on any short run average cost curve, given the size of the plant. The three plants operate with short run average cost denoted by SAC_1 , SAC_2 , and SAC_3 respectively as shown in figure 9.3.

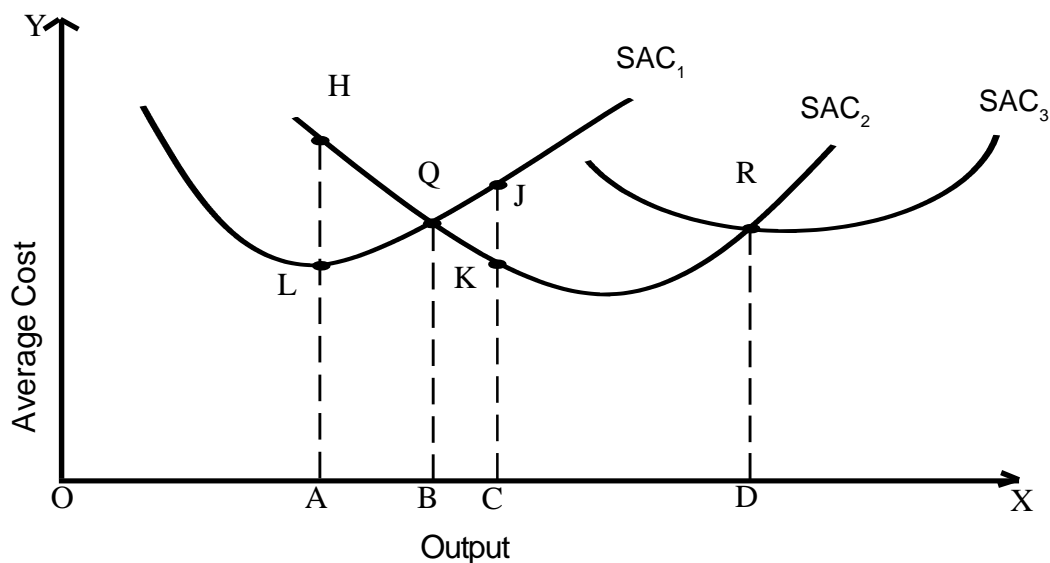


Figure 9.3 : PLANT CURVES

Given the size of the plant or short-run average cost curve the firm will decrease or increase its output by varying the amount of the variable inputs. But, in the long run the firm can choose among the three short run average cost curves SAC_1 , SAC_2 & SAC_3 . In the long run the firm will examine with which size of plant or on which short run average cost it should operate to produce a given level of output at the minimum possible cost. From the figure 9.3 we can see that upto OB amount of output, the firm will operate on the short-run average cost curve SAC_1 , though

it could also produce with SAC_2 , but SAC_1 curve produces with less cost than SAC_2 . All other output levels upto OB can be produced more economically with the SAC_1 , than SAC_2 . If the firm plans to produce an output which is larger than OB less than OD then it will not be economical to produce on SAC_1 . From the figure we can see that the outputs larger than OB but less than OD , can produced at a lower cost per unit on SAC_2 than on SAC_1 . If the firm wants to produce an output which exceeds OD , then the cost per unit will be lower on SAC_2 than SAC_3 . Therefore, in the longrun, the firm has a option in the employment of a plant, and choose minimum possible unit cost for producing a given output. The long run average cost curve depicts the least possible average cost for providing various levels of output when all factors have been adjusted.

Let us assume that there are many plant sizes each suitable for a certain level of output. If such is the case, we will get as many SAC curves, intersecting each other shown in figure 9.4.

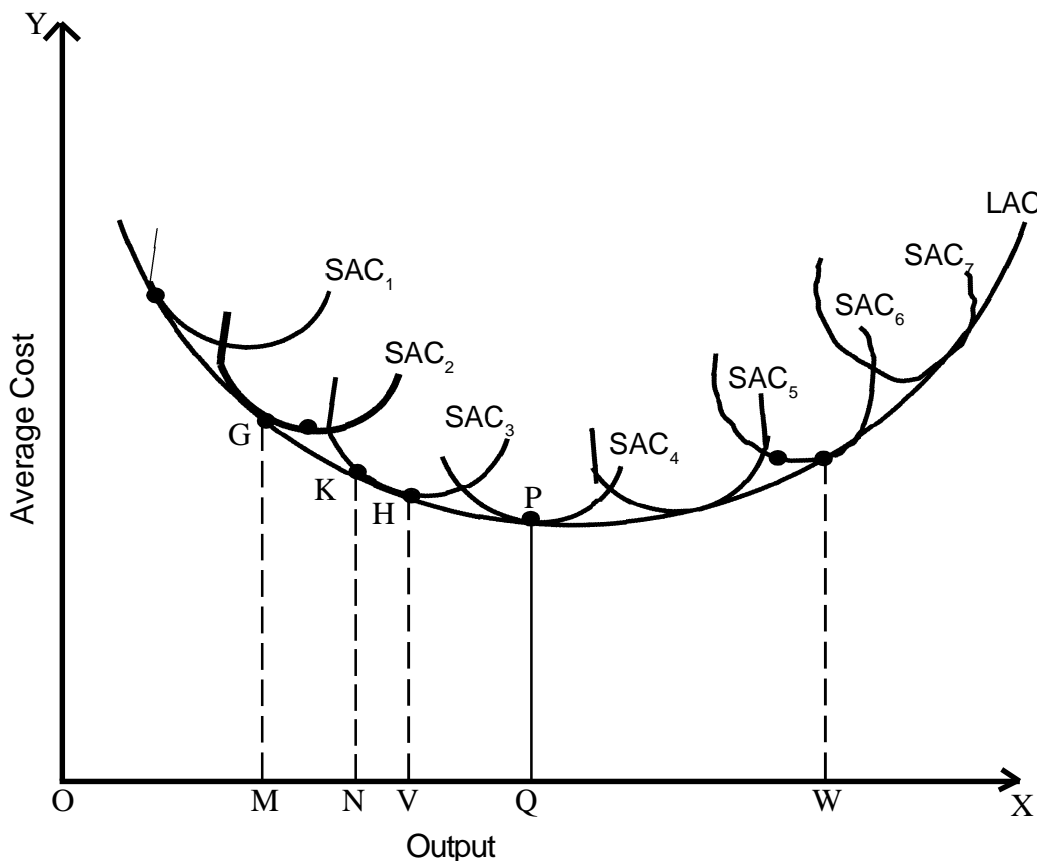


Figure 9.4 : Deriving LAC from SAC Curves

The intersection points will be so close to each other and we can make it a continuous curve. It is known as the long run average cost curve or the envelope curve. The LAC curve is a U-Shaped curve which reflects the laws of return to scale. The economics of scale exist only up to a certain size of plant, shown as the "optimum size plant" where all possible economics of scale are fully exploited. In figure 9.4 point 'Q' is the point of optimum output and the corresponding plant size 4 is the optimum plant size. It will be seen from the figure that the long-run average cost curve first falls and then beyond a certain point it rises.

Long-run average cost curve is also called as “planning curve of the firm by some economists because a firm plans to produce any output in the long run by choosing a plant on the long run average cost curve corresponding to the given output.

9.6 Summary:

The theory of cost is a fundamental concern of managerial economics. Costs play a very important role in managerial decision making. There are several types of costs. They are future cost, accounting cost, opportunity cost, explicit costs implicit cost, fixed cost, variable etc. The concept of cost is closely related to production theory. A cost function is the relationship between a firm’s cost and the firm’s output. Economists often divide costs into (1) fixed costs and (2) variable costs. The cost destruction is based on the time element (1) short-run and (2) Long-run. The short-run by definition some inputs are fixed and while the others are variable. In long-run there are no fixed inputs. Long run costs are cost that vary with the size of plant. In the short run, the total cost of any rate of output is equal to the total fixed cost plus the total variable cost of producing that output rate. The long-run average cost curve is the envelope of a series of short-run average cost curves. The long-run cost functions are used for planning the optional scale of plant size.

9.7 Key Words:

1. Actual Cost
2. Opportunity Cost
3. Explicit Cost
4. Implicit Cost
5. Direct Cost
6. Indirect Cost
7. Private Cost
8. Social Cost
9. Fixed Cost
10. Variable Cost
11. Average
12. Average fixed Cost
13. Average Variable cost

9.8 Self-Assessment Questions:

- 1) What are opportunity costs? Explain with the help of example.
- 2) Distinguish between:
 - (a) Fixed Vs Variable Cost
 - (b) Implicit Vs Explicit Cost

(c) Direct Vs Indirect Costs

(d) Private Vs. Social Cost

- 3) All direct costs are variable and all indirect costs are fixed Do you agree?
- 4) Explain why the average cost curve is U-Shaped.
- 5) Distinguish between average and marginal cost.
- 6) How is the long run average cost curve derived from the short run average cost curves?

9.9 References:

- 1) Roger D-Blair, Lawrence W. Kenny, Micro Economics, John Wiley & Sons.
- 2) V.L. Mote, Samuel Paul, G.S. Gupta, Managerial Economics, Tata Mcgraw Hills
- 3) H. Gaig Peterson. W. Cris Lewis : Manegerial Economics, Pearson Education
- 4) H.L. Asruja, Advanced Economic Theory, S.Chand & Co.

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LESSON – 10**MARKET STRUCTURE AND REVENUE CURVES****10.0 Aims and Objective:**

As we have already studied about the cost curves and its types, now it is necessary to know what revenue is and what the types are. The market structure is introduced in this chapter and the types of market are explained. There is a link between the market structure and the revenue curves, which is explained in this chapter.

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10.1 Introduction

Market is a place where the buyers and sellers meet to exchange the goods and services. Market can be of various types on basis of areas, time and competition. Among all the types of markets, the important one is on basis of competition. Here we basically find two types of

market namely perfect and imperfect. Among these two we highlight the imperfect market and its types. Further Revenue and types of revenue are dealt. The relations of various revenue curves in various imperfect markets are explained.

10.2 Market

Market in simple language is a place where the buyers and sellers come in contact with each other. The market is a set of conditions in which buyers and sellers come in contact for the purpose of exchange. In fact, anything which has a price has a market in economics to be called as a market. The market situation varies in their structure. Market structure is affected by the behaviour of the buyers and sellers; prices and trade volume in the market. All kinds of market are not same or equal in their efficiency of exploitation of resources and consumer's welfare. Every market differs for the other. The pricing process should be analysed in relation to the type of market.

10.3 Definition of Market

According to Cournot market means, "The whole of any region in which buyers and sellers are in such free intercourse with one another, that the price of the same goods tend to equality easily and quickly".

According to Ben ham market means, "any area over which buyers and sellers are in such close touch with one another, either directly or through dealers that the prices obtainable in one part of the market affect the price paid in other parts."

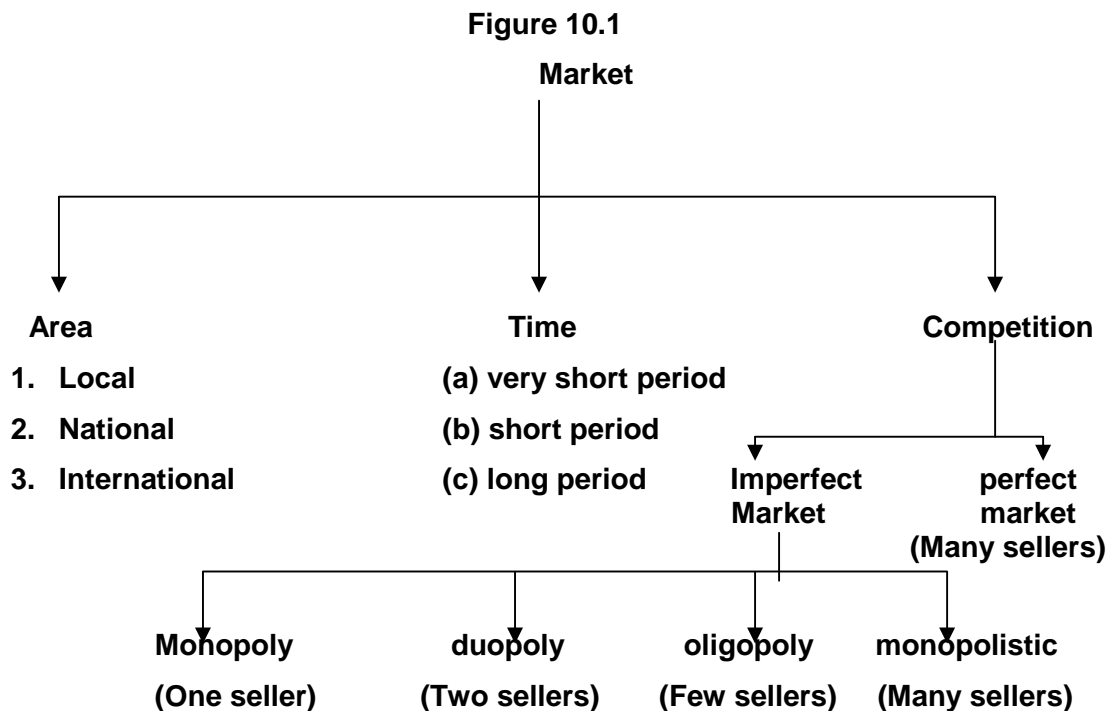
According to Macmillan market is – "Generally any context in which sale and purchase of foods and services takes place. There need be no physical entity corresponding to a market. It may, for example, consist of network of telecommunications across the world on which, say shares are traded."

10.4 Classification of Market

Market can be classified on basis of –

1. **On basis of area** – On basis of area, market can be divided further into three types namely – local market, national market and international market.
2. **On basis of time** – On basis of time market can be divided into three types. They are – very short period, short period and long period markets.
3. **On basis of competition** – On basis of competition market can be mainly divided into two types – perfect and imperfect markets. Again imperfect markets can be of various types namely – monopoly, duopoly, monopolistic and oligopoly.

This classification is explained in the following Figure 10.1



10.4.1 On basis of Area

On basis of area market can be of three types –

1. **Local Market** – When demand and supply of a commodity is restricted to a particular locality, it is called a local market. For example, vegetables, milk, flowers, fish etc. For such perishable good the consumers are available near to the local market.
2. **National Market** – When demand and supply of a commodity are spread over the entire country, it is called as national market. For example, wheat, sugar, medicines, etc. Goods available in the local markets may also have national markets.
3. **International Market** – When a commodity enjoys demand and supply from the entire world, it is said to have international market or world market. Gold, silver etc are best examples for such kind of market.

10.4.2 On basis of Time

1. Very short period – It is also called as market period. This is the time period in which supply remains constant or perfectly inelastic. The price is determined according to the demand and the price paid in this time period is called as market price or very short period price.

2. Short period – This is the time period in which supply can be altered to some extent by changing the variable factors of production.
3. Long period – This is the time period in which complete adjustment in supply is possible. Supply of commodity can be increased or decreased according to the changes in demand. In long run, all factors become variable.

10.4.3 On basis of competition

On basis of competition markets can be classified into two types namely perfect competition market and imperfect market.

1. **Perfect market** – There is a perfect competition amongst the buyers and sellers. There is uniform price in the market and homogenous commodities in the market. Buyers and sellers accept the price determined in the market. The main features in this type of market are -
 - There are large number of buyers and sellers.
 - There exist homogenous commodities in the market.
 - Firms can freely enter and exit from the industry.
 - There is perfect mobility of the factors of production.
 - Both buyers and sellers have perfect knowledge about the market.
 - There is no transport cost.
 - There is no publicity cost.
 - There is uniform price in the market.
 - AR curve is parallel to X axis.
 - The firm is a price taker and quality adjuster.
2. **Imperfect market** - In this market, competition is imperfect amongst the buyers and sellers. Different prices come to prevail for the same commodity at the same time. Imperfect market can be of several forms like –
 1. **Monopoly** – It is a market where only one seller controls the entire supply of the commodity which has no close substitutes. The price or output in monopoly market is not influence by other goods. Producer can determine either output quantity or price of the good.
 2. **Duopoly** – In this market there are two sellers. A change in the price and output by one seller affects the other. Duopolist takes any decision taking into account his rival.

3. **Oligopoly** – There are few sellers in this market dealing in differentiated products. As the number is small, each firm can influence the price and output decisions of its rival firms. Independence is one of the important features of the market.
4. **Monopolistic market** – In this market, many firms produce differentiated products. The commodities produced are close substitutes of one another. In monopolistic competition the goods are produced with slight difference.

The *main features* of the imperfect competition market are-

1. **Sellers** - In imperfect competition sellers are different in different markets –
In monopoly – single seller
In duopoly – two sellers
In oligopoly – few sellers
In Monopolistic – many sellers
2. **Nature of commodities** - The type of commodity differs in different market
In monopoly – no close substitutes
In monopolistic – differential products
In oligopoly and duopoly – homogenous products
- 3 **Price** – Price are different in different market
- 4 **Entry of firms** – In imperfect market entry especial in monopoly entry is restricted.
- 5 **Factor mobility** – The factors of production are not freely mobile.
- 6 **Knowledge about the market** – Consumers are not fully aware about the markets.
- 7 There is **both** transport and selling cost.
- 8 **AR** curve has downward sloping.

Table 10.1 shows, what is the nature of product, its elasticity and pricing in various forms of markets, which is based on competition.

Table 10.1

form of market structure	number of firms	Nature of product	Price elasticity of demand for individual firm	degree of control over price
Perfect competition	Large number of firms	Homogeneous products	Infinite	none
Imperfect competition	Large number of firms	Differentiated products(close substitutes)	Large	some
Monopoly Competition	One	Unique product without close substitute	Very small	considerable
Monopolistic competition	Many firms	Differentiated products(close substitutes)	Large	some
Pure oligopoly (without product differentiation)	Few firms	Homogeneous products	Small	some
Pure oligopoly (with product differentiation)	Few firms	Differentiated products which are close substitutes	Small	some

10.5 Revenue

Revenue is the proceeds or receipts that a firm from the sale of its products. In other words it is the amount of money received by the producer by the sale of goods and services is called as revenue. The revenue received by a firm depends upon two variables namely (1) price and (2) quantity sold.

$$R = P \times Q \text{ or } PQ$$

Where P – price, Q – quantity and R – revenue.

Normally as the price decreases the sales increase therefore the revenue also increases but only to certain point. A price decrease beyond a limit no doubt may increase the sales but it may not increase the revenue. Economists use three concepts of revenue –

(1) Total Revenue (TR) (2) Average Revenue (AR) (3) Marginal Revenue (MR)

10.5.1 Total Revenue

TR is the total income or receipts of the firm through its sales. For any output, total revenue is the price per unit multiplied by the number of units sold.

$$\text{Total revenue} = \text{price per unit} \times \text{number of units sold}$$

$$\text{i.e. } TR = P \times Q$$

If the price per unit is Rs.30 and 400 units are sold at this price, then the firm gets Rs.12,000 as total revenue. It can be shown as –

$$TR = P \times Q = 30 \times 400 = 12000$$

$$TR = \text{Rs. } 12,000$$

10.5.2 Average Revenue

Average revenue is the revenue per unit of output. AR is obtained by dividing total revenue by the number of units sold. If TR is equal to PQ, number of units sold is Q. then AR is equal to Price because –

$$AR = \frac{TR}{Q} = \frac{\text{Total revenue}}{\text{No. of units sold}}$$

$$\text{i.e. } AR = \frac{PQ}{Q} = P$$

$$\text{Thus } AR = P$$

If TR = Rs.12,000 and number of units sold is 400 then average revenue is –

$$AR = \frac{TR}{Q} = \frac{12,000}{400} = 30$$

$$AR = 30 = P$$

It should be noted that irrespective of the type of the market average revenue is always equal to price. The price paid by the buyer is revenue from the view point of the seller. Hence average revenue curve of the firm is really the same thing as the demand curve of the consumer.

10.5.3 Marginal Revenue

It is the additional revenue earned by selling one more additional unit of the product, it is the addition made to the total revenue. In other words, change in TR arising from the sale of an additional unit of output is called marginal revenue (MR).

$$MR = \frac{\Delta TR}{\Delta Q}$$

Where ΔTR – change in total revenue and ΔQ is change in quantity.

Suppose a firm earns a TR of Rs.30 by selling one unit and if the firm increases sells one more unit and the TR earned from the second unit is Rs.50, then the additional made to TR is Rs.20, which is MR.

$$MR_n = TR_n - TR_{n-1}$$

A schedule showing the relation between total, average and marginal revenues is shown in Table 10.2

Table 10.2
Total, Average and Marginal Revenues

No. of units sold	Total revenue	Average revenue	Marginal revenue
1	16	16	16
2	30	15	14
3	42	14	12
4	52	13	10
5	60	12	8
6	66	11	6
7	70	10	4
8	72	9	2
9	72	8	0
10	70	7	-2

10.6 Relationship between TR, AR and MR Curves

The relationship between AR and MR is same as any other average and marginal values. When average revenue falls, marginal revenue is less than the average revenue. If the relation between marginal and total revenue it would also be same as any other marginal and total values. Total revenue curve is shown in figure 10.2. Marginal revenue is positive till the total revenue is increasing and when total revenue reduces then marginal revenue becomes negative. If AR and MR are considered to be straight lines, then it can be shown that MR curve will cut the distance between AR curve and Y-axis in the middle. The relation between TR, AR and MR can be studied in the following points –

1. TR increases reaches maximum and then starts decreasing.
2. AR and MR keep on decreasing.
3. MR is always less than AR.
4. MR becomes zero and then negative.
5. When MR is zero then TR is maximum.
6. When MR is negative then TR starts decreasing.

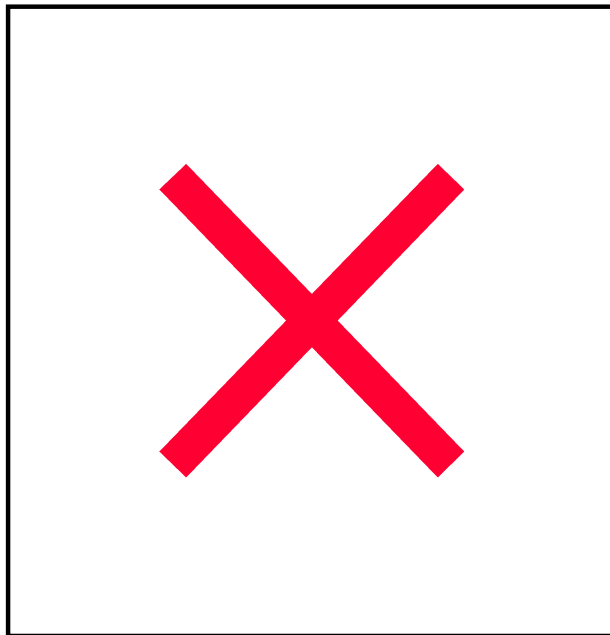


Figure 10.2

Revenue

Considered Figure 10.3 where both AR and MR curves are straight lines. Point A is taken on the AR curve and a perpendicular is drawn to y axis as AB. MR Curve cuts this perpendicular line at C, which is the mid point of this line. To prove MR curve is halfway between AR curve and Y axis we have to prove that $AC = BC$.

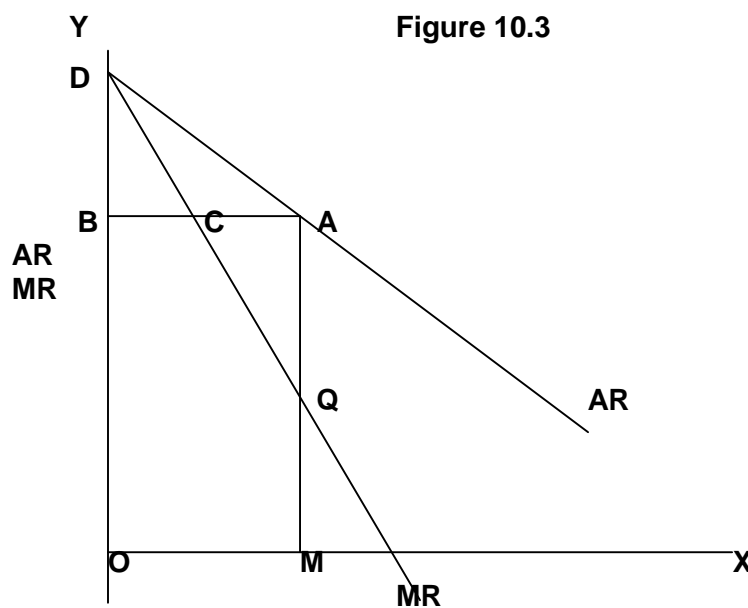


Figure 10.3

Quantity

Draw a vertical straight line from A so as to meet the X axis at M. It means that when OM quantity of goods are sold, AR = AM. Total revenue is –

$$\begin{aligned} \text{TR} &= \text{AR} \times \text{quantity sold} \\ &= \text{AM} \times \text{OM} \\ &= \text{area OMAB} \end{aligned}$$

TR can also be calculated in another way i.e. $\text{TR} = \Sigma \text{MR} = \text{area OMQD}$

Since TR for a given quantity of goods sold is to be same therefore, OMAB = OMQD. It can be noted from the figure that

$$\begin{aligned} \text{OMAB} &= \text{OMQCB} + \text{ACQ} \\ \text{OMQD} &= \text{OMQCB} + \text{BDC} \end{aligned}$$

From the above it follows that-

$$\text{OMQCD} = \text{ACQ} = \text{OMQCB} = \text{BDC}$$

$$\text{Or} \quad \text{ACQ} = \text{BDC}$$

Thus triangles ACQ and BDC are equal in area. In these triangles we find that –

$$\angle \text{QAC} = \angle \text{DBC} \quad (\text{right angles})$$

$$\angle \text{ACQ} = \angle \text{BCD} \quad (\text{vertically opposite angles})$$

$$\angle \text{BDC} = \angle \text{AQC} \quad (\text{alternate angles})$$

Therefore triangles ACQ and BDC are similar. When the two triangles are equal and similar then they are congruent i.e. equal in all respects.

$$\text{Hence AC} = \text{BC}$$

The above relationship between revenue AR and MR curves holds good generally for the straight line curves.

10.7 Revenue curves in perfect Competition

Under perfect competitive conditions where a firm is only a price taker and not a price maker. It can sell any number of units at market given price. In perfect competition TR curve slopes upwards as a linear straight line, (Figure 10.4) while AR and MR curves coincide with each other and as AR is same as price all the three coincide with each. They are parallel to X- axis as show in figure 10.5. The values of price, TR, AR and MR will be as shown in table 10.3

Table 10.3

Price	Sales	TR	AR	MR
10	11	10	10	10
10	2	20	10	10
10	3	30	10	10
10	4	40	10	10

Figure 10.4

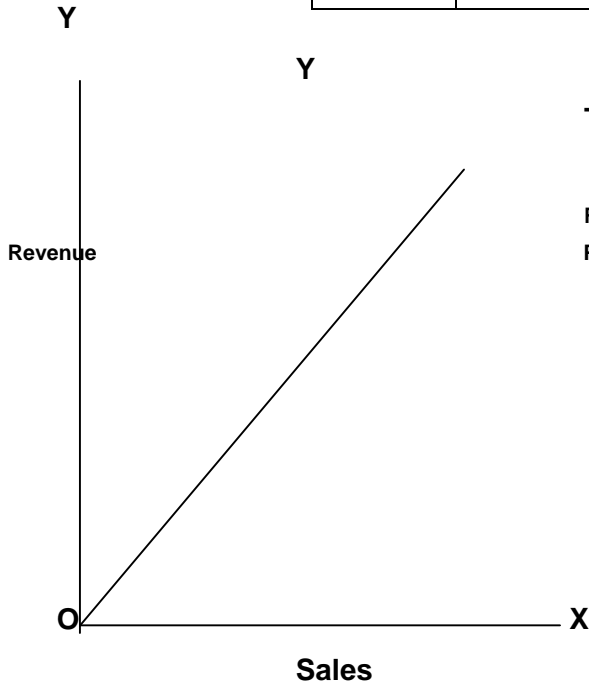
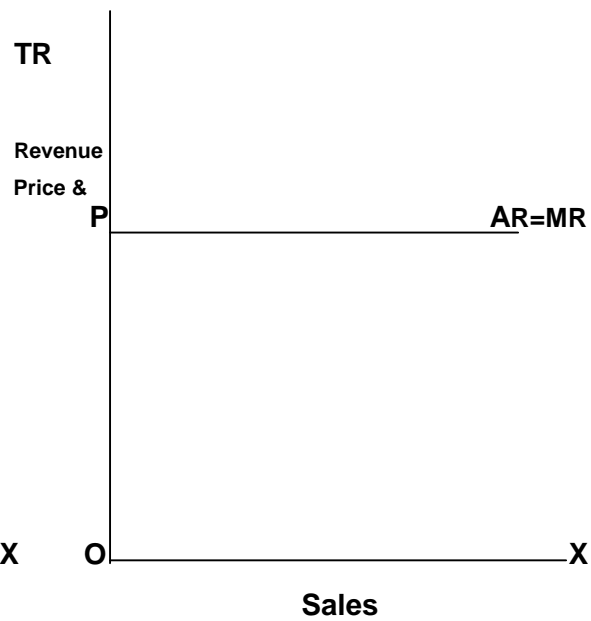


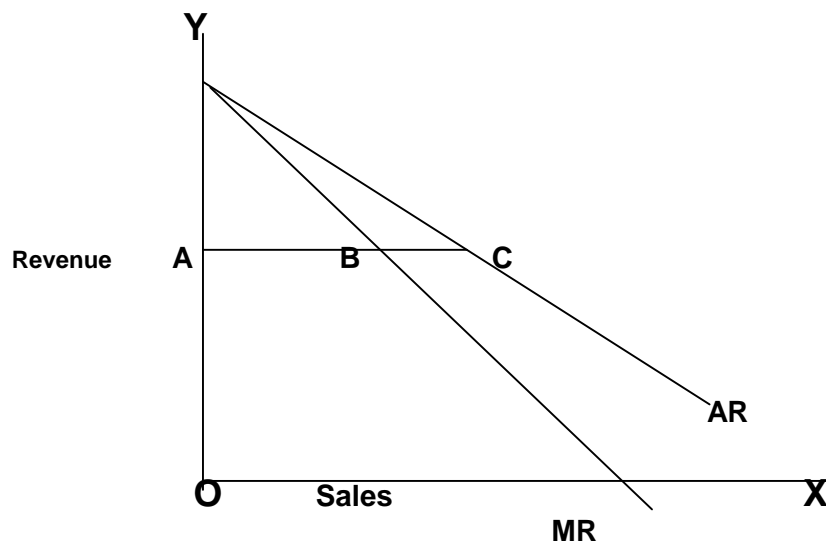
Figure 10.5



10.8 Revenue curves in Imperfect Competition

When the market is imperfect competition market then MR and AR curves slope downwards. The shape of the curves and their relationship varies depending upon the nature of the competition and the demand for the product. If AR is a linear straight line then MR will be below AR. A perpendicular drawn from Y axis will be bisected by MR curve as shown in the figure 10.6, where AB = BC. The proof for this is already discussed above. On contrary when the AR curve is concave or convex the MR curve does not cut in the middle of the perpendicular line drawn from Y axis. These two cases are discussed in the following paragraphs.

Figure 10.6



If the AR curve is convex to the origin and if a perpendicular is drawn from AR curve to Y axis, then MR curve will cut the line at a point less than the mid point between AR and the Y axis. In Figure 10.7 it is seen that when a perpendicular line AC is drawn from AR curve to Y axis, it cuts MR curve at S which is less than the mid point B. If AR curve is concave to origin. Any perpendicular drawn from AR to Y axis will cut the MR curve at a point more than mid point between the AR curve and Y axis. As in the Figure 10.8 the perpendicular line AC is drawn from AR curve to Y axis, it cuts MR curve at S and not at B which is the mid point rather it cuts the perpendicular line at more than the mid point.

10.9 Summary

Market in simple language is a place where the buyers and sellers come in contact with each other. The market is a set of conditions in which buyers and sellers come in contact for the purpose of exchange. Market can be classified on basis of –On basis of area which can be further divided into local national and international; the next is on basis of time which can be divided into very short period, short period and long period markets; the third type is On basis of competition which of various types perfect and imperfect markets. Again imperfect markets can be of various types namely – monopoly, duopoly, monopolistic and oligopoly.

Market and Revenue are linked. Revenue is the proceeds or receipts that a firm from the sale of its products. Economists use three concepts of revenue namely TR, AR, MR. The relationship between AR and MR is same as any other average and marginal values. When average revenue falls, marginal revenue is less than the average revenue. If the relation

between marginal and total revenue it would also be same as any other marginal and total values. In perfect competition $AR=MR=Price$ and it is parallel to X axis. When the market is imperfect competition market then MR and AR curves slope downwards. The AR and MR curve can be either concave or convex and the proofs are explained.

10.10 Self Assessment Questions

1. What is a market? What are the types of market?
2. Explain the concept of revenue and its types with suitable curves.
3. Explain the relationship between AR and MR curves in perfect and imperfect competitive markets.

10.11 References

1. Stonier and Hague : A Text Book of Economic Theory
2. Mrs. Joan Robinson : The Economics of Imperfect Competition
3. Sundaram K.P.M : Business Economics
4. Ahuja H.L : Principles of Micro Economics

Dr. (Smt.) M.Syamala

Lesson : 11

PERFECT COMPETITION

11.0 AIMS AND OBJECTIVES:

The main aim of this chapter is to study the features and price determination under perfect competition. We will also observe the equilibrium of the firm in the short run and long run under perfect competition. We also observe the equilibrium of the industry in perfect competition in this chapter.

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- 11.1 Introduction**
- 11.2 Features of Perfect Competition**
- 11.3 Price Determination**
- 11.4 Price determination when demand changes and supply remains constant**
- 11.5 Price determination where demand remains constant and supply changes**
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- 11.7 Equilibrium of the firm and industry under perfect competition**
- 11.8 Equilibrium of the firm under perfect competition**
- 11.9 Equilibrium of the firm in the short period with abnormal profit**
- 11.10 Equilibrium of the firm in the short period with losses**
- 11.11 Equilibrium of the firm in the long run**
- 11.12 Equilibrium of the industry under perfect competition**
- 11.13 Conclusion**
- 11.14 Points to be remembered**
- 11.15 Key Concepts**
- 11.16 Model Questions**
- 11.17 Reference Books**

11.1 INTRODUCTION:

The concept of market is playing an important role in study of economics. The determination of price of any commodity is mainly depending on the market. more over, the decision with regard to production and purchase are also mainly depending on the nature of market. On the basis of competition the markets can be classified into two - 1. Perfect Competition, 2. Imperfect Competition.

DEFINITIONS: There are various definitions with regard to perfect competition.

According to Lift witch "Perfect competition is a market in which there are many firms selling identical products with no firm large enough relative to the entire market to be able to influence market price."

According to Bilas, "The perfect competition is characterised by the presence of many firms; they all sell identically the same product. the seller is a price - taker."

Mrs. Joan Robinson has defined perfect competition as "it prevails when the demand for the output of the each producer is perfectly elastic."

11.2 FEATURES OF PERFECT COMPETITION:

The following are te main features of perfect competition.

1. **LARGE NUMBER OF BUYERS AND SELLERS:** There are large number of buyers and sellers in perfect competition. the activity of one buyer or seller may not influence the market price. The output of single firm and purchase of a single buyer are very much less in the total output and purchases respectively.
2. **HOMOGENEOUS PRODUCTS:** In perfect competition the goods produced by different firms are homogeneous or identical. All te commodities are uniform in the aspects of quantity and quality. there is no product differentiation in this market. Therefore, the customers prefer all commodities equally.
3. **FREE ENTRY AND EXIT:** There is a free entry and exit of te firms in perfect competition. Every firm has the freedom to enter the market and exit from the market. If the firms are getting abnormal profits then the new firms may enter the market. If the firms are getting losses, then the firms have the freedom to leave the industry. So, in the long run under perfect competition all firms get only normal profits.
4. **PERFECT INFORMATION ABOUT MARKET CONDITIONS:** In perfect competition the buyers and sellers must have the perfect knowledge with regard to the prices of various commodities at different supply and demand forces. Therefore, it is possible to avoid price discrimination in this market.
5. **PERFECT MOBILITY OF FACTORS OF PRODUCTION:** There is a perfect mobility of factors of production with in the country. This situation leads to uniform cost of production in the whole economy. It implies that different factors of production are free to seek employment in any industry that they may like to do.

6. **UNIFORM PRICE LEVEL:** All commodities are uniform in perfect competition in the quantity and quality. Therefore, the prices of the commodities are also uniform.
7. **NO TRANSPORT COST:** In perfect competition in order to maintain uniform price level, the transport costs should not be included in the price level.
8. **DIFFERENCE BETWEEN FIRM AND INDUSTRY:** Under perfect competition there is a difference between firm and industry. Firm is a production unit and industry is a group of similar firms.

11.3 PRICE DETERMINATION:

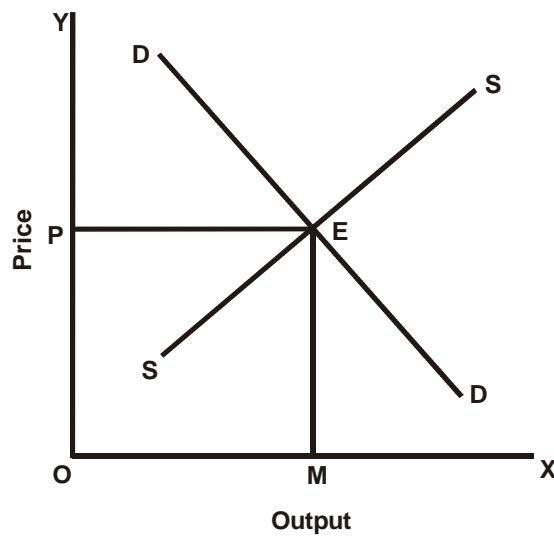
Generally prices are determined with the help of supply and demand forces. In perfect competition the price and output are determined at that point where the demand and supply both are equal. The following table explain the price determination under perfect competition.

Price (Rs.)	Demand	Supply
5	200	600
4	300	500
3	400	400
2	500	300
1	600	200

In the table above of the price of the commodity is Rs. 5 then there is a demand for 200 commodities and the supply is 600 commodities. If the price is reduced to one rupee, then the demand is increased to 600 commodities and the supply is decreased to 200 commodities. There is an inverse relationship between price and demand and there is a positive or direct relationship between price and supply. In the above table at Rs. 3 price level, there is demand for 400 commodities and the supply is also 400 commodities. Therefore, the price is determined as Rs. 3 in the above example.

DIAGRAMMATIC EXPLANATION:

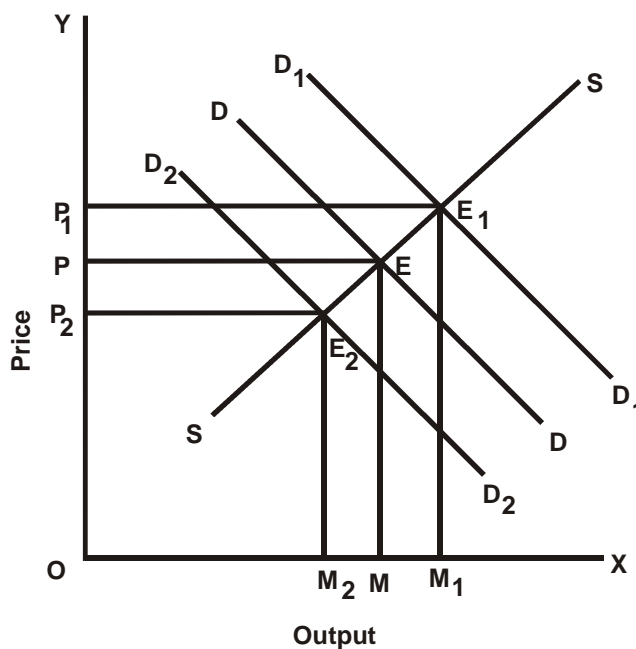
The price and output determination under perfect competition can be explained with the help of following diagram.



In the above diagram on X axis the output and on Y axis the price and determined. DD is the demand curve and it is falling down from left to right due to inverse relationship between price and demand. SS is the supply curve and it is increasing from left to right due direct relationship between price and supply. Both demand and supply curves are equal at point E. Therefore, the price is determined as OP and output as OM.

11.1 PRICE DETERMINATION WHEN DEMAND CHANGES AND SUPPLY REMAINS CONSTANT:

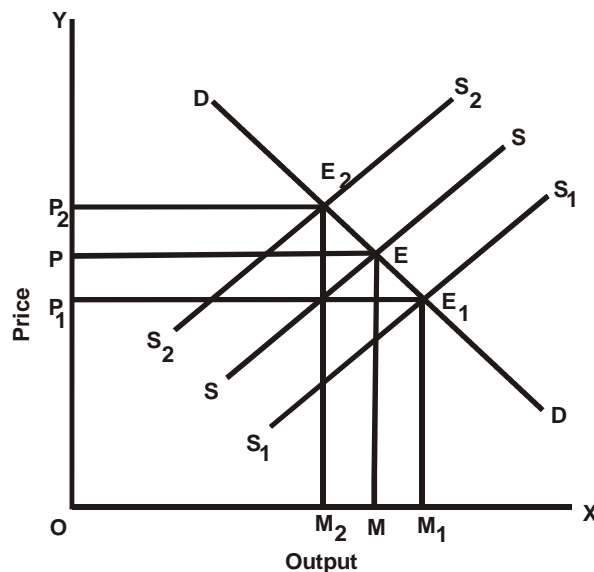
In perfect competition if supply being constant the equilibrium price rises when demand increases and when te demand decreases the price will fall down. This can be explained with the help of following diagram.



In the diagram the output is determined on X axis and price is determined on Y axis. DD is the demand curve and SS is the supply curve. In this diagram we are finding the price determination when demand changes and supply remains constant. The demand is increased from DD to DD_1 and this increased demand curve and constant supply curve intersect each other at point E_1 . Therefore, the equilibrium price is increased from OP to OP_1 and later the output is increased from OM to OM_1 . when the demand is decreased from DD to D_2D_2 , then this decreased demand curve and constant supply curve both are equal at point E_2 and therefore, the price is decreased from OP to P_2 and output is decreased from OM to OM_2 .

11.5 PRICE DETERMINATION WHEN DEMAND REMAINS CONSTANT AND SUPPLY CHANGES:

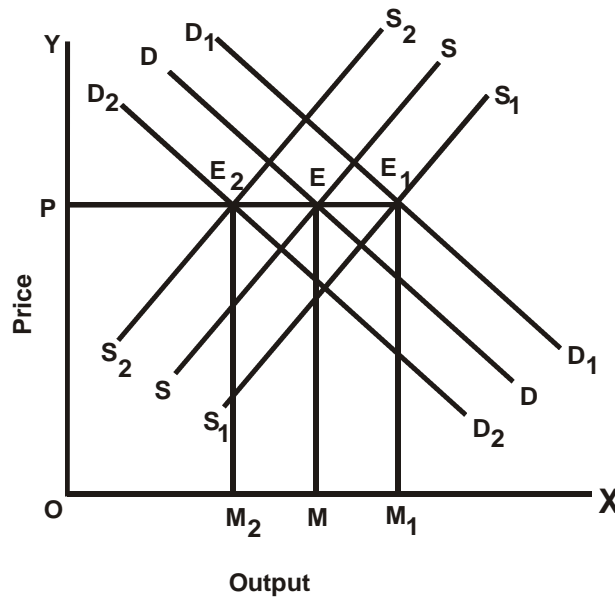
Under perfect competition if the demand being constant, the equilibrium price will rise when the supply decreases and when supply increases then the equilibrium price will fall. This can be explained with the help of following diagram.



In the diagram on X - axis the output and on Y axis the price are determined. DD is the demand curve and SS is the supply curve. When the supply is increased from SS to S_1S_1 , then the constant demand curve and the increased supply curve both are equal at point E_1 . So the output is increased from OM to OM_1 and the price is decreased from OP to OP_1 . when the supply is decreased from SS to S_2S_2 , then the decreased supply curve and the constant demand curve both are equal at point E_2 . Therefore, the output is decreased from OM to OM_2 and the price is increased from OP to OP_2 .

11.6 PRICE DETERMINATION WHEN BOTH DEMAND AND SUPPLY ARE CHANGED:

In perfect competition when the demand and supply both are changed in the same direction and in the same rate, then the equilibrium price may not be changed. This can be explained with the help of following diagram.



In the diagram on the X - axis the output and on Y - axis the price are determined. DD is the demand curve and SS is the supply curve and both are equal at point E and therefore, the price is determined as OP and the output is determined as OM . Suppose the demand and supply both are increased from DD to D_1D_1 and from SS to S_1S_1 respectively. Now the increased demand and supply curves are equal at point E_1 . At this point even though the output is increased from OM to OM_1 the price remains constant as OP . In the same way if the demand and supply both are decreased from DD to D_2D_2 and from SS to S_2S_2 respectively, then also the price remains constant as OP even though the output is decreased from OM to OM_2 . Therefore, under perfect competition, there will be no change in price if demand and supply both are changed in the same direction and same rate.

11.7 EQUILIBRIUM OF THE FIRM AND INDUSTRY UNDER PERFECT COMPETITION:

Market is a condition where buying and selling transactions are undertaken. On the basis of competition the markets are classified into perfect competition and imperfect competition. According to Liftwitch, perfect competition is a market in which there are many firms selling identical

products with no firm large enough relative to entire market to be able to influence the market price. According to Mrs. Joan Robinson perfect competition prevails when the demand for the output of the each producer is perfectly elastic.

In perfect competition there are large number of buyers and sellers. All the products are homogeneous in the quantity and quality. In this market there is free entry and exit of the firms and perfect availability of market information. There is a perfect mobility of factors of production. There is a uniform price and the transport costs are not included in the price level in perfect competition.

There is a difference between firm and industry under perfect competition. Firm is a production unit and where as industry is a group of firms. Equilibrium is a balancing position or resting point. A firm can get an equilibrium position where it has no desire to increase or decrease its output. A consumer is in equilibrium position where he gets maximum satisfaction with the help of his limited income. The producer gets an equilibrium position if he gets maximum production with the available resources. According to Bilas, "where profits are maximised we say the firm is in equilibrium."

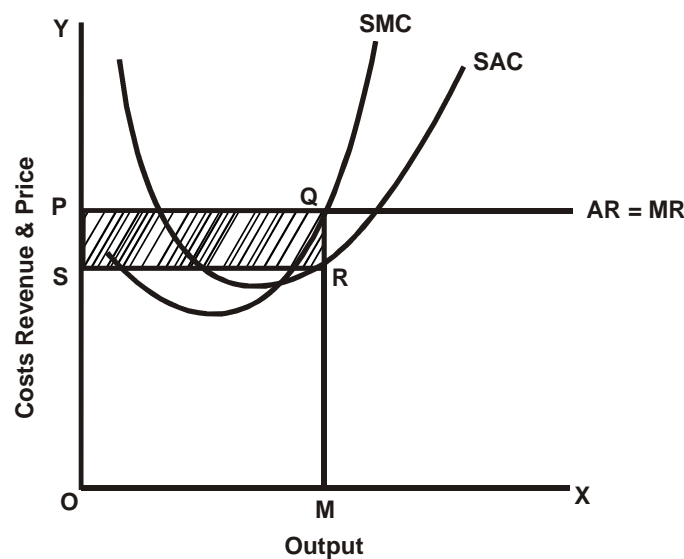
11.8 EQUILIBRIUM OF THE FIRM UNDER PERFECT COMPETITION:

The following conditions are necessary for attainment of equilibrium of the firm under perfect competition.

1. The firm must try to get maximum profits.
2. Marginal cost must become equal to marginal revenue and at that equilibrium point price and output are determined.
3. The marginal cost curve must cut the marginal revenue curve from below or from left side. At that equilibrium point the MC curve is at rising stage.

11.9 EQUILIBRIUM OF THE FIRM IN SHORT PERIOD WITH ABNORMAL PROFITS:

In perfect competition the firm can get abnormal profits or losses in the short period. The following diagram explains how the firm can get abnormal profits and reaches the equilibrium position in the short run.

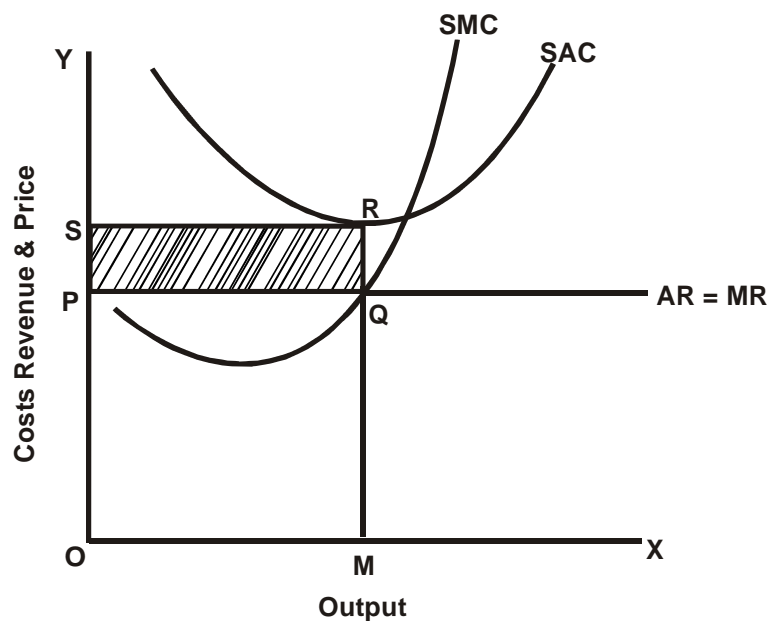


In the above diagram on X - axis the output and on Y - axis the cost, revenue and price are determined. In perfect competition the average revenue and marginal revenue curves are equal and therefore, AR and MR curves are equal and parallel to X axis due to uniform price level. In this diagram SMC curve is equal to MR curve at point Q. So, at that equilibrium point the output is determined as OM and the price as OP. Moreover at that equilibrium marginal cost curve is at rising stage. OPQM is the total revenue and OSRM is the total cost. If we deduct the total cost from the total revenue, then we can get the total profits. Therefore -

$$OPQM - OSRM = PQRS = \text{Profits.}$$

11.10 EQUILIBRIUM OF THE FIRM IN SHORT PERIOD WITH LOSSES:

In perfect competition in the short run some firms may get losses. We can know this thing with the help of following diagram.

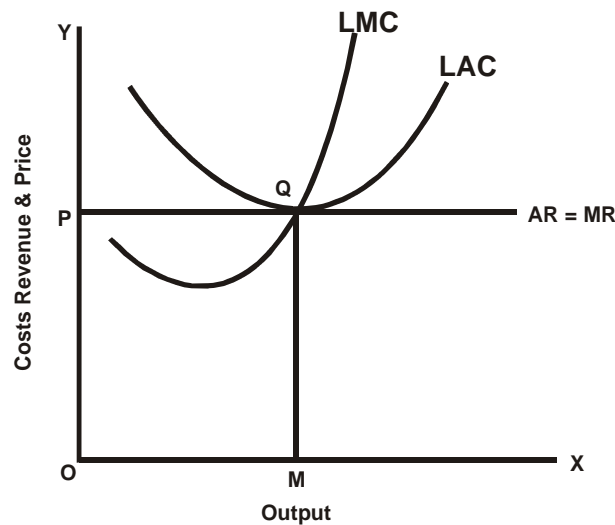


In the diagram on X - axis the output and on Y - axis the costs, revenue and price are determined. The marginal cost and marginal revenue are equal at point Q and therefore it is an equilibrium point. At this point average cost (SAC) is more than average revenue (AR). In the diagram OM is the output and OP is the price. OPQM is the total revenue and OSRM is the total cost. In this diagram total cost is more than total revenue and therefore, the firm is getting losses. In this diagram -

$$OSRM - OPQM = PQRS = \text{Losses}$$

11.11 EQUILIBRIUM OF THE FIRM IN THE LONG RUN:

Under perfect competition in the long run the firm does not get abnormal profits or losses because of free entry and exit of the firms. In the long run all firms get only normal profits. In this period both AC and AR become equal and therefore, the firms get only normal profits. This can be explained with the help of following diagram.



In the diagram on X axis the output and on Y axis the costs, revenue and price are determined. Both marginal cost and marginal revenue are equal at point Q and it is an equilibrium point. At this equilibrium point average cost (LAC) and average revenue (AR) both are equal. OPQM is the total revenue and also total cost. Therefore, the firm is getting only normal profits in the long run. These normal profits are included in the cost of production.

11.12 Equilibrium of The Industry Under Perfect Competition:

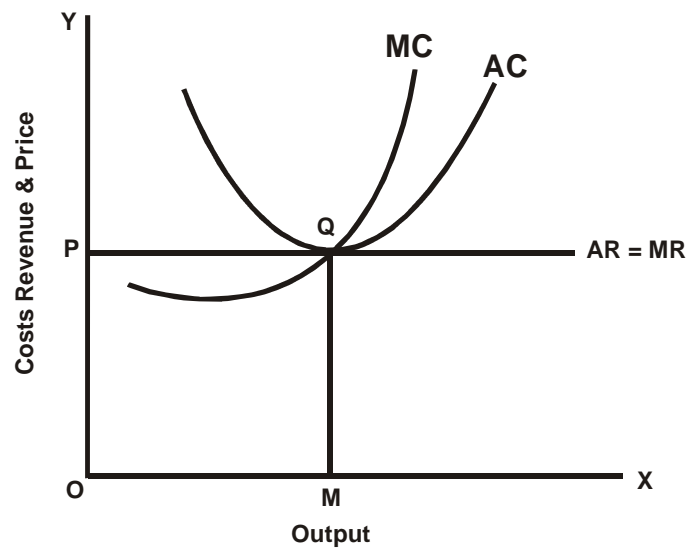
Industry is a group of firms producing similar products. In fact the concept of industry exists only under perfect competition. The industry is in equilibrium when it has no tendency to increase or decrease its level of output. Therefore, equilibrium of the industry means that forms are neither moving in or nor moving out.

In order to attain the equilibrium position of the industry under perfect competition the following conditions are observed -

1. All firms in the industry get only normal profits.
2. The industry gets an equilibrium position where the marginal cost is equal to marginal revenue.
3. In the case of industry at equilibrium point the marginal cost, average cost, marginal revenue and average revenue are equal.

DIAGRAMMATIC EXPLANATION:

Under perfect competition in the case of the firm in the short period there are some possibilities of getting abnormal profits or losses. But in the case of industry, there is no possibility of getting of abnormal profits or losses. The industry gets only normal profits. This can be explained with the help of following diagram.



In the diagram on X axis the output and on Y axis the costs, revenue and price are determined. In this diagram the MC and MR are equal at point Q. At this point the MC, MR, AC and AR are equal. The output is determined as OM and the price as OP. OPQM is the total revenue and also total cost. So, there are no abnormal profits or losses. The industry is getting only normal profits. These normal profits are included in the cost of production.

11.13 CONCLUSION:

In perfect competition the price, average revenue and marginal revenue are the same. There is a uniform price in perfect competition. Actually the concept of perfect competition is only a myth. It is not a realistic concept. The most important essential condition for equilibrium of the firm or industry under perfect competition is the marginal cost must become equal to marginal revenue.

11.10 POINTS TO BE REMEMBER:

1. There are various definitions with regard to perfect competition.
2. Perfect competition is having some features.
3. In perfect competition the price is determined at that point where demand and supply are equal.
4. Equilibrium is a resting point or balancing position.
5. Certain conditions are necessary for attainment of equilibrium of the firm under perfect competition.
6. In the short period under perfect competition some firms may get abnormal profits and some firms may get losses also.
7. In the long run all firms get only normal profits.

8. For attainment of equilibrium of the industry certain conditions are observed.
9. All firms in the industry get only normal profits.

11.15 KEY CONCEPTS:

1. **Firm** : Firm is a production unit. Goods produced by a single unit of production unit is known as firm.
2. **Industry** : Industry is a group of similar firms. The group of firms which are producing similar products is known as industry.
3. **Equilibrium** : Equilibrium is a balancing position or resting point.
4. **Marginal Cost** : Marginal cost is the additional cost which is added due to production of one more unit of output.
5. **Average Cost** : Average Cost is the unit cost. If we divide the total cost by the total quantity of output, then we get average cost.
6. **Marginal Revenue** : Marginal revenue is the additional revenue which we get because of selling of additional commodity.
7. **Average Revenue** : Average Revenue is the unit revenue. If we divide the total revenue by the total number of goods sold, then we can get average revenue.

11.16 MODEL QUESTIONS:

I. Essay Questions:

1. What is perfect competition and how the price is determined under it.
2. Explain the equilibrium of the firm and industry under perfect competition.

II. Short Essay Questions:

1. Write about the features of perfect competition.
2. Explain the equilibrium of the firm under perfect competition.
3. Write about the equilibrium of the industry under perfect competition.

III. Very Short Questions:

1. Conditions for equilibrium of the firm under perfect competition.
2. Condition for equilibrium of the industry under perfect competition.
3. Features of perfect competition.

11.17 REFERENCE BOOKS:

1. R.A. Bilas : Micro Economic Theory
2. Stonier & Hague : A Text Book of Economic Theory
3. H.L. Ahuja : Principles of Micro Economics
4. M.L. Jhingan : Micro Economic Theory
5. తెలుగు అకాడమి : అర్థశాస్త్ర సిద్ధాంతం
6. Centre for Distance Education : ఆర్థికశాస్త్రం - సిద్ధాంతము

Lesson : 12

MONOPOLY AND DISCRIMINATING MONOPOLY

12.0 AIMS AND OBJECTIVES:

The main aim of this chapter is to study the price and output determination under monopoly and discriminating monopoly. We also observe the main differences between perfect competition and monopoly market in this chapter.

CONTENTS:

- 12.0 Aims and Objectives**
- 12.1 Introduction**
- 12.2 Features of Monopoly**
- 12.3 Price and output determination under monopoly**
- 12.4 Price determination when costs are increasing or constant or falling**
- 12.5 Monopoly Price and Elasticity of Demand**
- 12.6 Price discrimination under monopoly**
- 12.7 Kinds of price discrimination**
- 12.8 Conditions for price discrimination**
- 12.9 Price and output determination under discriminating monopoly**
- 12.10 Degrees in price discrimination**
- 12.11 Importance of price discrimination**
- 12.12 Differences between perfect competition and monopoly**
- 12.13 Conclusion**
- 12.14 Points to be remember**
- 12.11 Key Concepts**
- 12.16 Model Questions**
- 12.17 Reference Books**

12.1 INTRODUCTION:

The word monopoly has been derived from the combination of two words like 'mono' and 'poly'. Mono means 'single' and 'poly' means 'seller'. Therefore, monopoly means single seller. It

is the ordinary meaning of monopoly. In economics monopoly is said to be existed when a firm is the single seller or producer of a product where there are no close substitutes for it.

DEFINITIONS:

According to Ferguson, "a pure monopoly exists when there is only one producer in the market. There are no dire competitions."

According to Mc. Connel, "pure or absolute monopoly exists when a single firm is the sole producer of a product for which there are no lose substitutes."

12.2 FEATURES:

The following are the main features of monopoly market.

1. **SINGLE PRODUCER:** Under monopoly there is only one seller or producer. He controls the entire supply of the commodities. Monopoly may be an individual or firm or a partnership or a joint stock company or a state. There is no competition in monopoly market.
2. **NO CLOSE SUBSTITUTES:** In monopoly market there are no close substitute products. There are no other firms producing the similar or near commodities for the product of monopoly.
3. **NO FREE ENTRY:** The new firms have no freedom to enter the market in the monopoly. Therefore, the monopoly firm can get abnormal profits in the short run as well as in the long run.
4. **NO DIFFERENCE BETWEEN FIRM AND INDUSTRY:** In monopoly market there is no difference between firm and industry. There is only one firm in this market and the other firms should not produce the similar products which are produced by the monopoly firm. Therefore, in monopoly market, the firm and industry both are same.
5. **REVENUE CURVES FALLDOWN FROM LEFT TO RIGHT:** The revenue curves are falling down from left to right in monopoly market. The monopolist can control only price or output. If the monopolist to sell more, he must reduce the price level and if he wants to fix more price, he must reduce the output.
6. **PRICE MAKER:** In monopoly market, the monopolist has complete control the supply of the commodity. Due to large number of buyers, demand of any one buyer constitute a small part of the total demand. Therefore, buyers have to pay the price fixed by the monopolist.

12.3 PRICE AND OUTPUT DETERMINATION UNDER MONOPOLY:

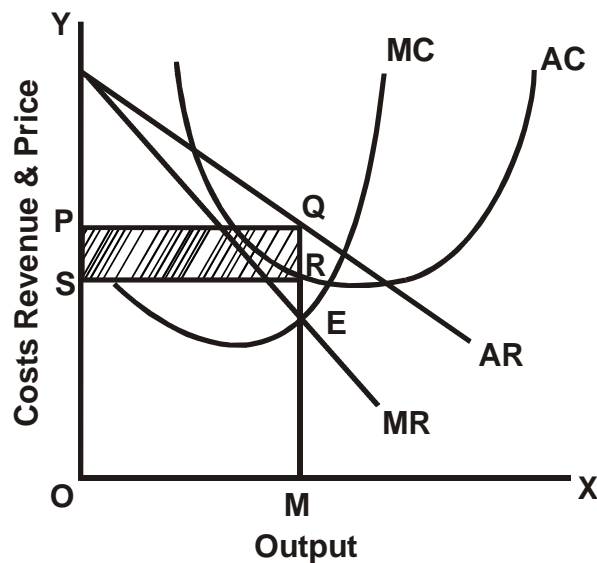
The following conditions are necessary for the price and output determination under monopoly market.

1. The aim of the monopolist in to get maximum profits. He must produce the goods to that extent where the marginal cost becomes equal to marginal revenue. AT that level he will get an equilibrium position and gets maximum profits.

2. The average revenue and marginal revenue curves fall down from left to right with the increase of output in monopoly market. If the monopolist wants to sell more output, he must reduce the price level and therefore, the revenue curves are falling down from left to right with the increase of output.
3. In monopoly the average revenue is equal to price and therefore, the AR line is the demand line.
4. Under monopoly market the MR falls more rapidly than the AR with the increase of the output.
5. In monopoly market, the monopolist fixes the output at that point where the marginal cost is equal to marginal revenue. On the basis of this, he will fix the price on the average revenue line and this is more than MR and AC. The difference between AR and AC is the amount of profit.

DIAGRAMMATIC EXPLANATION:

In monopoly market the output is determined at that point where MC and MR are equal and on the basis of this the price is determined on AR line. This can be explained with the help of following diagram.



In the above diagram on X-axis the output and on Y-axis the costs, revenue and price are determined. In this diagram AR is the average revenue, MR is the marginal revenue, AC is the average cost and MC is the marginal cost. In monopoly market where MC and MR are equal and at that point only the output is determined. On the basis of this equilibrium point the price is determined on AR line. In the above diagram the MC and MR are equal at point 'E'. Therefore, the output is determined as OM. On the basis of this the price is determined as OM on the basis of this the price is determined on AR line at point Q. Therefore, the price is OP or QM. The difference between AR and AC is the amount of abnormal profit per one unit. Therefore, QR is the unit

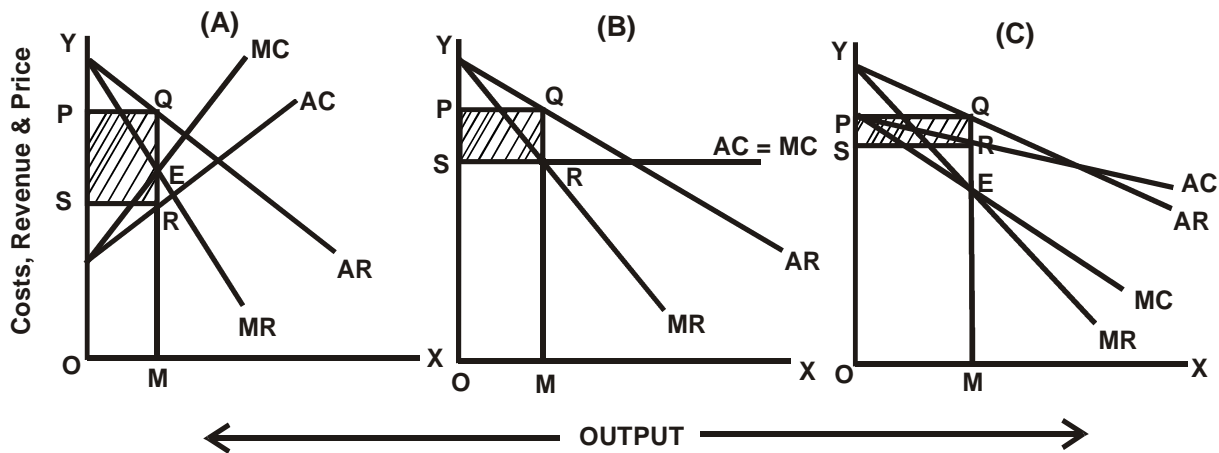
profit. IF we deduct the total cost from the total revenue, we can get the total amount of profit. Therefore -

$$OPQM - OSRM = PQRS = \text{Profit}$$

In the above manner to monopoly firm may get abnormal profits in the short run. In the short run the monopoly may get normal profits or losses. In the long run also the monopoly firm may get abnormal profits because of no free entry of new firms in the market.

12.4 PRICE DETERMINATION WHEN COSTS ARE INCREASING OR CONSTANT OR FALLING:

In price and output determination, there is a difference between perfect competition and monopoly. In perfect competition at equilibrium point the cost curves especially the marginal cost curve is at rising stage. But in monopoly market the cost curves may be increased or constant or decreased at equilibrium point. We can know these things with the help of following diagrams.



In the above diagrams on X axis the output and on Y axis the costs, revenue and price are determined. In diagram A the cost curves are increasing MC and MR are equal at point E and therefore, the output is determined as OM and on the basis of this the price is determined on AR line at point Q. Therefore, OPQM is the total revenue and OSRM is the total cost. So, PQRS is the total amount of profit.

In diagram (B) the marginal cost and marginal revenue (MC and MR) are equal at point R. OPQM is the total revenue and OSRM is the total cost and therefore PQRS is the total amount of profit. In this diagram AC and MC are constant and therefore, they are parallel to X axis.

In the diagram C the cost curves are falling. Marginal cost (MC) and marginal revenue (MR) are equal at point E and therefore it is equilibrium point. In this diagram OPQM is the total revenue and OSRM is the total cost and therefore PQRS is the total amount of profit.

12.5 MONOPOLY PRICE AND ELASTICITY OF DEMAND:

There is a relationship between monopoly price and elasticity of demand. The concept of

elasticity of demand is more helpful to monopolist in price determination. The main motive of monopolist is to get maximum profits. In order to get maximum profits the monopolist fixes more price in the case of those goods in which the demand is inelastic one and fixes less price in the case of elastic demand goods. If the monopolist is fixing the price on the basis of elasticity of demand, then only he will get maximum profits.

12.6 PRICE DISCRIMINATION UNDER MONOPOLY:

Price discrimination refers to the changing of different prices from different buyers by the monopolist for the same type of products. Therefore, the practice of selling the same commodities at different prices to different buyers is known as price discrimination. Under monopoly market only the price discrimination is possible.

DEFINITIONS:

Mrs. Joan Robinson has defined the price discrimination as "the act of selling the same article produced under single control at different prices to different buyers."

According to Stigler, "price discrimination refers to the sale of technically similar products at prices which are not proportional to their marginal cost."

12.7 KINDS OF PRICE DISCRIMINATION:

1. **PERSONAL DISCRIMINATION:** In this personal discrimination the monopolist changes different prices from different customers for the same type of product on the basis of ability to pay. For example a doctor may charge more fee from a rich patient and less fee from a poor patient for the same services rendered.
2. **PLACE OR LOCAL DISCRIMINATION:** The monopolist changes different prices in different markets for the same product under place discrimination. Duruping is the best example for place discrimination. According to this the producer may sell the same commodity at one price at home market and at the other price in abroad. Place discrimination is also known as local discrimination or geographical discrimination.
3. **TRADE OR USE DISCRIMINATION:** In this trade discrimination the monopolist will charge different prices for different types of uses of same commodity. For example, electricity will be sold at the lower price for agriculture purpose and at higher price for domestic purpose.

12.8 CONDITIONS FOR PRICE DISCRIMINATION:

The price discrimination is possible when the following conditions are prevailing.

1. **MORE THAN ONE MARKET:** There must be two or more than two separate markets, otherwise the price discrimination is not possible. For charging different prices from different persons, different markets must be existed.
2. **DIFFERENT ELASTICITIES:** The elasticity of demand in each market must be different. It means if one market is less elastic then the other market must be more elastic. This condition is very important condition for price discrimination.

There will be no scope for price discrimination if the elasticity of demand is equal in all markets.

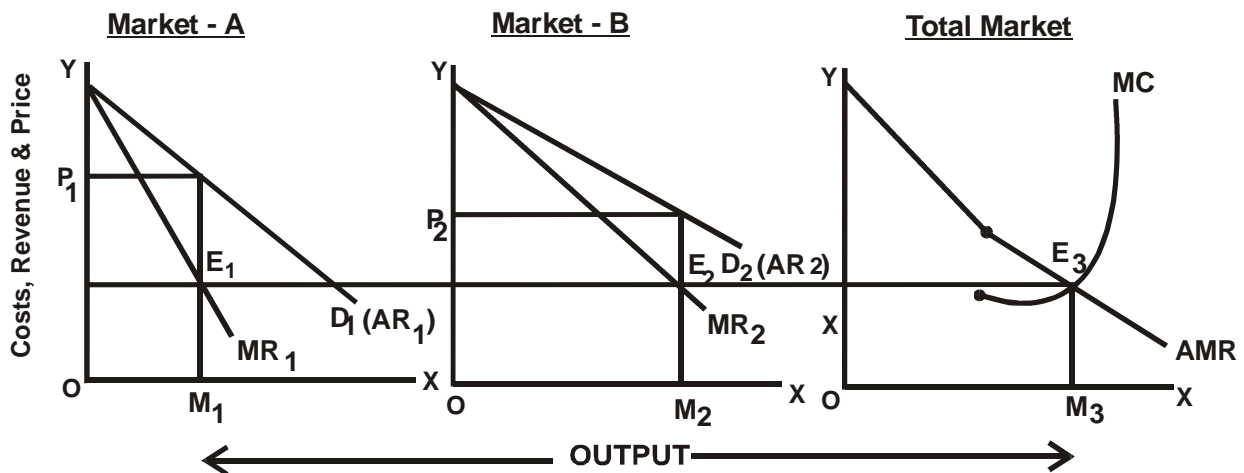
12.9 PRICE AND OUTPUT DETERMINATION UNDER DISCRIMINATING MONOPOLY:

The main aim of price discrimination under monopoly is to get maximum profits. The following conditions must be observed for getting of maximum profits and for price and output determination under discriminating monopoly.

1. The monopolist must fix more price in the case of inelastic demand and less price in the case of elastic demand.
2. All the marginal revenues in different markets must be equal to the marginal cost.

DIAGRAMMATIC EXPLANATION:

The following diagrams explain the price and output determination under discriminating monopoly where there are two markets.



In the above diagrams on X axis the output and on Y axis the costs, revenue and price are determined. In market A, MR₁ is the marginal revenue and D₁ is the demand or average revenue curves. In this market the demand is inelastic one. In market B, MR₂ and D₂ are the marginal revenue and demand curve respectively. The demand curve is also known as average revenue curve. In this market the demand is elastic one. If we combine the marginal revenue curves of these two markets (MR₁ + MR₂), then we can get the marginal revenue curve (AMR) in the total market. At point E₃ the marginal revenue is equal to marginal cost. Therefore, the output is OM₃. This equilibrium point is extended to market A and market B. The price in market A i.e. OP₁ is more than the price in market B i.e. OP₂.

12.10 DEGREES IN PRICE DISCRIMINATION:

A.C. Pigeon has distinguished the degrees of price discrimination into three on the basis of the degree or extent of price discrimination. Under first type of price discrimination the monopolist will fix different prices to different buyers in that way in which the consumer surplus is not allowed. This type of price discrimination is called perfect price discrimination.

In the second type of price discrimination the monopolist is fixing different prices to different buyers in that way in which he allows a part of consumer surplus but not the complete consumer's surplus.

In third degree of price discrimination the monopolist divides the buyers into two or more classes or groups or markets and charges different prices in different markets. In this type the markets are divided on the basis of the elasticity of demand. This degree of price discrimination is the most common one.

12.11 IMPORTANCE OF PRICE DISCRIMINATION:

1. There are several services such as rail transportation etc., which cannot be worked profitably unless the price discrimination is allowed. Uniform price for such services will lead to low income or losses to entrepreneur. In order to avoid those losses the price discrimination must be implemented.
2. Some times, for promotion of welfare of the community the price discrimination is compulsory. For example, if the doctor charges more fee from rich and low fee from the poor, then the public welfare can be promoted.
3. The government can reduce the economic inequalities to some extent with the help of price discrimination.
4. Price discrimination enables the monopolist to obtain a higher total revenue and larger output. Here the output would be identical with the perfectly competitive output. Therefore, the society at large is benefited, since output under discriminating monopoly is larger than with a single price.
5. When the monopolist fixes higher price in the case of inelastic demand goods and lower price for elastic demand goods and then the demand and output will not be badly affected.

12.12 DIFFERENCES BETWEEN PERFECT COMPETITION AND MONOPOLY:

Perfect competition and monopoly are the two extreme contradictory extreme concepts. There are some differences between perfect competition and monopoly. Perfect competition is that type of market where there are large number of sellers selling similar products and where the activity of single seller or buyer may be said to be existed when the firm is the sole producer or seller of the product where there are no close substitutes for this product.

In perfect competition there are large number of buyers and sellers and all products are homogeneous. In this market there is a free entry and exit of the firms and also perfect information about market conditions. There is also perfect mobility of factors of production. In perfect

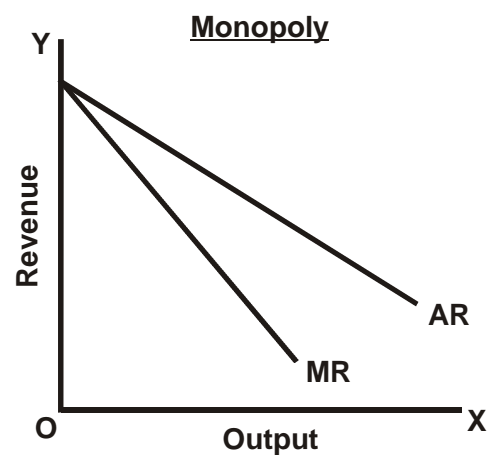
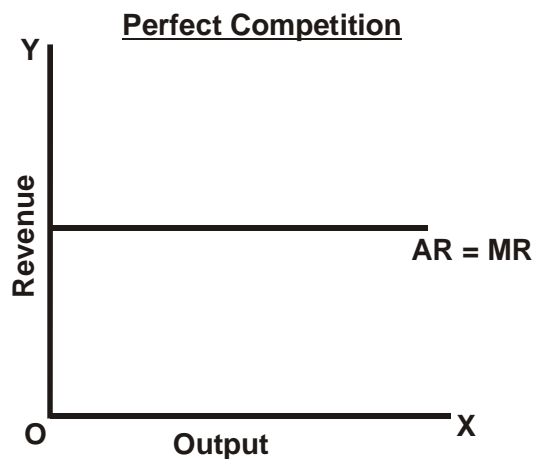
competition, there is a uniform price level. In this competition the transport costs should not be included in the price level. There is a difference between firm and industry under perfect competition.

In monopoly market there is only single seller or producer. There are no close substitute products for monopoly products. In this market there is no difference between firm and industry. The new firms have no right to enter the market. The monopolist has the controlling power on only the price or output. In this market the revenue curves fall down from left to right with the increase of output.

DIFFERENCES:

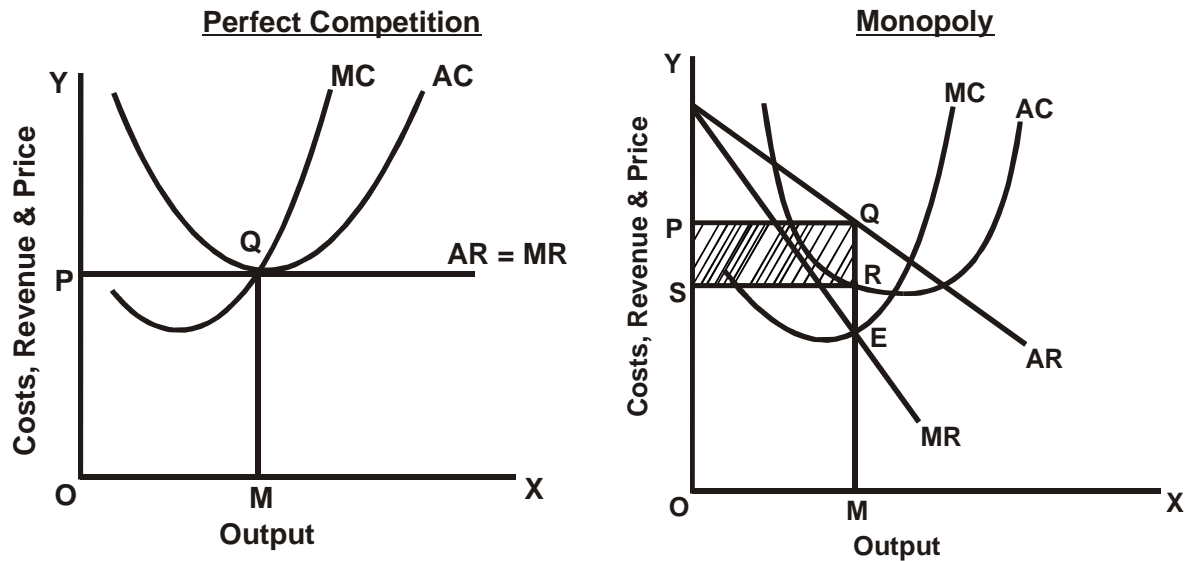
The following are the main differences between perfect competition and monopoly.

1. **NUMBER OF SELLERS:** In perfect competition there are large number of sellers who are producing homogeneous products. Therefore, the activity of single seller may not influence the market price. But in monopoly there is a single seller. He controls entire supply of the commodities. In this market there is no competition.
2. **NATURE OF REVENUE CURVES:** In perfect competition because of uniform price the average revenue and marginal revenue are equal. They are parallel to X axis. But in monopoly the average and marginal revenue curves fall down from left to right. We can know these things with the help of following diagrams.



In perfect competition AR and MR both are the same and they are parallel to X axis. In monopoly market AR and MR both are falling down from left to right. If the monopolist wants to sell more, he must reduce the price level and if he wants to fix more price he must reduce the output.

3. **PRICE AND OUTPUT DETERMINATION:** In perfect competition the price and output are determined at that point where MC and MR are equal. But in monopoly where MC and MR both are equal and at that equilibrium point the price is determined on AR line. We can know these things with the help of following diagrams.



In the case of perfect competition MC and MR both are equal at point Q and therefore, the point is determined as OM and price as OP. In monopoly market where MC and MR both are equal and at that equilibrium point only the output is determined and on the basis of the price is determined on AR line at point Q. So, the price is determined as OP.

4. **ENTRY AND EXIT OF THE FIRMS:** In perfect competition there is free entry and exit of firms. The new firms may enter the market when the firms are getting abnormal profits and leave the market when they are getting losses. But in monopoly the other firms have no freedom to enter the market.
5. **NATURE OF COST CURVES:** In perfect competition the firm gets an equilibrium position where the marginal cost is at rising stage. If the marginal cost curve falls down, then there is no possibility of equilibrium between MC and Mr. Under monopoly the firm may get equilibrium position where the MC is at a rising stage or constant or falling stage.
6. **DIFFERENCE BETWEEN FIRM AND INDUSTRY:** There is a difference between firm and industry under perfect competition. Firm is a production unit and industry is a group of similar firms. But in monopoly market, there is no difference between firm and industry and both are same.
7. **NORMAL PROFITS AND ABNORMAL PROFITS:** Under perfect competition in the short period the firm may get abnormal profits. But in the long run because of free entry and exit, the firm gets only normal profits. But in monopoly the firm may get abnormal profit in the short period as well as in the long period because of no free entry of new firms.
8. **NATURE AS AVERAGE COST AT EQUILIBRIUM POINT:** Under perfect competition the average cost becomes minimum at equilibrium point. In the above diagram in the case of perfect competition the average cost becomes minimum at point Q. But in monopoly market the firm attains equilibrium where the average

cost is at falling stage. In the diagram in the case of monopoly the average cost curve i.e. Ac is falling stage at the equilibrium point i.e. at point E.

9. **PRICE AND OUTPUT:** In perfect competition the output is more and the price is less and where as in monopoly the output is less and the price is more.
10. **UNIFORM PRICE AND PRICE DISCRIMINATION:** In perfect competition there is a uniform price and there is no price discrimination. Fixing of different prices to different customers for the same commodity is said to be price discrimination. But in monopoly, there is a possibility for price discrimination. Monopolist can fix different prices to different customers for the same commodities.
11. **PRICE TAKER AND PRICE MAKER:** In perfect competition the firm is a price - taker and where as in monopoly the firm is a price maker. In perfect competition the firms must follow and take the existing price. Under monopoly, the monopolist has full control over the supply of the commodity and therefore, the monopolist is price - maker.

12.13 CONCLUSION:

In this chapter we discussed the price and output determination under monopoly and price discrimination in monopoly. Monopoly is said to exist when a firm is the single seller or producer of a product where there are no close substitutes for it. The practice of selling the same commodities at different prices to different buyers is known as price discrimination. The monopolist will get maximum profits if he will fix prices on the basis of elasticity of demand.

12.14 POINTS TO BE REMEMBER:

1. Monopoly is a market where there is a single seller in which there are no close substitutes.
2. There are some features with regard to monopoly.
3. Certain conditions are necessary for price and output determination under monopoly.
4. Price and output are determined in monopoly at the time of increasing costs, constant cost and diminishing costs.
5. There is a relationship between monopoly price and elasticity of demand.
6. The practice of selling the same type commodities at different prices to different buyers is known as price discrimination.
7. There are various kinds of price discrimination.
8. The price discrimination under monopoly is possible when certain conditions are prevailing.
9. According to A.C. Pigou there are three degrees of price discrimination.
10. Price discrimination is supported on various grounds.
11. There are some differences between perfect competition and monopoly.

12.11 KEY CONCEPTS:

1. **Monopoly** : Monopoly is that type of market where there is a single firm producing the goods in which there are no close substitutes.

2. **Price Discrimination** : The practice of selling the same commodities at different prices to different buyers is known as price discrimination.
3. **Personal Discrimination** : If the monopolist charges different prices from different customers for the same type of product on the basis of ability to pay, then it is known as personal discrimination.
4. **Place or Local Discrimination** : In this monopolist charges different prices in different places for the same product. It is also known as geographical discrimination.
5. **Trade or Use Discrimination** : The monopolist will charge different prices for different types of uses of the same commodity.

12.16 Model Questions:

I. Essay Questions:

1. What is monopoly and how the price and output are determined under it.
2. What is meant by price discrimination and how the price and output are determined under discriminating monopoly.
3. Explain the main differences between perfect competition and monopoly.

II. Short Essay Questions:

1. Write about the features of monopoly.
2. Explain the price and output determination under monopoly in different types of costs.
3. Write about the importance of price discrimination.

III. Very Short Questions:

1. Monopoly price and elasticity of demand.
2. Types of price discrimination.
3. Conditions for price discrimination under monopoly.

12.17 Reference Books:

1. R.A. Bilas : Micro Economic Theory
2. Stonier & Hague : A Text Book of Economic Theory
3. M.L. Jhingon : Micro Economic Theory
4. K.K. Dewett : Modern Economic Theory
5. తెలుగు అకాడమి : ఆర్థికశాస్త్ర సిద్ధాంతం
6. Centre for Distance Education : ఆర్థికశాస్త్రం - సిద్ధాంతము

Lesson : 13 & 14

MONOPOLISTIC COMPETITION & OLIGOPOLY

13&14.0 AIMS AND OBJECTIVES:

The main aim of this chapter is to analyse the equilibrium of the firm and industry in monopolistic competition. We also observe the nature and price determination under duopoly market. In this chapter we study the nature, feature and types of price determination under Oligopoly market.

CONTENTS:

- 13&14.1 Introduction**
- 13&14.2 Features**
- 13&14.3 Short run equilibrium of the firm under monopolistic competition**
- 13&14.4 Long run equilibrium**
- 13&14.5 Difference between perfect competition and monopolistic competition**
- 13&14.6 Difference between monopoly and monopolist competition**
- 13&14.7 Duopoly**
- 13&14.8 Oligopoly Market**
- 13&14.9 Features of Oligopoly**
- 13&14.10 Price determination under Oligopoly**
- 13&14.11 Diagrammatic explanation - kinked demand method.**
- 13&14.12 Points to be remembered**
- 13&14.13 Important Concept**
- 13&14.14 Model Questions**
- 13&14.15 Reference Books**

13&14.1 INTRODUCTION:

Prof. E.H. Chamberlin developed the concept of "Monopolistic Competition" in his book "The Theory of Monopolistic Competition" published in 1933. Monopolistic Competition refers to a market situation where there are many sellers of a commodity, but the product of each seller differs from each other. It is one type of imperfect competition. It is also sometimes referred to as 'group equilibrium'. There are some features of perfect competition and some features of monopoly.

in this monopolistic competition. Therefore, it is the midway of perfect competition and monopoly.

DEFINITIONS:

According to liftwitch, "Monopolistic Competition is a market situation in which there are many sellers of a particular product, but the product of each seller is in some way differentiated in the minds of consumers from the product of every other seller."

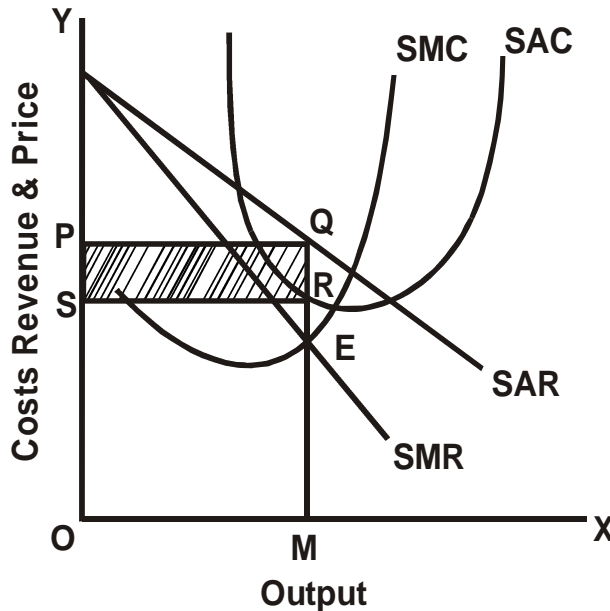
According to Joe S. Bain "Monopolistic Competition" is found in the industry where there is a large number of small sellers selling differentiated but close substitute products."

13&14.2 FEATURES:

1. **EXISTENCE OF LARGE NUMBER OF FIRMS:** There are large number of firms in monopolistic competition. The output of each firm is very small in the total output. Each firm acts independently without bothering about the reactions of the rivals because of existence of large number of firms.
2. **PRODUCT DIFFERENTIATION:** Under monopolistic competition there is a product differentiation. In this competition products are not homogeneous as in perfect competition and they are not remote substitutes as in monopoly. These products may be close substitutes. For example, Colgate tooth paste, Promise tooth paste, Close-up tooth paste etc... are close substitutes. Product differentiation can be brought about in so many ways.
3. **FREE ENTRY AND EXIT:** In monopolistic competition there is a free entry and exit of the firms. There is no difficulty for a new firm to enter the market or to leave the market under monopolistic competition. Because of existence of large number of firms there is a free entry and exit.
4. **LACK OF PERFECT KNOWLEDGE:** There is no perfect knowledge with regard to prices, quality of the products and quantity of the product produced in the market. The buyers do not know about all these products. The sellers do not know the exact preferences of buyers and unable to get advantage out of the situation.
5. **EXCESS CAPACITY:** In monopolistic competition the firms produce the goods up to that level where the average cost is at falling stage. The firms do not produce the output up to that level where the long run average cost is minimum. In monopolistic competition the amount of output that is produced by the firm is less than the ideal output. This is called excess capacity.
6. **SELLING COSTS:** Generally the costs on advertisements are commonly known as selling costs. According to Chamberlin selling cost is that cost which shifts the demand curve towards the right side. Therefore, the selling costs are useful for the increase of demand for the product. The producer spends on selling costs until where the additional revenue becomes zero. In real sense the selling cost will not promote the welfare of the consumers with the help of advertisements the firms may change the tastes and preferences of the consumers.

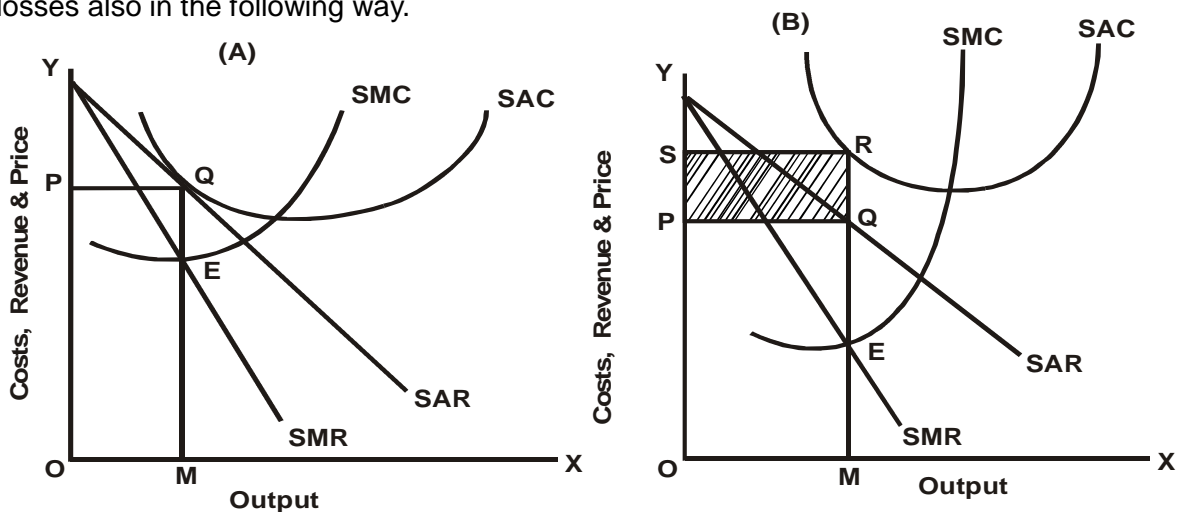
12.3 SHORT RUN EQUILIBRIUM OF THE FIRM UNDER MONOPOLISTIC COMPETITION:

In the short run some firms may get abnormal profits and attains equilibrium position in the following way.



In the diagram on X axis the output and on Y axis the costs, revenue and price are determined. SAR is the short run average revenue curve and also demand line. SMR is the short run marginal revenue curve. SAC is the short run average cost curve and marginal revenue curves are equal at point 'E'. Therefore, the output is determined as OM and price is OP. OPQM is the total revenue and OSRM is the total cost. QR is the amount of abnormal profit of one unit. PQRS is the total amount of profit.

In the short period it is possible that some firms may get abnormal profits like in the above manner. In the same short period some firms may get normal profits and some other firms may get losses also in the following way.



In the diagram 'A' the firm is getting only normal profits which are included in the cost of production. The equilibrium output is OM. At OM output level the price is OP which is also equal to average cost. In the diagram OPQM is the total revenue and also total cost. Therefore the firm is getting only normal profits.

In the diagram 'B' the firm is getting losses. In this diagram at OM output level the price is OP. But the average cost is OS. So the firm is getting SP or QR amount of unit loss OPQM is the total revenue and OSRM is the total cost. So PQRS is the total amount of loss. Therefore -

$$OSRM - OPQM = PQRS = \text{Losses}$$

13&14.4 LONG RUN EQUILIBRIUM:

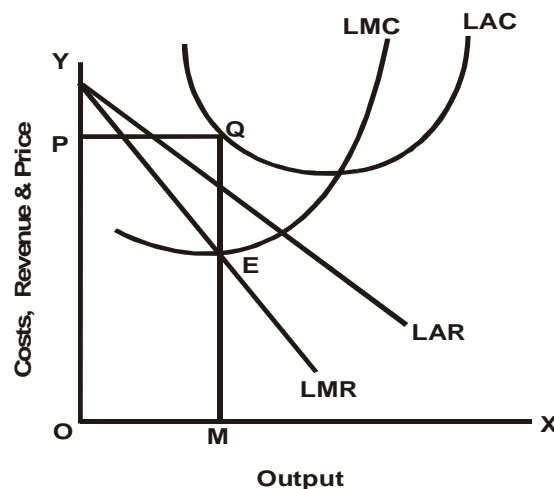
There is a free entry and exit under monopolistic competition. If the existing firms are getting abnormal profits, then the new firms may enter the market and if the firms are getting losses, then they have freedom to leave the market. Therefore, in the long period the firms get only normal profits. This can be explained with the help of following diagram.

In the above diagram on X axis the output and on Y axis the costs revenue and price are determined. LAC is the long run average cost curve and LMC is the long run marginal cost curve. LAR is the long run average revenue curve and LMR is the long run marginal revenue curve. The LMC and LMR are equal at point E. So the output is determined as OM and price as OP. In the diagram at equilibrium point the average cost is equal to average revenue. so the firm is getting only normal profits in the long run. These normal profits are included in the cost of production.

13&14.5 DIFFERENCE BETWEEN PERFECT COMPETITION AND MONOPOLISTIC COMPETITION:

There are some differences between perfect competition and Monopolistic Competition.

1. Under perfect competition in the long run the firm gets an equilibrium position at that level where the AC is the minimum and where as in monopolistic competition the firm gets an equilibrium position where the AC is at falling stage. Therefore, in monopolistic competition, there is an excess capacity.



2. In perfect competition the revenue curves are parallel to X axis due to uniform price. In monopolistic competition the revenue curves are falling down from left to right.
3. In perfect competition all products are homogeneous in quantity and quality. But in monopolistic competition there is a product differentiation.
4. There is a perfect information about market conditions in perfect competition. But in monopolistic competition there is no perfect information about market conditions.

13&14.6 DIFFERENCE BETWEEN MONOPOLY AND MONOPOLISTIC COMPETITION:

Even though there are some similarities between monopoly and monopolistic competition, there are some differences between these two markets.

1. In monopoly there is a single seller and in monopolistic competition there are large number of sellers.
2. In monopoly, the firm may get abnormal profits in the short period as well as in the long period. But in the case monopolistic competition, the firm may get abnormal profits normal profits. In monopoly, there is no free entry of new firms and therefore, the monopoly firm may get abnormal profits in the short run as well as in the long run. In monopolistic competition there is a free entry and exit of new firms and therefore, the firms in the monopolistic competition can get only normal profits in the long run.
3. The absolute monopoly market is some what not a realistic one in practical life. The monopolistic competition is very nearer to practical and real life.

13&14.7 DUOPOLY:

Duo means two and poly means sellers. Therefore, duopoly refers to that type of market situation in which there are two sellers. There are two types of price determination under duopoly market - 1. Pricing under duopoly without product differentiation, 2. Pricing with product differentiation.

1. PRICING WITHOUT PRODUCT DIFFERENTIATION:

A. COLLUSIVE PRICE: when there are two sellers producing or selling identical products, there may be collusion between these two sellers. They may come to an agreement and divide the market between them and fix the price collectively. In such case it will be similar to that of monopoly market.

B. INDEPENDENT PRICING: There may be continuous price-war between the two sellers if there is no agreement between these two sellers. Each firm may try to drive out the other seller from the market by reducing the price. Some times the price may be lower than the average cost and it may lead to losses also.

C. LONG RUN PRICE: Under duopoly market if there is no product differentiation, the consumers do not have any special preference for any producer. So in the long

run. The two producers may charge the same price. Therefore, these two sellers may earn only normal profits.

COURNOT MODEL: A model of Oligopoly, projecting duopoly was first put forth by Cournot, a French economist in 1838. This model is developed on the basis of certain assumptions -

1. There are two sellers selling identical products.
2. There are large number of buyers.
3. The total output must be shared out.
4. The cost of production is assumed to be zero.
5. Each seller knows the demand curve of his product.
6. Each seller takes the supply & his rival to be constant and ignorant about his rival's plans of output.
7. Each seller wants to acquire maximum net revenue.

On the basis of above assumptions Cournot developed his model. Cournot model tells us that each producer will be supplying exactly equal quantities of output and the price charged will be the same.

EDGEWORTH MODEL: Edgeworth also developed his model on the basis of the same assumptions of Cournot - except one assumption. Edgeworth did not take the assumption of constant supply of rivals. He has taken the assumption of constant price of his rivals. There will not be any price stability under duopoly, according to Edgeworth. According to this model, the price changes continuously between competitive price and monopolistic price. According to Edgeworth duopoly situation is unstable and indeterminate equilibrium.

CHAMBERLIN MODEL: Prof. Chamberlin advocated a stable equilibrium model. He recognised the mutual interdependence of the two sellers. According to Chamberlin each seller is intelligent and recognises the importance of natural agreement between the two sellers. This will lead to a spirit of stable monopoly equilibrium.

2. **PRICING WITH PRODUCT DIFFERENTIATION:** Under duopoly market, if there is product differentiation, each seller may act as monopoly and is having his own market. Like in monopoly each seller decides his price and output. The seller who sells the superior quality of the product may earn abnormal profits when compared to the other seller.

13&14.8 OLIGOPOLY MARKET:

The term 'Oligopoly' is derived from two Greek words namely 'Oligoi' which means 'a few' and 'pollein' which means 'to sell'. Therefore, Oligopoly refers to that form of imperfect competition where there will be only few sellers producing either homogeneous products or products which are close substitutes. So Oligopoly market prevails when an industry is made up of a few firms producing either identical products or differentiated products. Oligopoly may also be referred as competition among the few.

DEFINITIONS:

According to Mc. Connel, "Oligopoly is a market situation in which number of firms in an industry is so small that each must consider the reaction of rivals in formulating its price policy".

In view of P.C. Dooley, "An Oligopoly is a market of only a few sellers offering wither homogeneous or differentiated products."

13&14.9 FEATURES OF OLIGOPOLY:

1. **INTERDEPENDENCE:** Existence of interdependence of firms in the main feature of Oligopoly market. The price and output decisions of one firm will effect the other firms.
2. **INDETERMINATE DEMAND CURVE:** In Oligopoly market no firm can forecast with fair degree of certainty about the nature and position of its demand curve. The firm can not make an estimation of sales of its products if it reduces its price.
3. **ELEMENT OF MONOPOLY:** Monopoly element may be prevailed in the Oligopoly market. In this market there are only few firms and each firm controls a large share of the market and therefore, we can find out the element of monopoly even in oligopoly to some extent.
4. **IMPORTANCE OF SELLING COSTS:** In Oligopoly market each firm employs various techniques of advertisements. Indeterminate demand leads to making of advertisements to make the average revenue curve more favourable.
5. **PRICE RIGIDITY:** In Oligopoly there is price rigidity. The price will be kept unchanged due to fear of retaliation and the price will tend to inflexible. Every firm knows the ultimate outcome of the price change and therefore no firm is willing to change its price. In order to avoid the retaliation among the consumers and to discourage the entry of new firms the existing firms want to maintain the stable price.

13&14.10 PRICE DETERMINATION UNDER OLIGOPOLY:

There are mainly three types of price determination under Oligopoly market -

A. Independent Pricing

B. Pricing under collusion

C. Price leadership

A. INDEPENDENT PRICING: In Oligopoly market, the firms may produce either identical products or products with close substitutes. If there is a product differentiation under Oligopoly each firm can act as a monopoly and fix the price independently. If these firms produce identical products, it is difficult to know the price determination in accurate manner. There may be heavy competition among these firms and finally they may fix the common reasonable price which can not be changed. But this policy of independent pricing can not withstand in the market.

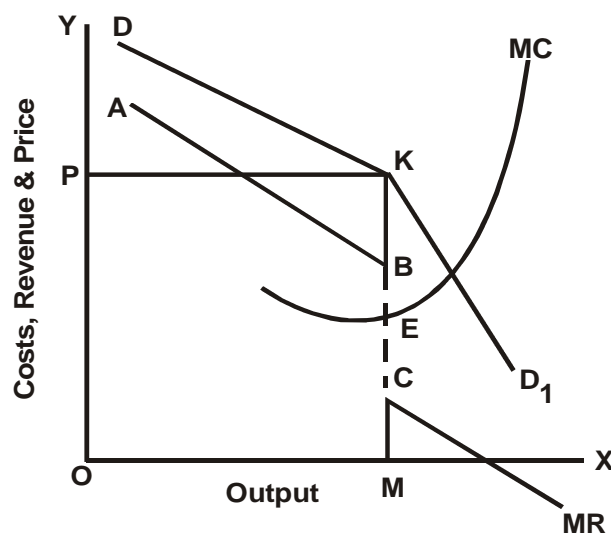
B. PRICING UNDER COLLUSION: Most of the firms have the opinion that independent price determination leads to uncertainty. To avoid this defect there is

a tendency among the oligopoly firms to act collectively by collusion. In this method these few firms may make 'cartel' arrangements. The firms may agree to share the market even though they are producing identical products. Generally the cartel determines the output produced by different firms and the price is also determined which is the most acceptable by all the firms.

C. PRICE LEADERSHIP: When the other firms follow the price which is determined by one firm in oligopoly then we can say that there is a price leadership. There are various ways of taking of leadership in price determination in oligopoly market. A dominant firm or the firm with low costs or a well established firm or a old firm may take the leadership and fix the price. Generally the other firms will follow this price.

13&14.11 DIAGRAMMATIC EXPLANATION-KINKED DEMAND METHOD:

In Oligopoly the popular method with regard to price and output determination is the method of 'Kinked demand method'. This concept was introduced by Paul M. Sweezy. We can know the price and output determination with the help of following diagram.



In the diagram on X axis the output and Y axis the costs, revenue and price are determined. The demand curve DD_1 has kink at point 'K'. It is the average revenue curve. The point 'K' divides the demand curve into two parts i.e., DK and KD_1 . DK part of demand curve is more elastic one and KD_1 part of demand curve is less elastic one. There is a price rigidity at point K because of several reasons. If particular firm rises its price, the other firms do not follow. Therefore, the demand for the particular product will be reduced on the other hand, if the particular firm cuts its price, its rivals will react and they will also reduce their prices. So, no firm has the desire to increase or decrease the price level. Therefore, there is a price rigidity in Oligopoly market. In the diagram

the marginal revenue curve is discontinuous between B and C. Marginal cost is equal to marginal revenue at point E. Therefore, the output is determined as OM and the price as OP.

In imperfect competition, the monopolistic competition duopoly and oligopoly are the most important concepts. In monopolistic competition there are large number of firms and there is a product differentiation. In this market we can find out some features of perfect competition and some other features of monopoly. In duopoly there are only two sellers. In Oligopoly market there are only few sellers. Price rigidity is the main feature of oligopoly market. Monopolistic competition and oligopoly market situations are very nearer to the real life.

13&14.12 POINTS TO BE REMEMBER:

1. Monopolistic Competition is a midway of both perfect competition and monopoly.
2. Existence of large number of firms, product differentiation importance of selling costs are some of the main features of monopolistic competition.
3. Under monopolistic competition in the short run some firms may get abnormal profits, some others get normal profits and some more firms may get even losses. But in the long run all firms get only normal profits.
4. There are some differences between perfect competition and monopolistic competition and monopoly and monopolistic competition.
5. In duopoly market there are two sellers. In this market prices are determined without product differentiation and with product differentiation.
6. Oligopoly market refers to that type of imperfect competition where there will be only few sellers producing either homogeneous products or products which are close substitutes.
7. Interdependence, price rigidity etc... are some of the features of Oligopoly market.
8. In Oligopoly market the popular method with regard to price and output determination is the method of 'Kinked demand method'.

13&14.13 IMPORTANT CONCEPTS:

1. **PRODUCT DIFFERENTIATION:** Product differentiation is the main feature of monopolistic competition. In this market the products are different but close substitutes.
2. **SELLING COSTS:** Generally the costs on advertisement are known as selling costs. Selling costs are useful for increase of the demand for the product.
3. **EXCESS CAPACITY:** In monopoly and monopolistic competition the output is not produced up to that level where the average cost is minimum. Therefore, the amount of output that is produced by the firm is less than the ideal output. This is called excess capacity.
4. **DUOPOLY:** 'Duo' means 'few' and 'poly' means 'sellers'. Therefore, duopoly is that type of market where there are only two sellers.
5. **OLIGOPOLY:** Oligopoly refers to that type of imperfect competition where there

will be only few sellers producing either homogenous products or differential products.

6. **PRICE RIGIDITY:** It is the main feature of Oligopoly market. The price will be kept unchanged due to fear of retaliation from rivals. Every firm knows the ultimate outcome of the price change and therefore, no firm is willing to change its price.
7. **KINKED DEMAND CURVE:** This concept was introduced by Paul M. Sweezy. We can find this Kinked demand curve in Oligopoly market. Kinked demand curve method represents the price rigidity.

13&14.14 MODEL QUESTIONS:

I ESSAY QUESTIONS:

1. Explain the short run and long run equilibrium of the firm under monopolistic competition.
2. Write about the features and price determination under Oligopoly market.

II SHORT ESSAY QUESTIONS:

1. Explain the features of Oligopoly.
2. Write about the features of monopolistic competition.
3. Write about the price determination with help of Kinked demand curve in Oligopoly market.

III VERY SHORT QUESTIONS:

1. Duopoly Market
2. Product Differentiation
3. Kinked Demand Curve
4. Price Rigidity

13&14.15 REFERENCE BOOKS:

- | | | | |
|----|-------------------------------|---|--------------------------------|
| 1. | Stonier & Hague | : | A Text Book of Economic Theory |
| 2. | R.A. Bilas | : | Micro Economic Theory |
| 3. | M.L. Jhingon | : | Micro Economic Theory |
| 4. | K.K. Dewett | : | Modern Economic Theory |
| 5. | తెలంగాణ అకాడమి | : | అర్థశాస్త్ర సిద్ధాంతం |
| 6. | Centre for Distance Education | : | ఆర్థికశాస్త్రం - సిద్ధాంతము |

1. **Functional Distribution** – It deals with the pricing of services of factors of production namely land, labour, capital and entrepreneur or organisation. It is concerned with the rewards or remuneration paid to these factors for their role played in production activity. Thus Functional Distribution relates to the share of rent, wages, interest and profit respectively to the above said factors of production. It is a macro concept.
2. **Personal Distribution** – It is the amount of wealth or income received by an individual in the society for the efforts he made. In other words it is his remuneration for the efforts he made. It is a micro concept. The personal distribution of income among the individual is the cause for the inequalities in the economy.

The theory of distribution deals with the functional distribution and not with the personal distribution. It seeks to explain how the rewards for the factors of production i.e. rent, wages, interest and profits are determined.

15.2 Theory of Marginal Productivity of Distribution

The theory is considered as the general theory of factor pricing as it can be used to determine the price of any factor of production. The theory is derived from economists like – Ricardo, J.B.Clark, Marshall and Hicks. The marginal theory of distribution is an attempt on the part of the economist to evolve a general theory which will explain the determination of factor prices such as wages, rent, interest and profits.

The key to the pricing of factors of production lies in marginal productivity. The remuneration or the reward which the firm will be willing to pay to the factors is nothing but price of the factor and this depends on their productivity. The greater the productivity of the factor the higher is the remuneration or price of that factor. The essence of this theory is that the price of any factor of production depends upon its marginal productivity. The theory is based on the following assumption

1. There is perfect competition in the labour market and product market.
2. There is perfect mobility of the factors of production.
3. All the units of factors are homogenous.
4. The theory assumes full employment of the factors.
5. A substitution is possible between the factors.
6. The firm employs factors till its price is equal to its marginal productivity.
7. The marginal productivity of an individual factor is measurable.

On basis of these assumptions we can explain various concepts of the theory. First, to understand the concept of marginal physical productivity of the factors.

15.2.1 Marginal Physical Product (MPP) – It is the addition made to the total output in physical units, when an additional unit of a factor is employed while other factors remain constant. This concept was developed with reference to labour but it is equally applicable to all the other factors of production.

For example, the total output produced is 100 units with 10 labourers. If an additional of 11th labourer is employed keeping the other factors constant, and if the output increases to 110 units. The MPP is $110 - 100 = 10$ units.

$$MPP = TP_n - TP_{n-1}$$

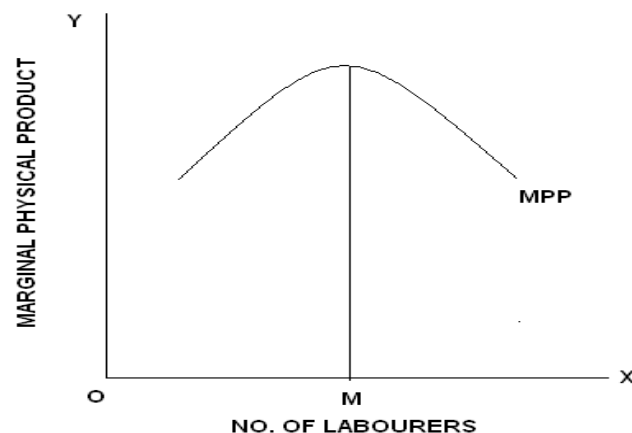
Where TP is total product and 'n' is the number of labourers employed. To understand this concept better a schedule is shown in Table 15.1. The marginal physical productivity of the labour increases, when an additional labourer is taken, until six labourers are employed. When the seventh labourer is employed, the marginal physical productivity of the labour begins to decline and continues to decline. The total physical product increases at first at increasing rate, after the seventh labour employed it increases at a diminishing rate. So long as the marginal physical productivity is increased, the total product increases at an increasing rate. The movement the marginal physical productivity begins to decline, the total product increases at a diminishing rate. The marginal physical productivity curve is shown in figure 15.1. The curve is in the shape of inverted U.

Table 15.1

Schedule of Total and Marginal Physical Productivity

Labourers employed	Total product (kgs)	Marginal physical product (kgs)
1	5	5
2	12	7
3	24	12
4	44	20
5	69	25
6	99	30
7	126	27
8	151	25
9	169	18
10	179	10

Figure 10.1



15.2.2 Average Physical Product (APP) – It is obtained by dividing total product with the number of factor units employed.

$$APP = TP / n$$

15.2.3 Marginal Revenue Productivity (MRP) – It is the net addition made to the total revenue by employing of an additional unit of a factor, other factors remaining constant.

$$MRP = MPP \times MR$$

Where MPP is the marginal physical product, MR is the marginal revenue. The MRP curve is in the shape of inverted U as shown in figure 10.2. It rises at first, but falls subsequently. The rising slope of the MRP curve indicates that there is an increase in MRP and vice versa. If it is assumed that the price of a unit is Rs.5 then MRP can be calculated with the above formula. This is explained in the following table 10.2

Table 10.2
Schedule of Marginal Revenue Productivity

Labourers employed	Marginal physical product (kgs)	Marginal Revenue Productivity of the Labour (Rs.)
1	5	25
2	7	35
3	12	60
4	20	100
5	25	125
6	30	150
7	27	135
8	25	125
9	18	90
10	10	50

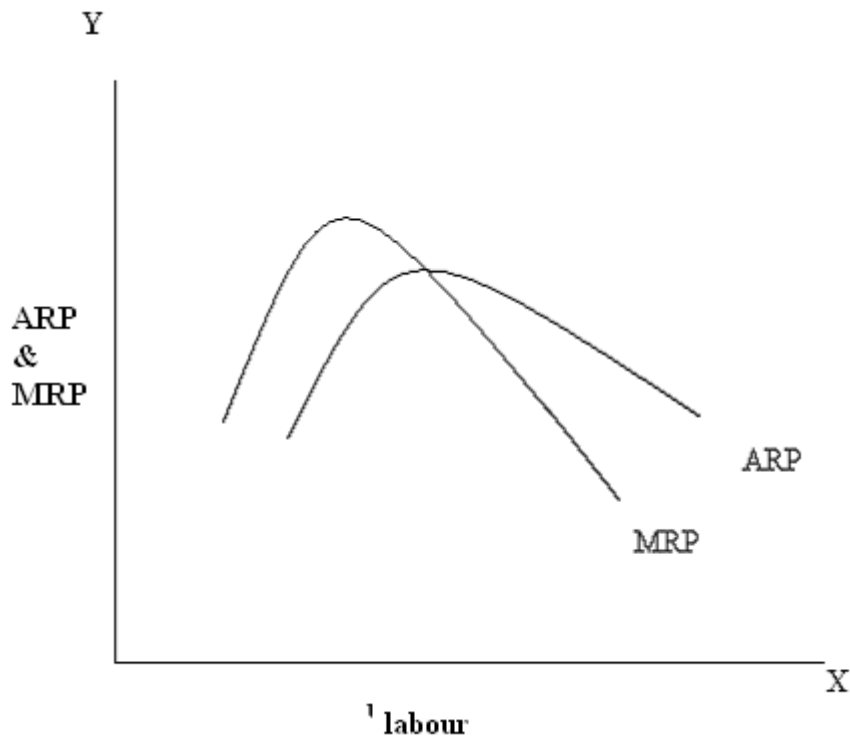
15.2.4 Value of Marginal Physical Product (VMPP) - It is obtained by multiplying marginal product with price.

VMPP = MPP X P, where MPP is the marginal physical product and P is the price.

The conceptual difference between MRP and VMPP is clear from the above equations. In MRP calculating MRP we consider MR and while calculating VMPP we consider P.

15.2.5 Relationship between ARP and MRP – The relationship between Average Revenue Product and Marginal Revenue Product can be explained through figure 10.2.

Figure 10.2



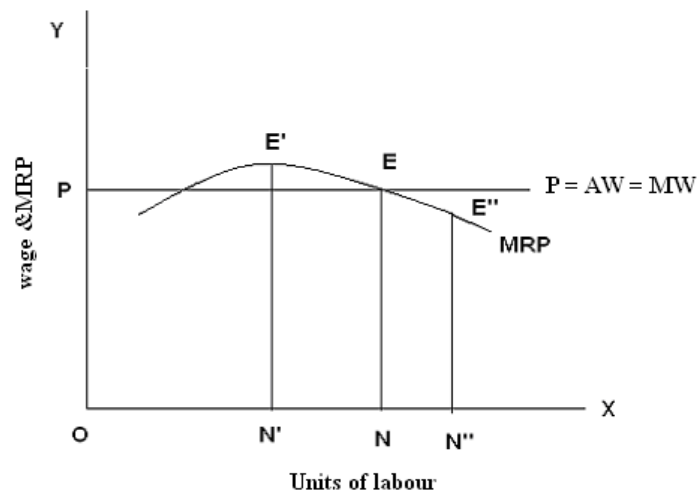
The relation between ARP and MRP that is shown in the above figure can be explained in the following way –

1. An increase in ARP increases MRP but the rise in MRP is greater than ARP.
2. When ARP falls, MRP also falls but the fall in MRP is more than in ARP.
3. When ARP falls MRP is below ARP.
4. When ARP is maximum then MRP is equal to it.

15.2.6 Factor pricing in the Firm

As the theory assumes perfect competition, factor pricing in the firm will be examined with this assumption. The price paid to the factor (labourer) is the cost of production for the firm. The supply curve of the factor is perfectly elastic. So the average wage cost = marginal wage cost = price. This is explained in figure 10.3. Marginal revenue product determines the demand curve for the labour. As it is perfect competition individual firm cannot influence the wage. The firm employs labourers till that point where it gets maximum profits.

Figure10.3

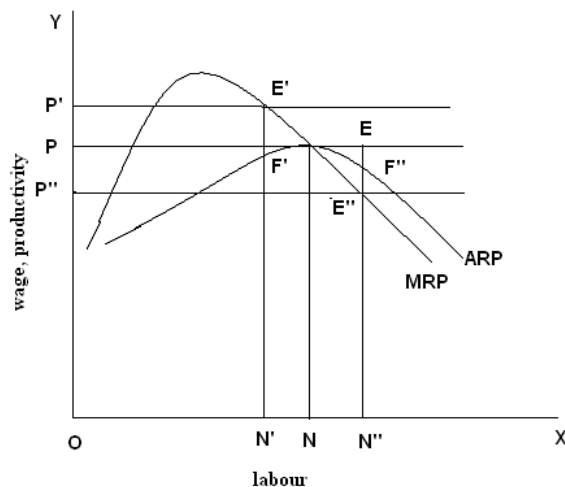


Given the price OP , the firm will employ ON units of labour where price $OP = MRP$ (EN). If it employs less than ON i.e. N' units, MRP will be $N'E'$ which is higher than the price OP . It implies that at this point of employment of an additional unit will add more to the revenue than to the cost. So, the firm increases employment till price = MRP i.e. till ON . If the firm employs more than ON say till ON'' , here price OP is more than MRP ($E''N''$). It implies that at this point employment of an additional labour will lead to increase of the cost rather than revenue to the firm. So, the firm decreases employment until price = MRP i.e. till ON .

15.2.7 Factor pricing in the industry (long run)

The equilibrium condition of the firm and industry is same but only difference is that industry is at equilibrium when $MRP = MW = \text{wage}$. This can be explained with

Figure10.4



Suppose the wage is OP' . Firm will be in equilibrium at E' and it employs ON' units of labourers. The average revenue productivity is $N'F'$ and the firm makes a loss of $E'F'$ one each unit of labour. In long run, some of the firms leave the industry. Demand for the labour decreases, as a result the price reduces to OP level. Suppose the price of the labour is OP'' then firm will be at equilibrium at E'' . It employs N'' units of labour. Firm makes a profit of $E''F''$ on each unit of labour. IN the long run, attracted by these profits more firms enter the industry. As a result the price increases to OP level. Therefore in the long run wage of labour = average revenue productivity = marginal revenue productivity.

15.3 Criticism

The following are the criticism against the marginal productivity of the theory of the distributions

1. **Factors are not homogeneous** – The theory assumes that factors of production are homogeneous but factors are never alike land defers in fertility, labour defers in efficiency and so on.
2. **Factors are not substitutable** – The theory assumes that the factors are assumable but in reality this is not possible. If substitutability is not possible the theory of marginal productivity of deferent factors can't be equal.
3. **Perfect mobility of factors** - The factors of production are not mobile so the assumption is unrealistic. If the factors of production are not mobile among different users the marginal indifferent users will defer.
4. **Divisibility** of factors as assumed in the theory is not possible machines, managers, factory buildings are indivisible. So the theory is based on unrealistic assumptions.
5. The theory holds good only if all the employees aim at **maximum profit**. But in practice every employers defers in his objectives.
6. The assumption of **full employment** is a myth. If the economy works beyond the full employment workers will be available at the price less than marginal productivity.
7. The theory is not valid in **short term**. As it assumes long run.
8. The theory is based on **perfect competitive** market. But in the real world we have only imperfect markets.
9. **Measurement** of marginal productivity of a factor is impossible task.
10. The theory is based on the assumption of **constant returns to scale**. But a constant return to scale is a rear situation. So the theory has little practical application.

15.4 Modern Theory

The marginal productivity theory explains only about the number of units that are employed, given the price of the factor. It does not explain as how the price of a factor is determined. The theory is one sided. It emphasizes the demand side ignoring the supply side. Modern economists feel that both the demand and supply forces are needed to determine the price of commodities and they can only determine the price of factors. Now let us consider demand and supply side of the factors.

15.4.1 Demand

Demand for a factor is derived demand. The demand for a factor depends on the demand for the final goods that is produced by the factor. The demand for a factor is joint demand as it depends on the demand of cooperating factors. The demand for a factor depends on factor substitutability, demand elasticity of the final product and technical progress. The marginal revenue productivity determines the demand for the factor. MRP curve slopes downwards because the more the factor is used; the lower is its marginal productivity. The firm is at

equilibrium by equalizing the prices of the factor and its MRP. MRP is the demand of the firm. To determine the total demand the sum of demands of all firms in the industry is considered.

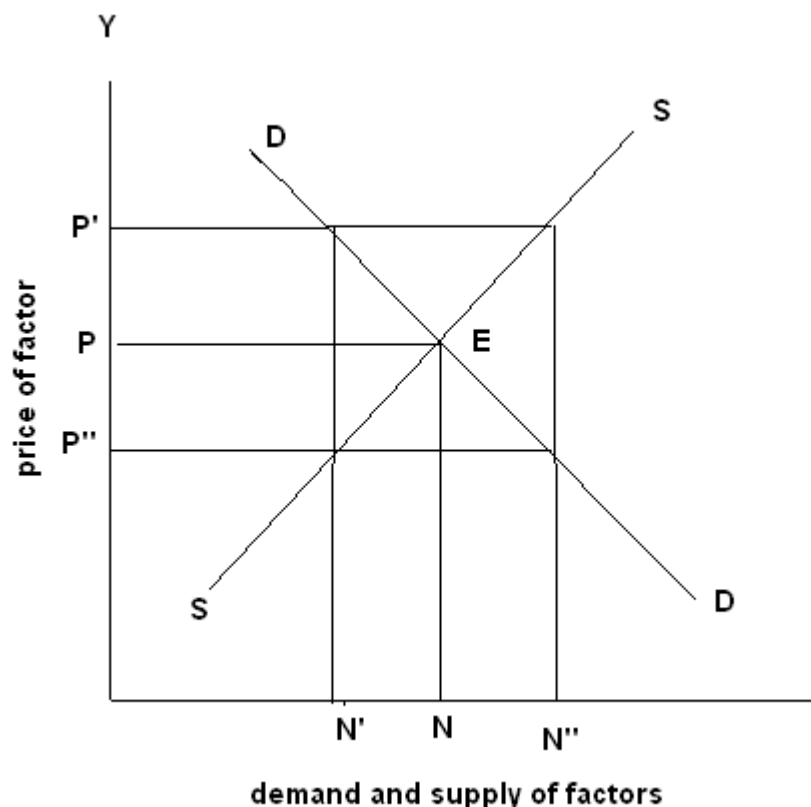
15.4.2 Supply

There is a direct relationship between supply of a commodity and its price. Marginal cost of production of a commodity determines its supply. There are various factors on which the supply of a factor depends. If we consider the supply of land which is one of the factors of production, its supply is perfectly inelastic in nature. So its supply price is zero. Supply of labour depends on population, composition of population, attitude of women towards work etc; some times the supply curve for labour may bend backwards. Supply of capital depends on the rate of interest, rate of capital formation, complimentary resources and technological progress. The supply of entrepreneur or the organiser depends on the socio, economic and culture factors. Generally the supply curve slopes upwards.

15.4.3 Interaction of demand and supply

Equilibrium price of the factor will be determined at that point where the quantity demanded is equal to quantity supplied. This is explained in figure 10.5. The DD curve is the demand curve in the figure. SS is the supply curve. Demand and supply meet at a point E, which is the equilibrium. Here the price is OP and quantity demanded and supplied is equal to ON. If the price increases to OP' supply will be ON'' and demand will be ON'. As supply is more than demand the price will fall to OP. If the price is at OP'' supply will be ON' and demand will be ON''. Here demand is more than supply so the price rises to OP level to make demand and supply equal. So equilibrium is only at that point where the demand and supply are equal i.e. at E.

Figure 10.5



15.5 Summary

The marginal productivity theory deals with the pricing of the factors of production. There are two concepts of distribution – functional and personal distribution. The theory is based on some assumptions. According to the theory price of a factor is equal to its marginal productivity. In long run price of the factor will be equal to both ARP and MRP. As the law states that the marginal productivity of the factor alone determines the price, it has many criticisms from various economists.

15.6 Self Assessment Questions

1. Critically examine the marginal productivity theory of distribution.
2. Explain marginal productivity theory of factor pricing
3. What is the relationship between ARP and MRP?
4. What are the types of distribution?
5. Explain the concepts – VMPP, MRP, MPP, ARP.
6. Explain the modern theory of distribution.

15.7 References

1. Stonier and Hague : A Text Book of Economic Theory
2. M.L.Seth : Micro Economics
3. Sundaram K.P.M : Business Economics
4. Ahuja H.L : Principles of Micro Economics

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LESSON – 16

THEORIES OF DISTRIBUTION

16.0 Aims and Objectives

In the last chapter we have studied that the factors of production are priced on basis of marginal productivity. The theory of marginal productivity of distribution is not only applicable to just labour but to all the other factors. The aim of this chapter is to explain as how the distribution theory is applicable to rent, wages, interest and profits. Various theories concerning these concepts are explained in brief.

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16.1 Introduction

The theory of marginal productivity has explained that the pricing of the factors is based on its marginal productivity. On basis of this the theories of rent, wage, interest and profits are been developed by various economists. This chapter explains briefly the various concepts of rent, wages, interest and profits. Only a sketch of various theories concerning these concepts is explained.

16.2 Rent

In ordinary language rent means hiring charges or the reward paid to the land services. But in economics it has distinguished concepts. They are –

1. Contract Rent

2. Economic Rent

1. Contract Rent – It is a periodical payment for the use of durable commodities like rent of house. It is a rental income and a periodical payment. It includes interest on capital investment besides the payment for the use of land.

2. Economic Rent – It is that part of payment which is made only for the use of the land. It excludes interest on landlord's capital investment.

In economics rent is used in two ways –

1. Classical concept of economic rent which is dealt by David Ricardo in his theory of Rent.

2. Modern concept of economic rent which is explained as

- Scarcity rent
- Rent as a surplus over transfer earnings
- Quasi rent.

16.2.1 Classical concept of Economic rent – Ricardian theory of rent

David Ricardo has explained the concept of rent in his "Principles of Political Economy and Taxation". Ricardo defined rent as, "Rent is that portion of the produce of the earth which is paid by the tenant for using the original and indestructible powers of the soil". Ricardo viewed rent as "differential surplus" earned by more fertile plots of land in comparison with the less fertile lands. The essences of the theory can be explained as –

1. Rent is a payment made to the land for the original and indestructible power of the soil.

2. Rent is a pure surplus.

3. Rent is also differential surplus which is earned by more fertile lands.

4. Least fertile lands are the marginal lands which are no-rent lands.

5. More fertile land gets more rent and when less graded land come into cultivation then higher graded land gets rent.

6. Rent neither enters nor determines price.

7. The cost of production on marginal land determines the price of the crop produced.

8. Diminishing returns applies to agricultural production.

9. Land is put to only one use and that is cultivation.

10. For its unrealistic assumptions the theory has various criticisms.

16.2.2 Modern Theory of Economic Rent

Modern economists like Marshall, Joan Robinson and Benham have propounded this concept of modern theory or economic rent. They have made some modification to the Ricardian theory of rent. They have not only explained the concept of rent but also extended the concept to other factors of production namely land, capital and organisation. The modern theory of rent can be explained by the following concepts –

1 Scarcity Rent – This concept is based on the fact that the supply of land is scarce or perfectly inelastic in relation to its demand. According to the economist rent emerges even if the land is homogeneous as it is scarce in relation with the demand. Any factor of production will earn rent if its supply is inelastic in nature. Marshall explains scarcity rent on basis of supply and demand. The supply of land is inelastic and fixed. So, the demand for the land will fix the rent. If the demand is more rent is more and vice versa.

2. Rent as surplus over transfer earnings- Mrs. Joan Robinson gave a clear exposition of rent as surplus over transfer earnings. According to her rent is the surplus earned by a factor over and above its transfer earnings. The minimum price which is necessary to retain a given unit of a factor in a firm or industry is called as its transfer earnings. It can also be explained as the amount of money which a factor can earn in its next best alternative use. Transfer earnings can be called as opportunity cost of the factor. According to the modern economist this type of rent can be earned by all the factors of production.

$$\text{Economic Rent} = \text{Current earnings of the factor} - \text{Transfer earnings}$$

3. Quasi Rent – This concept is introduced by Alfred Marshall. Quasi rent is the income derived from machines and other man made appliances of production in the short run. In other words, it is the temporary surplus earned by instruments of production other than land. In short run quasi rent can be considered as the difference between total revenue and total variable cost.

16.3 Wages

Wage is the price paid for the services rendered by a labour in production. The labour can be either mental or physical. According to Benham wage is the “Sum of money paid under contract by an employer to a worker, for the services rendered. Wages can be understood in micro or macro sense. The above definition is in micro sense. In macro sense, wage represents the share of national income that goes to the labour. There are various types of wages.

16.3.1 Types of wages

Wages can be of various types. They are –

1. Money wage – It is also called as nominal wage. They refer to the amount of wage paid in the form of money for the service of the labour.
2. Real Wage – It refers to the amount of goods and services that can be purchased with the money wage at a particular period of time. It is the amount of purchasing power received by the labourer through his money wage. When there is a rise in the prices of goods and services then real wage declines and if the prices reduce then real wages increase. Real wages are determined by the following factors.

• Purchasing power of money	• Regularity of work
• Subsidiary (extra) earning.	• Future prospects
• Additional facilities	• Social status
• Nature of work	

3. Piece wage – The wage paid according to the work done by the labourers is called as piece wage
4. Time wage – wage paid according to the period of time worked is called as time wage. It is paid either on daily, weekly, monthly or yearly basis.

16.3.2 Theories of wages The theories of wages try to explain as how wages can be determined. Most of these theories assume that the workers are alike in their efficiency, training and skills. Following are the various theories explained by the economists –

1. Subsistence theory – This theory assumes that the labour is a commodity and its gets price which is equal to the cost of production in the long run. If the wages are raised above the subsistence level, workers are encouraged to marry and get children, which would increase the supply of labour. As a result the wages will decrease to the subsistence level. But if the wages reduce then the death rates would increase as they would not be good nourishment and so the supply of labour would reduce. This decrease in supply of labour will increase the wage to the subsistence level. Thus the wages will be always at subsistence level. This theory is based on Malthusian theory of population and the law of diminishing marginal returns. Lasalle called this theory as “iron law of wages”.

2. Wage fund theory – Wages are determined on basis of the supply and demand of the labour. That is on the number of population which is the working class and the capital which is in circulation. So the employer sets a part of the fixed capital for the payment of wages. Wages

depend directly on the size of the labour force. Wage rate varies inversely with the size of the labour force

3. Residual claimant theory – This theory is explained by Walker. According to him the worker is a residual claimant. After the payment of rent, interest and profits in the total production the residual is paid as the wages to the worker. There are laws for rent, interest and profits, but there are no laws for wages. So, wages are the residue left after paying other factors of production.

4. Marginal Productivity Theory - This theory has already been explained in the previous chapter (Chapter 15). The same theory applies here in determining the wages. The key to the wage determination lies in marginal productivity. The remuneration to the labourer i.e. wage which the firm will be willing to pay depends on the productivity of the labourer. The greater the productivity of the worker the higher is the remuneration or wage. The essence of this theory is that the wages depend upon the marginal productivity of the labour. Wage determination differs in different markets. The marginal productivity theory assumes perfect competitive market. In Monopsony we find exploitation of labour and the role of trade unions in determining the wages.

5. Tausig's theory of wages – Tausig has proposed a theory for determining wages. It is a modification of marginal productivity theory of wages. According to him wages are equal to the discounted marginal product of the labour. According to him the labour will not get his remuneration equal to their marginal productivity because at the time of production the employer will pay the labour wages in advance. So, the employer will deduct some percentage from the final output to compensate the risk involved in making advance payment to the labour.

6. Modern theory of wages – The theory is based on both demand and supply of the labour. It is proposed by Marshall and Hicks. The wage of the labourer is determined by the demand and supply of labour. It is similar to the pricing of any commodity. The demand for labour is determined by various factors like – demand for the product to be produced, demand for other factors, technology, prices of the other factors etc. The marginal revenue productivity curve of a firm is the demand curve of a firm for labour. The supply of the labour depends on – population, age composition of the population, working attitude of women, labour efficiency, etc. Wage is determined at that point where the quantity demanded of the labour is equal to labour supply.

16.4 Interest

It is the price of capital. Interest is the share of the national income that goes to the capitalists. According to Cairn Cross interest is the price paid for the fire of loan. Seligman considers interest as the return from the fund of capital. According to Keynes it is, "The reward paid to the lender of money for parting with liquidity". There are two concepts of interest namely gross interest and net interest.

Gross interest – It is the actual amount paid by the borrower to the lender. Capital borrowed is called gross interest. It includes net interest, insurance against risk, reward for inconvenience and reward for management.

Net interest – pure interest or net interest is a payment made exclusively for using the capital. The theories of interest can be discussed in two ways – why rate of interest is paid and how the rate of interest is determined.

16.4.1 Theories concerning why the rate of interest is paid

On basis of why the rate of interest is paid theories can be of following types –

1. **Productivity theory** – According to Physiocrats and classicalist interest is paid as capital is productivity. Capital is demanded because of its productivity.
2. **Abstinence or waiting theory** - This theory is proposed by Senior. According to him capital is demanded because it is productive in nature. He studies only the supply side of capital. Capital is formed by saving and saving involves sacrifice or abstinence.
3. **Agio theory**- This theory is proposed by Bohm Bawerk. According to him the present goods have agio or premium over future goods. Interest is the reward paid to induce people to postpone their present consumption and present consumption is more important than future consumption.
4. **Time preference theory** - This theory is proposed by Irving Fisher. It is a modified version of Agio theory. People always prefer present satisfaction to future satisfaction. People with large income have lower time preference as most of their present needs are satisfied. Greater the uncertainty of future greater is the time preference. Willingness and opportunity determines individual time preference.

16.4.2 Theories concerning as how the rate of interest is determined

On basis of how the rate of interest is determined, there are various theories. They are-

1. **Classical theory of interest** – This theory has defined interest as the price paid for the use of capital. It is determined by both demand and supply of capital. According to Keynes this theory is saving and investment theory. Keynes has criticized this theory as unrealistic and indeterminate.
2. **Loanable Fund Theory** – It is proposed by Wickshell. Lindhal, Ohlin and Robertson have refined the theory. Rate of interest is determined by the demand and supply of loanable funds. Loanable funds are the sum of money supplied and demanded in the money market at any time. Supply of loanable funds can be derived from four main sources namely – bank credit, dishoarding, disinvestment and savings. The demand for loanable funds depends on three sources. They are – investments, consumption and hoarding. The rate of interest is determined at that point where the total demand and total supply of loanable funds are equal.
3. **Liquidity preference Theory** – This theory is proposed by Keynes. According to him interest is monetary factor. It is determined by both demand for and supply of money. Interest is the reward for parting with liquidity. The demand for money depends on the liquidity preference of the people. People hold or demand money basically for three motives namely – transactions, precautionary and speculative. Supply of money is determined by the central bank of the country. At any given period of time the supply of money is assumed to be fixed or perfectly inelastic in nature. According to Keynes interest rate is determined by both demand for and supply of money in the market. The rate of interest may fall below a certain level where the demand for money becomes perfectly elastic or infinite. This point is called by Keynes as “liquidity trap”. The concept of liquidity trap makes it clear that the rate of interest can never be zero or negative.
4. **Modern theory of interest** – This theory is associated with Hicks and Hansen. The theory considers both monetary and real factors. This theory explain about two curves – IS and LM curves. IS curve shows the equilibrium between investment and savings in real sector. LM curve shows equilibrium between liquidity preference i.e. demand for money and supply of money in monetary sector. The rate of interest as well as the level of income is determined at that place where these two curves intersect.

16.5 Profits

Profit can be simply defined as the remuneration or reward for the entrepreneur. According to Peter Drucker profits are the surplus of current income over past costs. Profits are excess of receipts over expenses. Profits just like interest have two concepts. They are Gross profits and

Net profits. Former is the surplus of total revenue over the total money expenditure incurred by a firm. It is mixed income. It is the remuneration paid to the entrepreneur. It includes imputed costs, it is part of cost of production, monopoly gains, windfall gains net profits etc. Net profits can be calculated by deducting from gross profit implicit rent, implicit wages, implicit interest, depreciation and maintenance, monopoly gains, windfall gains and normal profits. There are various theories concerning profits which are discussed below.

16.5.1 Theories of profits - The theories of profits are-

1. **Rent theory of profits** – It is proposed by Walker. According to the theory profits are concerned as the rent of ability. Just as Ricardian theory of rent, profits also differ according to the ability of the entrepreneurs. Profits are considered as the reward for differential ability. Higher the ability higher is the profit rate and vice versa.
2. **Wage theory of profits** – There are two versions of this theory. One is given by the socialists where profits are regarded as deductions from wages. Secondly according to Taussig profits are regarded as a special kind of wages.
3. **Dynamic theory** – It is proposed by J.B.Clark. According to him dynamic changes in the economy are the fundamental cause of profits. In static society prices of the goods is equal to the cost of production, so there can be no profits beyond wages for management. Profits are caused by – increase in population, capital formation, improvement in production methods, changes in form of business organization etc.
4. **Innovation** – This theory is proposed by Schumpeter. According to him profits are the reward for innovations. Entrepreneur initiates innovation in the business and when he succeeds, he makes profits. There are two motives of innovation namely – product innovation and market innovation.
5. **Risk bearing theory** – The theory is proposed by Hawley. According to him the essence of entrepreneurship is risk taking. Higher is the expected profits greater is the risk Higher is the risk more will be the profit level. And vice versa. There can be four kinds of risks. They are replacement risk, risk proper, uncertainty and obsolescence.
6. **Uncertainty theory** – Prof. Knight has formulated this theory. This theory is an improved of risk bearing theory of profits. Profit is the reward paid to the entrepreneur for the uncertainty bearing. Risk can be classified into two types – Insurable risk and non-insurable risk. Risk like fire, theft, flood can be considered as insurable risk. These are not the real risks. True entrepreneurship lies in facing the non-insurable risks and uncertainties. Uncertainties can be due to- changes in taste and preference; fluctuations

in business cycles; technological progress; policies of the government; unpredictable situations like wars, etc.

16.6 Summary

This chapter explains about the various theories of distribution. Rent means hiring charges or the reward paid to the land services. Rent in economics can be understood in two ways namely contract rent and economic rent. In the classical theory of rent the most important type is Ricardian theory of rent. Wages are the remuneration to the labour. There are various types of wages like – money wage, real wage, piece wage and time wage. There are various theories that are been proposed by various economists concerning the determination of wages. Interest is the reward for the use of capital. It can be gross and net interest. There are theories concerning as why the rate of interest is to be paid and theories concerning as how the rate of interest is to be determined. Lastly, profits are the reward to the entrepreneur. There are various theories which examine as how the profits arise.

16.7 Self Assessment Questions

1. What is rent? What are the various concepts of rent?
2. Explain Ricardian theory of rent
3. Explain modern concepts of economic rent
4. What are wages? What are types of wages
5. Explain various theories concerning determination of wages.
6. What is interest? Explain gross and net interest.
7. Explain why the rate of interest is to be paid.
8. How the rate of interest is determined?
9. What are profits? How are profits determined?
10. Explain Gross and net profits.

16.8 References

1. Stonier and Hague : A Text Book of Economic Theory
2. M.L.Seth : Micro Economics
3. Sundaram K.P.M : Business Economics
4. Ahuja H.L : Principles of Micro Economics

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