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ECONOMICS

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Principles of Microeconomics – I

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Course No. **ECONA101**

Course title: **Principles of Microeconomics – I**

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Course Outline

Block	Description
I.	**Introduction** Problem of scarcity and choice: scarcity, choice and opportunity cost; production possibility frontier; economic systems. Demand and supply: law of demand, determinants of demand, law of supply, determinants of supply, market equilibrium. Applications of demand and supply: consumer surplus, producer surplus. Elasticity: price elasticity of demand, calculating elasticity, determinants of price elasticity, income and cross elasticities.
II.	**Consumer Theory** Budget constraint, concept of utility, diminishing marginal utility, Diamond-water paradox, indifference curves, derivation of demand curve from indifference curve and consumer's equilibrium; price, income and substitution effects.
III.	**Production and Costs** Production: behavior of profit maximizing firms, production functions, law of variable proportions, law of returns to scale; choice of technology, isoquant and iso-cost lines, cost minimizing equilibrium condition. Costs: costs in the short run, costs in the long run, revenue and profit maximizations, minimizing losses, short run industry supply curve, economies and diseconomies of scale.
IV.	**Market Structure and Perfect Competition** Market: Meaning. Market structure: Types and Definition. Role of time element: Market Period, Short Period and Long Period. Market Price and Normal Price. Perfect Competition: assumptions: theory of a firm under perfect competition, demand and revenue; equilibrium of the firm in the short run and long run; long run industry supply curve: increasing, decreasing and constant cost industries.

CONTENTS

Unit-1

MICRO ECONOMICS: MEANING AND SCOPE

STRUCTURE

1.1 INTRODUCTION

Let me welcome you to the course on micro-economics which you will be studying through a course of a limited number of lessons. Before I start explaining to you the meaning and scope of micro-economics which is the subject matter of this first lesson, I would like to tell you what you may expect to receive from us in these lessons and what we expect of you as students of the course. We have to cover the prescribed course in a limited number of lessons only. It is obvious that there is a limit to the length of an individual lesson. Thus we have to attain our objective within the constraints of time and space. In order to achieve this objective in the best possible manner, we have to cut out the non-essentials as well as avoid going too wide and too deep. We, presume that once you are set on the right track, you will be able to pursue a particular topic further with your own efforts. You have to look upon these lessons as guide posts and not as the key to each and every possible type of problem of micro-economic theory. In brief it is expected of you to supplement these

lessons with a study, on your own of the literature which will be referred to at the end of each lesson.

1.2 LEARNING OBJECTIVES

After going through this unit, you will be able to:

- Explain meaning and scope of economics.
- List the different economic problems.

1.3 MEANING AND SCOPE OF ECONOMICS

Let us now come to the proper subject of this lesson, namely, the Scarcity and Choice as Economic Problems**.** However, in order to clarify the meaning of micro-economics, we must first, know the nature of economics in general, of which micro-economics is only a branch. The science of economics in general seeks to explain the functioning of an economic system. An economic system may be described as the sum total of all such arrangements, all such forces and relations, which a society creates in order to solve its economic problems, the science of economic analysis, the working of such forces and through this analysis explains, the behaviour of a particular economic system. Micro- economics is a particular branch of such a study which relies on a particular method of analysis to explain the behaviour of an economic system.

Self-Check Exercise-1

Q.1 Discuss Meaning and Scope of Economics.

1.4 SCARCITY AND CHOICE AS ECONOMIC PROBLEM

To truly understand the essence of microeconomics, it is essential to first grasp the concept of an economic problem and its origins. According to Professor Lionel Robbins in his renowned work *An Essay on the Nature and Significance of Economic Science*, economic issues arise due to a fundamental characteristic of human behavior—the necessity to manage limited resources that have alternative uses to fulfill various needs and desires. This definition highlights two fundamental principles in economics: the scarcity of goods and the need for society to allocate resources efficiently.

Imagine a world without scarcity, where unlimited quantities of every good could be produced, or human wants were fully satisfied. In such a scenario, individuals would not have to worry about managing their income since everything they desired would be readily available. Businesses would not concern themselves with expenses such as labor or healthcare costs, and governments would not face challenges related to taxation, public spending, or environmental issues, as these would no longer be relevant. Furthermore, since everyone would have access to as much as they wanted, there would be no debates over income distribution or economic inequality.

In this hypothetical world, all goods would be freely available, much like sand in a desert or seawater at the beach. Prices would cease to exist, and markets would become redundant, rendering economics an irrelevant discipline. However, no society has ever attained such an ideal state of boundless resources. In reality, we live in a world defined by scarcity, where economic goods are finite and must be allocated judiciously to meet competing demands.

However scarcity of means in itself is not a sufficient condition for an economic problem to exist. If the scarce means did not have several uses but could be put to one and only one use, it would give rise to not an economic problem but to a technological problem. If a piece of land can be used only for growing wheat and nothing else, then the problem would be to choose a technology which produces the largest possible quantity of wheat per acre of this land. This is, according to Friedman, a technological problem and not an economic problem. It is only when means are scarce and have, at the same time alternative uses that an economic problem arises.

The above point can be further explained with the help of Adam Smith's famous example of deer and beaver. We know that there is a limit to the maximum number of work-hours for a man in a particular day, for there are only twenty four hours in a day. Let us suppose that Adam Smith's primitive hunter can hunt down on any one day either one deer or two beavers. Here the means, that is, the number of Hunting hours in a day are limited or scarce. But at the same time this scarce means has alternative uses either one deer or two beavers. Whether to hunt one deer or two beavers is an economic problem. But supposing there had been no alternative to hunting deer, then the hunter's problem would have been only a technological problem, a problem of how to hunt with the best possible technique so that maximum possible number of deer are hunted down in a fixed period of time.

Prof. Robbin's definition of an economic problem, as explained above, is rather too general and, therefore, will include even such problems which ordinarily are not regarded as belonging to economics. The science of economics as it is not concerned with all economic problems in the Robbinsian sense. We should never lose sight of the fact that economics is a social science and, therefore, it studied the economic problems of an organized society alone and not of individuals like a Robbinson Crusoe. But it does not imply that economics does not study the individual behaviour at all. In fact, micro-economics is primarily that branch of economic theory which seeks to understand the behaviour of an economy on the basis of the analysis of individual behaviour. What it means is that economics in far as it is a social science, studies individual behaviour only in so far as the individual's behaviour has implications for or effects upon other individuals." (Friedman). As Friedman rightly points out in his Price -Theory, economics "is concerned not with an economic problem in the abstract, but with how a particular society solves its economic problems."

Self-Check Exercise-2

Q.1 What is an Economic Problem?

1.5 TYPES OF ECONOMIC PROBLEM

Now that we have explained the basic nature of economic problems, we shall now try to list up the basic types of economic problems that any economic system has to arrange to solve. In this matter we shall do well to follow Prof. Knight's exposition in his book, Economic Organization. According to him every type of society must make some type of arrangements or the other, in order to solve the following basic types of economic problems:

1. Fixing of standards;
2. Organizing Production:
3. Providing for economic maintenance and progress;

4. Adjustment consumption to production over short periods.

1.5.1 Fixing of Standards: It was pointed out earlier that the means at the disposal of a society are scarce and, moreover, they are capable of being put to several uses. The 'means' at the disposal of a society refer to its natural resources, its labour resources, its accumulated capital stock, its organizational and technical skills, etc. Each one of these productive resources is limited in relation to the demand for it. Furthermore each one of these is capable of being put to alternative uses. Land, for example, can be employed to produce wheat or rice or sugar cane of some other crop or even to raise buildings on it. Hence every type of society has to make a choice of the use or uses to which a given productive resource is to be put. In other words, every type of society has to decide upon the types of goods and the appropriate product-mix that it must produce with the help of the limited quantities of productive resources which are available to it. We can explain the above point in a better way with the help of the analytical tool of 'production possibility curve.' Scarcity of means implies that a given society has production frontier which cannot be crossed under the given technological conditions.

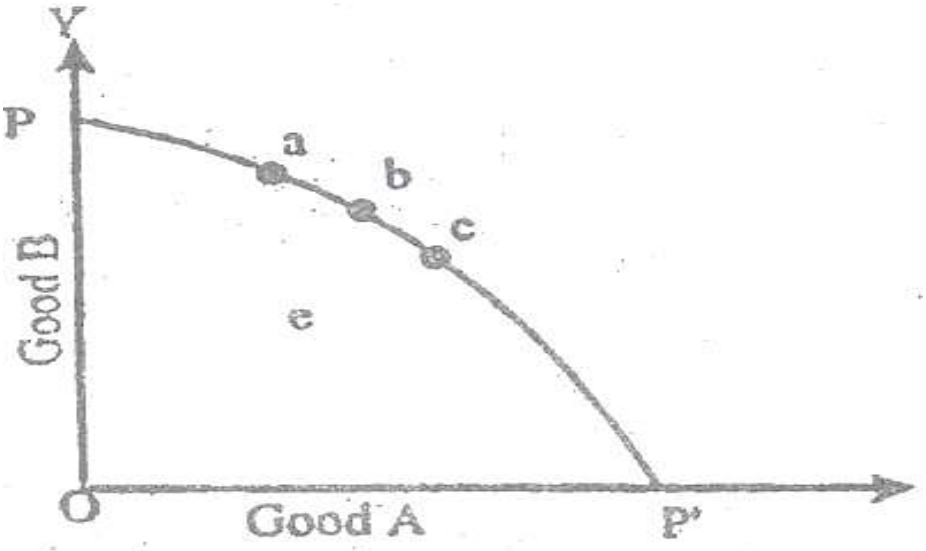

Fig. 1.1

However, within this frontier or on this frontier movement is possible, that is, a large number of alternative choices are possible within a given state of technology. The problem of fixing standards is, in essence, the problem of making a choice from amongst the alternatives open to the society.

1.5.2 Organizing Production: Let us suppose that a given society, whose technical knowledge is given and constant, is capable of producing OP' quantity of good A, if all of its available productive resources are devoted to its production alone. Similarly, we suppose that if all these resources are devoted to the production of another good B alone, only a maximum of OP of it can be produced. On the other hand, if the society wants to produce both the goods, it can produce the various combinations of A and B but only in such a way

that more of one good can be produced only by reducing the production of the other. When we join all such combinations of the given pair of goods, we shall get a curve like PP' in the above figure 1.1. Such a curve is known as the 'production possibility curve' or the 'production frontier. Thus production possibility curve may be defined as the locus of all such combinations of a given pair of goods which the society can produce with its given stock of productive resources under a given and constant technology. The production-possibility curve has two important attributes. Firstly, it slopes downwards to the right indicating that an increase in the production of one good must go with a decrease in the production of the other good. Secondly, it is concave to the origin indicating that the more, we produce of a given good, and the larger is the quantity of the other good that will have to be given up in order to produce an additional unit of the former. In other words, production-possibility curve is drawn on the assumption that there are diminishing returns or increasing costs in production. If all the available resources of the society are fully and most efficiently employed, the society will be operating on the production frontier PP'. It may be on any point like a or b or c or any other on the curve PP'. But it cannot produce a combination like d which is beyond the production frontier. When it is operating at a point, like e within the production frontier, the society is employing its available resources either less than fully or inefficiently or both. However, we shall assume that the economy is operating at full employment and full efficiency, so that it must be on PP' curve in the figure. But the question is at which point on the PP' curve it will be operating. Through some mechanism or the other, every society has to make the choice as to at what point on its production-possibility curve it should operate. It has to fix some standards with reference to which such a choice could be made. Different economic systems have different arrangements for fixing these standards which determine the goods that are to be produced and the relative quantities in which they are to be produced. This is what is meant by 'fixing of standards' problem in Prof. Knight's list of the basic problems of an economic system.

1.5.3 Providing for economic maintenance and progress: Once the choice of goods to be produced is made, there has to be some arrangement or mechanism for organizing the production of the desired goods. This is another type of problem which an economic system has to tackle. But the economic problems of a society are not finished as soon as the desired goods are produced. An allied problem is how much of each good produced should go to the individual members of the society. That is, the total product of the society has to be distributed among its members. Thus, every type of economic system has to make some sort of arrangement for distributing the total product of the economy. It should also be obvious that there is wear and tear of the productive resources during the process of production. If the-productive capacity of the economy is to be maintained, the society must make some arrangement to provide out of the total product, enough to replace the worn out productive equipment. This is the problem of providing for economic maintenance.

1.5.4 Adjustment consumption to production over short periods: All the three types of economic problems discussed above are the problems of a static

society. Still another static problem that a society has to solve is the last in the list of Prof. Knight, namely, the problem of adjusting consumption to production over short periods. Over a short period, the available supplies of various kinds of consumer goods are fixed and since they must be scarce in relation to the demand for them, there must be some institutional arrangement for rationing these goods in order to adjust consumption to production over a short period. However, over a long period we have to provide for growth too. Firstly population will increase over time and if increasing population is to be provided for even at the prevailing standard of living, the total product of the economy must also grow proportionately over time. Secondly, economic progress implies a rising standards of living for the people, which further underscores the necessity of a growing total product. This will require arrangements of some kind or the other to increase the productive resources or improve technology or both so that the production frontier of the economy is pushed outwards. This is the problem of providing for growth of progress which Prof. Knight has tagged on to the problem of providing for maintenance discussed above.

Self-Check Exercise-3

Q.1 Discuss Various Types of Economic Problems.

1.6 PROBLEM OF EFFICIENCY OR OPTIMUM USE OF PRODUCTIVE RESOURCES

Knight's view, according to which a society has to solve only the above explained five types of economic problems, is rather based on an implicit assumption which is also the implicit assumption of microeconomics, namely, that the economy always operates at full employment and at full efficiency. But ever since the publication of Keynes's General Theory of Employment Interest and Money (1936) this assumption has been questioned. It is generally recognized that there might be times when the economy is not operating at full employment. Indeed, many may argue that, oftener than not, it operates at less-than-full-employment level, that is, it usually functions not on the production frontier PP' in the fig. 1.1, but within it on a point like e. If it is so, some resources must be lying idle and unemployed. A society has to look after this problem also. It has to make arrangements to attain full employment of resources. Thus, we may add this sixth type of problem to Knights' list of five.

However, we have to add a seventh type also to the above list in order to make it tentatively exhaustive An economy, may be operating within the production frontier a point like e in fig. 1.1, not because some productive resources are unemployed or underemployed but because they are Inefficiently employed. Naturally, then, the society has to see to it that the resources are not only fully employed, but are also efficiently employed. This is known as the problem of efficiency or optimum use of productive resources.

Self-Check Exercise-4

Q.1 What do you mean by optimum use of Productive Resources.

1.7 ECONOMIC PROBLEMS IN FREE MARKET ECONOMY

Economics, as a discipline, examines how an economic system functions while addressing various economic challenges. Microeconomics specifically explores how a free-market economy attempts to resolve some of these issues. It is essential to keep two key aspects in mind when studying microeconomics.

First, microeconomics focuses on the functioning of a free-market system, where economic problems are addressed through the independent operation of market forces. These forces determine the relative prices of goods and production factors. However, the conclusions drawn from microeconomic studies should not be directly applied to economies that lack a free market for goods and production factors.

Second, microeconomics does not analyze every aspect of a free-market economy or pricing system. It primarily investigates how the market handles three key challenges identified by economist Frank Knight:

(i) Establishing standards,

(ii) Organizing production, and

(iii) Distributing the total output.

Additionally, microeconomics examines how a free-market system adjusts consumption in response to production changes over short periods. However, it does not delve into issues related to long-term economic growth and progress, which fall under Development and Growth Economics. Similarly, topics such as employment levels and full employment are studied separately within macroeconomics, often referred to as the Theory of Output and Employment.

Efficiency and the optimal use of resources also extend beyond microeconomics, as they are the focus of Welfare Economics. Nonetheless, because Welfare Economics employs similar analytical techniques, it is often included in microeconomics courses. Microeconomics seeks to explain how a free-market economy tackles fundamental economic concerns such as setting standards, organizing production, distributing goods, maintaining capital stock, and balancing consumption and production over short periods. The price mechanism plays a central role in solving these challenges.

For instance, the issue of setting production standards is resolved through the relative prices of goods, which reflect societal preferences. When the price of a particular good rises compared to others, it indicates a higher societal demand for that good, influencing producers to increase its supply.

Production organization in a free-market economy also relies on the price mechanism. The interaction between the prices of goods and production factors determines resource allocation across industries. Two critical aspects of production organization include:

(i) Allocating available resources among industries producing different goods.

(ii) Combining various production factors within industries.

The allocation of resources is guided by the relative prices of goods and production factors. Industries that produce goods with relatively higher prices (compared to factor costs) attract more resources. Within an industry, production

factors are combined in a way that ensures the ratio of their marginal productivities aligns with the ratio of their prices.

Similarly, income distribution within a free-market economy is determined through the price system. An individual's share of national income depends on the quantity of factor services they supply and the corresponding factor prices. This distribution is influenced by both factor prices and the ownership of production resources. The price mechanism also helps balance short-term consumption and production. When goods become scarce, competition among buyers drives prices upward, which in turn reduces demand until it aligns with available supply.

Although economic growth involves multiple complex factors, one of the key determinants is capital accumulation. The maintenance and expansion of capital stock depend on interest rates, which incentivize savings. Savings, in turn, serve as the primary source of capital stock maintenance and expansion. Ultimately, all economic challenges within a free-market system are addressed through price mechanisms. Microeconomics, therefore, is fundamentally concerned with explaining how prices of goods and production factors are determined. Since these prices dictate what and how goods should be produced, microeconomics is often referred to as "price theory" or the "science of prices." However, it is crucial to understand that this field focuses on relative prices rather than absolute price levels.

While "price theory" describes its subject matter, the term "microeconomics" refers to its analytical approach. This methodology studies the overall economic system by analyzing the behaviors of its individual components, such as consumers and firms. The specifics of this analytical approach will be explored in the subsequent units.

Self-Check Exercise-5

Q.1 Discuss economic problems in a free economy.

1.8 SUMMARY

Before concluding this unit, I would like to highlight an important aspect regarding the scope of microeconomics. Microeconomics falls under the domain of positive economics, which is distinct from normative economics. As a branch of positive economics, it focuses on studying and explaining economic phenomena within its scope, as discussed earlier in this lesson. In this context, positive microeconomics is limited to analyzing causal relationships between relevant microeconomic variables. Simply put, it deals with the question of "what is" rather than "what ought to be." Normative economics, which addresses prescriptive questions about "what ought to be," lies beyond the scope of positive microeconomics.

1.9 GLOSSARY

- **Production Possibility Curve:** A graphical representation showing all possible combinations of two goods that an economy can produce using its available resources and technology, assuming efficient utilization and a constant level of technology.
- **Free Economy**: is a market system characterized by minimal government intervention, where private enterprises operate independently. It is also referred to as a free market economy, private enterprise economy, or free enterprise system.

1.10 ANSWERS TO SELF-CHECK EXERCISES

Self-Check Exercise-1

Ans.1 Please refer to section 1.3

Self-Check Exercise-2

Ans.1 Please refer to section 1.4

Self-Check Exercise-3

Ans.1 Please refer to sections 1.5,1.5.1,1.5.2,1.5.3 and 1.5.4

Self-Check Exercise-4

Ans.1 Please refer to section1.6

Self-Check Exercise-5

Ans.1 Please refer to section1.7

1.11 REFERENCES/REFERENCES/SUGGESTED READINGS

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1.12 TERMINAL QUESTIONS

Q1. What is the meaning of economics? Discuss the scope of economics in detail?

Q2. What are the types of economic problem faced in the free market situation?

Unit-02

ECONOMIC SYSTEM

STRUCTURE

2.1 INTRODUCTION

Economic systems are the means by which countries and governments distribute resources and trade goods and services. They are used to control the five factors of production, including labor, capital, entrepreneurs, physical resources and information resources. In everyday terms, these production factors involve the employees and money a company has its disposal, as well as access to entrepreneurs, the people who want to run companies or start their own businesses. The physical materials and resources needed to run a business, along with the data and knowledge companies use to be successful, are also factors in production. Different economic systems view the use of these factors in different ways.

2.2 LEARNING OBJECTIVES

After going through this unit, you will be able to;

- Define economic system
- Identify the main functions of economic system
- Explain Primitive Communism
- Explicate Feudal system

2.3 ECONOMIC SYSTEM

An economic system refers to the framework that governs the production, distribution, and consumption of goods and services within a society. It encompasses various institutions, social relationships, and principles that address

economic challenges, such as scarcity, by managing limited resources effectively. This system includes individuals, organizations, and their connections to productive assets, often defined by property rights and ownership structures. Common modern economic systems include capitalism, socialism, communism, and mixed economies.

2.3.1 Functions of an Economic System

Economic systems everywhere may perform similar functions. These functions may be traditional or non-traditional. As mentioned, the traditional functions include the following:

- What to produce.
- How to produce, i.e. what method of factor combination to adopt in order to maximize the use of the resources.
- For whom to produce.
- How to distribute the goods and services produced.

Economists have realized the importance of economic growth and the attainment of full employment, if the system must achieve the best use of its scarce resources. Attainments of full employment and high economic growth have become the non-traditional functions.

Traditional Functions of Every Economic System

The traditional functions of every economic system include the following:

- **What not to produce**. In deciding on what goods to produce, an economic system also decides in what not to produce. For example, if the system wants to provide roads and recreational facilities, it may have problems since it may lack enough resources to do so at the same time. It will be necessary that it chooses between the two. It may for instance have to choose roads. An economic system can consider a wide variety of goods than the other which is poorly endowed.
- **What method to use**. Economic systems also function to decide on the particular technique to be used in production. Here, the economic system decides what method of factor combination to be employed in order to maximize the use of the scarce resources, by minimizing cost and increasing productivity. The decision may involve whether to employ labor-intensive or capital-intensive methods of production. In a free exchange economy, its choice will depend on relative factor endowment and factor prices. In developing countries for instance, labor is more abundant and cheap. A labor-intensive method may be preferred.
- **For whom to produce**. Another problem the economic system is faced with is for whom to produce. To get maximum use from the scarce resources, the commodity must be produced in an area where it would be demanded and where costs will be minimized. The production unit may be sited near the source of raw material or the market centre depending on the nature of the product.

Non-Traditional Functions of Every Economic System

- **Enduring economic growth**. Economic systems must ensure economic growth. Owing-to scarcity of resources, the society must know whether its

capacity to produce goods and services is expanding or decreasing. Some major ways to promote economic growth include ensuring adequate rate of growth of per capita income, improvement in technology through the adoption of superior techniques of production, and better and more extensive education and training of the labor force and others.

- **Ensuring full employment**. Society must also ensure full employment. It is the task of economic systems to ensure that resources are not idle or unemployed, since resources are scarce. In the market economy, full employment is achieved by stimulating demand.

Self-Check Exercise-1

Q.1 What is Economic System?

Q. 2 Discuss various functions of an Economic System.

2.4 PRIMITIVE COMMUNISM

Primitive communism is a concept introduced by Karl Marx and Friedrich Engels, who argued that hunter-gatherer societies were traditionally structured around egalitarian social relations and communal ownership. Their ideas were largely influenced by Lewis Henry Morgan's observations of the Iroquois people in North America, particularly his descriptions of "communism in living." According to Marx's model of socioeconomic development, societies characterized by primitive communism lacked hierarchical class divisions and did not accumulate capital.

Engels provided a detailed analysis of primitive communism in his 1884 work *The Origin of the Family, Private Property and the State*. Unlike later Marxists, Marx and Engels applied the concept not only to hunter-gatherer groups but also to certain subsistence-based agricultural societies. However, scholars—including Marxists—have since debated the historical prevalence and duration of primitive communism.

In such a society, all able-bodied individuals participated in acquiring food, and resources were shared collectively. Private property did not exist, though personal possessions, such as clothing, were distinguished from communal goods. Since production was limited to immediate consumption, there was no surplus accumulation. Durable items like tools and shelters were collectively owned. Engels associated this communal lifestyle with matrilineal descent and matrilocal residence. Furthermore, the absence of a formal state structure was a defining characteristic of primitive communism.

The transition from primitive communism to class-based societies occurred with the domestication of plants and animals following the Neolithic Revolution. Agriculture and animal husbandry introduced private ownership, leading to social stratification, slavery, and economic inequality. As some individuals specialized in areas such as manufacturing, culture, philosophy, and science, social classes began to emerge, marking a significant shift in human society.

Basic Characteristics of Hunter-Gatherer Societies

The archaeological record, consisting almost entirely of skeletons and tools, provide insufficient insight into human patterns of behaviour. However, a rich and detailed ethnographic literature describes hunter-gatherer people and near hunter-gatherer people who have survive into the modern era. This literature definitely establishes the distinct features of hunter-gatherer behaviour that appear in nearly

every primitive society—the "stylized facts" of hunter-gatherer societies that provide important insights into man as an economic and political animal. The most important of these stylized facts are as follows:

(i) The basic unit of society is the band, which typically consists of a small number of nuclear families related by kinship. Bands rarely exceed fifty persons (Fried 1967, 113). The widespread nature of this basic unit is impressive. All known foraging groups seem to take this form. Moreover, the band form of social organization also predominates among our closest primate species. We can be fairly confident, therefore, that this form of social organization prevailed throughout human history (and probably prehuman history as well) until the advent of settled agriculture.

(ii) Bands are widely scattered over relatively large territories, yielding population densities from perhaps one person for every five square miles to one person for every fifty or more square miles (Steward 1955, 125). The total human population was apparently extremely small until fairly recent times. Some estimates place the entire population of Europe at no more than one hundred thousand people as recently as twenty thousand years ago.

(iii) Bands have no effective government or formal laws. They frequently do have one or two men who command more respect than their peers and might be referred to as "headmen." But whatever their designation, they typically have little more authority than other men in the band. According to Fried, any band leader is "unable to compel any of the others to carry out his wish" (1967, 83). Of course, bands have norms of behaviour that apply, sometimes rather strictly, to all band members.

(iv) Food is typically hunted or gathered, not produced, as in pastoral or agricultural societies. Yet some primitive groups who have survived into the modern era (such as the Yanomamo of remote South America) may engage in a limited amount of gardening while still maintaining basic hunter-gatherer characteristics (Chagnon 1992,.79).

(v) Most goods are perishable. Primitive people have limited means of preserving food. Even non-food items may have to be abandoned when the band moves to a different location. This characteristic of foraging society has obvious implications for the accumulation of property.

(vi) Goods are exchanged according to a system of reciprocal-gift giving. This system is of course the only practical one for a society that has no money or even a workable substitute for money. It is a much-discussed characteristic of foraging societies and one that must be thoroughly understood in order to answer the questions raised in this article.

(vii) There is generally a division of labor between the sexes but not within the sexes. Thus, each adult male performs more or less the same work as every other adult male, and each adult female performs more or less the same work as every other adult female, but the work of men and the work of women are quite different. Women tend to care for Children and to gather food and material, whereas men tend to hunt.

(viii) Although hunter-gatherers have individual rights to personal property, no property rights typically exist in the natural resources the band uses. With very few people and abundant natural resources, creating property rights in those

resources yields no advantage. This common-property condition probably prevailed with few exceptions until the development of agriculture some ten thousand years ago.

(ix) Life in the band is characterized by extreme lack of privacy. Individuals therefore have extensive information about the activities of other individuals in the band.

(x) Intra-band conflict is relatively minor despite the lack of laws, police, and judges, but inter-band conflict may be significant. Marvin Harris concludes that a majority of hunter gatherer societies engaged in interband warfare, not ordinarily caused by disputes over territories or resources, but by disputes over personal grievances (1977, 47—49). Disputes over women and the widespread practice of capturing women were prominent causes of warfare (Chagnon 1992, 218-19)

Self-Check Exercise-2

Q.1 What do you know about Primitive Communism?

Q.2 Discuss various characteristics of Hunter- Gatherer Societies.

2.5 FEUDAL SYSTEM

In pre-colonial England, a system of land ownership existed in which the sovereign, typically the king, was regarded as the ultimate source of all property rights. Individuals were granted the right to possess land as a life estate, meaning ownership was not permanent. Upon their death, the land reverted to the sovereign rather than passing to their heirs.

Feudalism was a medieval political and economic structure that existed before the formation of modern nation-states. It was based on a hierarchical system in which rulers or lords granted land, known as a fief, to mounted warriors in exchange for military service. Those who received land became vassals, while those who granted it were referred to as liege lords. The agreement was often formalized through oaths sworn on religious texts or sacred relics. Typically, military obligations included forty days of service per year during peacetime, while in wartime, service was required for an indefinite period. However, these obligations varied based on factors such as local customs, the warrior's abilities, and the financial status of the liege lord. By the late medieval period, direct military service was often replaced by monetary payments or agreements to provide a specific number of trained soldiers.

Over time, fiefs became hereditary, meaning that land and military duties were passed from father to son. Feudalism had a profound impact on medieval society in two major ways.

(i) **Weakening of Centralized Authority** – Feudalism fragmented political power, as lords continued to divide their land among lesser nobles, who in turn granted portions to knights. This system of personal allegiances rather than national loyalty led to a lack of centralized governance. While rulers such as kings and high-ranking nobles held theoretical authority, in practice, local lords often operated with significant autonomy. This decentralization frequently led to conflicts, as lords and knights owed loyalty to different rulers who might be at war with one another. Unlike modern nation-states, where allegiance is given to a country, feudal society was built on personal relationships, which ended when a leader died.

(ii) **Hindrance to Economic and Trade Growth** – Economic activity under feudalism was restricted by rigid social structures. Serfs, who worked the land, were bound to specific estates and could not change their occupation or relocate without their lord's consent. A significant portion of their agricultural output was taken as taxes and fees by the feudal lord. Serfs were also obligated to provide labor for their lord's fields and were required to use his mills, ovens, and infrastructure while paying fees for these services. Lords held monopolies over essential services, preventing serfs from establishing their own means of production or transport. Some communities attempted to gain more economic independence by collectively paying fees to establish self-governing communes or obtaining charters that granted limited rights to trade and own land. While these arrangements offered economic advantages, they were often framed as privileges bestowed by the lord in exchange for financial compensation.

Thus, feudalism, while providing a structured social and military system, ultimately contributed to political fragmentation and economic stagnation, shaping medieval Europe for centuries.

Main Features of Feudalism are as follows:

Feudalism was a novel social system. It had several features.

(i) **Castle:** The Castle was the chief characteristic of feudalism. The feudal Lords lived in huge castles or forts. The living house and court of the Lord existed inside the castle. The Lords stored arms and weapons and found grains inside the castle. At the time of external invasion, it provided shelter to the common people. There was strong and high wall with towers at intervals around the castle. In some cases the castles were surrounded by wide ditch or moat. From towers one could watch the movement of enemies. The gateway of the castle was very strong. Deep ditches were dug around the castle and filled up with water. This was connected with a bridge. During the attack, this bridge was lifted off Mild the enemy could not enter into the castle. A feudal Lord had many castle and he lived inside different castles at different time.

(ii) **Manor:** Another significant mark of feudalism was Manor. The land associated with the castle was known as Manor. This was like a small estate. The castles, cultivated land, dwelling houses of barons and Church were associated with it. A feudal Lord had one or more manors. According to the possession of Manors, the strength of a feudal Lord was known.

(iii) **Demense**: Another feature of feudalism was 'Demense'. After distributing the land among his serfs whatever land remained with him was known as Demense. This law entirely belonged to the Lord which he could use according to his whims and caprices.

(iv) **The Feudal Society:** The division of a feudal society followed a pyramidal pattern. This society was largely an agrarian society. The King' was at the top of the society and he was quite powerless. Below him was placed the 'Feudal Lord'. Then came the 'Vassels' or 'Independent Farmers'. They could resort to independent profession and move from one place to another according to their own hill. The lowest stratum in the society projected the 'Serfs'. They had neither the land of their own, nor they were independent. They worked in the

land given to them by their Lord. In one day of the week, they worked in the field of their Lord without payment which was known as 'Forced Labour'. They remained inside small huts with their domestic animals like cows and pigs in a very unhealthy condition. They had to lead a miserable life.

(v) **The Knight:** Another characteristic feature of the feudal society was Knighthood'. A Knight took oath to fight with enemy and to protect the weak. Generally, the sons and relatives of a Lord received education and training to be a Knight. When one wanted to be a Knight, he had to work as a Page' or servant near another Knight. When he could serve property, he was appointed as a 'Squire' or body-guard of that Knight. During that period he learnt how to clean the weapons and prepare a horse. After he achieved mastery in these works, he was to be appointed as a Knight. He had to spend a night inside the Church in prayer. Then he had to kneel down before priest who would deliber a light blow of his palm on the young man's neck with the blessings- "Be a Valiant Knight". This act was famous as 'Accolade'. After becoming a Knight, he had to purchase horse and arms for himself. .By exhibiting chivalry he could save an old man, destiture, weak man from the clutches of injustice and tyranny. A Knight also respected a lady. They also spent their time in different plays and gymnastics. The medieval European literature sang the glory of these Knights in no uncertain terms.

(vi) **The Rights and Duties of Feudal Lords:** The Lords had many duties to perform. Most of them were employed in the work of the Government, army and diplomacy. They also looked to the administration of estates, draining of swamps and trade and commerce. Their main duty was to save their subjects from the invaders. The Lords enjoyed certain rights too. A Lord became the owner of the land of a vassal who died leaving a minor son. This ownership was called 'Wardship' and it continued till the minor came of age. In that case, the land was to be handed over the heir on payment of a sum known as 'Relief, when a Vassal died without the heir, his fiefs was taken over by the Lord. This was called 'Escheat'. Thus, the feudal Lords had many duties which they discharged and they also enjoyed certain rights inside the society.

(vii) **Duty of Vassals:** In feudal society, vassals or subjects had specific responsibilities toward their lord. They were required to attend the lord’s court whenever summoned. Additionally, vassals provided mandatory military service for forty days each year, accompanied their lord to battle, and protected his castle. They were also obligated to make financial contributions on certain occasions, such as the marriage of the lord’s eldest daughter, the knighthood of his eldest son, and the lord’s captivity, when ransom was needed for his release. These obligations were fulfilled in exchange for the lord’s protection of their lives and property against external threats, as well as his administration of justice.

(viii) **Ceremony of Homage:** The leading feature of feudalism prevailing in Europe was the Ceremony of Homage. This Ceremony was organised to cement the bond between the 'Lords' as 'Vassal'. After assembling in the castle of the noble each man used to Kneel down before the Lord with uncovered head. Then each one placed his folded hands on the hands of the Lord. He then took the oath to be his "man" or "Vassal". This ceremony was famous as "Homage" in which the Vassal: took vow to remain loyal to his Lord.

(ix) **Investiture:** After the Vassals showed homage, then the Lord raised him up and kissed them. He recognised them as his 'Subject' or 'Vassal'. Then the Lord placed in the hands of the Vassal a little earth or some leaves or a sword as a token of gift. A legal document concerning 'fief (land given to vassal), a staff and a flag were also handed over to the Vassal. This Sanction was termed as Investiture.

Self-Check Exercise-3

Q.1 What is feudal system? Discuss its main features.

2.6 SUMMARY

Economic systems are categorized based on how the dominant class within a society acquires surplus production. The methods by which surplus is controlled are vast and diverse, shaped by historical and social contexts. Throughout human history, numerous economic systems have emerged, but only a few have significantly influenced economic development. These include kinship-based production, feudalism, capitalism, slavery, and socialism. Some of these systems, such as kinship production and slavery, have existed since the earliest stages of human civilization, dating back approximately 100,000 years. In contrast, other economic structures have emerged more recently, reflecting evolving societal needs and technological advancements.

2.7 GLOSSARY

- **Economic Systems**: Frameworks through which nations and governments allocate resources, manage trade, and oversee the production and distribution of goods and services. They regulate key factors of production, including labor, capital, entrepreneurship, physical assets, and information resources.
- **Primitive Communism**: The earliest form of economic organization, as proposed in Marxist theory. Karl Marx identified different stages of economic evolution, including Asiatic, ancient, feudal, and bourgeois modes of production, marking societal transitions over time.
- **Feudalism**: A socio-economic and political system that dominated Europe from the 9th to the 15th century. It was characterized by a hierarchical structure in which land was held in exchange for service and loyalty. Lords granted land to vassals, who, in return, provided military or economic contributions, shaping medieval societies.

2.8 ANSWERS TO SELF-CHECK EXERCISES

Self-Check Exercise-1

Ans.1. Please refer to section 2.3 and 2.3.1

Self-Check Exercise-2

Ans.1. Please refer to section 2.4

Self-Check Exercise-3

Ans.1. Please refer to section 2.5

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2.10 TERMINAL QUESTIONS

Q1. What is an economy? Explain the key features of a primitive economy.

Q2. "The economy functions as a network of interdependent cooperation and transactions." Discuss.

Unit-03

MERCANTILISM AND CAPITALISM

STRUCTURE

3.1 INTRODUCTION

Mercantilism was an economic theory and practice prevalent in Europe from the 16th to the 18th century, emphasizing government regulation to strengthen state power by outcompeting rival nations. It aligned with political absolutism, though its leading proponents—such as Thomas Mun in England, Jean-Baptiste Colbert in France, and Antonio Serra in Italy—never explicitly used the term. The concept gained prominence through Adam Smith's *Wealth of Nations* (1776).

The theory was based on several interconnected principles. Wealth was primarily measured in precious metals like gold and silver, which were considered essential for national prosperity. Countries without direct access to mines were expected to acquire these metals through trade. Maintaining a favorable balance of trade, where exports exceeded imports, was a key objective. Colonies were viewed as both suppliers of raw materials and exclusive markets for the mother country's manufactured goods. Consequently, colonial manufacturing was prohibited, and trade was strictly controlled to benefit the ruling nation.

A prosperous nation, according to mercantilist beliefs, required a large population to ensure a steady labor force, a thriving domestic market, and a strong military. Luxury imports were discouraged, as they led to the loss of valuable foreign currency. Governments enacted sumptuary laws to limit excessive consumption, particularly of imported goods. Thrift, saving, and frugality were promoted as essential virtues, as they facilitated capital accumulation. Ultimately, mercantilism created a foundation for early capitalism by fostering a climate focused on profit and economic expansion.

3.2 LEARNING OBJECTIVES

After going through this unit, you will be able to;

- Explain Mercantilism
- Elucidate Capitalism

3.3 MERCANTILISM

Adam Smith, the 'Father of Economics' had first used the word 'Mercantilism'in his famous book 'Wealth of Nations'. Mercantilism means-"Governmental regulation of economic affairs, especially, trade and industry". The exponents of Mercantilism opined that Commerce is the key to progress of every country and it can be achieved at the cost of the interest of other country. Although they put emphasis on economy, they never wanted the intervention in politics.

3.3.1 Definition

Mercantilism, according to Laura La Hay, in the Library of Economics and Liberty, "is economic nationalism for the purpose of building a wealthy and powerful state." Economist Adam Smith coined the term mercantile system. The system was most popular between the 16th and 18th centuries in Europe. Countries tried to maintain a balance of imports to bring money into the country and exports to keep up domestic employment. The theory states than an economy needs to export more than it imports to remain economically and politically viable.

3.3.2 Causes of the Rise of Mercantilism:

Mercantilism grew due to several reasons.

At first, the Renaissance did not accept the religious doctrine of Medieval Europe. It explained 'Materialism' as one of the mediums of human happiness. So, everybody dreamt to lead a happy and prosperous life. This gave birth to Mercantilism.

Another factor contributing to the rise of Mercantilism was the decline of Feudalism. As feudalism fell, agriculture's future became uncertain, which in turn promoted the growth of small-scale industries. Towns and guilds supported the expansion of these industries and aimed to export the surplus production. This development played a significant role in the emergence of Mercantilism.

Thirdly, the Reformation Movement encouraged the merchants. The results of the Reformation Movement carried on by Martin Luther in Germany and Henry Vlll in England were far reaching. They condemned the unnecessary intervention of Pope in Political and Economic affairs except religion.

Martin Luther opposed the Pope so much so that he was issued 'Bull of excommunication by the Pope. However, Luther did not bend before it. In a similar vein Henry Vlllof England did not obey Pope and brought reformation in the Church England. These activities encourage the merchants to take up their business independently. This encouraged Mercantilism.

Fourthly, the Guilds and Banking System gave great impetus for the growth of Mercantilism. The guilds acted as distribution centres and exported the surplus to outside countries. This encouraged the international trade which was well-regulated by the banking system. Thus, Mercantilism grew out and out.

Fifthly, the Geographical Discoveries encouraged Mercantilism. The sea voyage of Columbus, Vascodagama, Magellan and others encouraged Mercantilism.

Sixthly, Political Patronage established Mercantilism on sound footing. The kings wanted to reduce the power of the feudal Lords and Barons. So, they encouraged the merchants for trade. Henry, 'the Navigator' of Portugal and Henry Vlll and Queen Elizabeth of England patronised sailors. Their patronage established Mercantilism on sound footing.

At last, Scientific Invention and Discoveries helped a lot in the growth of Mercantilism. The telescope invented by Galileo helped the merchants in their journey. The Mariner's Compass also helped the merchants a lot to determine direction inside the deep sea. These inventions made merchants confident for maritime trade which galvanised Mercantilism.

3.3.3 Characteristics of Mercantilism

Mercantilism had many characteristics. It was seen mostly in the European countries. Among those countries, England, France, Germany, Italy etc. were prominent.

The Characteristics of Mercantilism were as such:

1. Foreign Trade

In the first place the mercantilists laid great emphasis on a favourable balance of trade. They held that the strength and richness of a country depends on two things- the possession of gold and silver mines and favourable balance of trade. As all the countries did not possess mines of gold and silver, they could built up rich stocks of these metals by exporting maximum of their manufactured articles and importing minimum of commodities from other countries. Highlighting the importance of foreign trade Thomas Mun wrote: "The ordinary means....to increase our wealth and treasure is by Forign Trade....This ought to be encouraged, for upon it hangs the great revenue of the king, the honour of the kingdom, the noble profession of the merchant, the school of our arts, the supply of our poor, the improvement of our lands, the nursery of our mariners, the walls of the kingdom, the means of our treasures, the sinews of our wars and the terror of our enemies. "For the maintenance of a favourable balance of trade the mercantilists favoured commercial regulation. They insisted on discouraging the im-ports through imposition of heavy duties and prohibitions on foreign goods. On the other hand, the exports should be encouraged through bounties and other artificial stimulation of domestic agriculture and indus-try. For the promotion of the country's trade a number of Navigation laws were passed to ensure that the country's trade remained in the hands of the native shippers.

The mercantilism not only laid emphasis on the regulation of foreign trade but also emphasized the principle of monopoly. In most of the European countries the right to engage in. foreign trade was vested only in a small privileged section of the society. For example, the British govern-ment allowed its subjects to trade freely only with a small area (viz. France„spain and Portugal) while the rest of the world was divided for trading purposes amongst numerous joint stock companies. Each com-pany was allotted a defihite trading sphere.

Thus the East India Company enjoyed monopoly of trade with Asia, Africa Company With Africa and Levant Company with the Mediterranean. Similarly, the

European powers also vested the right of trade in various joint stock companies. East India Companies were formed in France, Holland, Sweden and Denmark for carrying on trade with the East.

The mercantilists applied the principle of monopoly with regard to their colonies also. It was asserted that colonies had no right to regulate their economic independently and must try to meet the needs of the mother country through supply of raw materials for her manufacturers.

The other foreigners were excluded from the colonial trade. They were not permitted to carry on trade with the colonies except in some less important articles. Industries were permitted to develop in the colonies only if they did not compete with the mother country. Obviously this policy led to complete neglect of the interests of the colonial people.

2. Importance of Money

Mercantilism attached great importance of money. It considered the wealth as the source of all powers and laid great emphasis on the importance of gold, silver etc. It also considered money as a significant factor for the commercial advancement. Further as the trade in those days was mostly carried on 2the basis of barter of goods, the people naturally preferred to keep gold and silver rather than the commodities.

The importance of money also increased because the state needed more taxes for the management of its affairs and it naturally preferred those taxes in money rather than in kind. The enormous amounts required for the conduct of commercial wars with other nations for the retention of colonies also greatly contributed to the importance of money. Money was also considered essential for abundance of trade. It was commonly held that "where money was scarce, trade was sluggish, where it was abundant, trade boomed." I short, mercantilism emphasized the importance of money on account of numerous reasons.

3. Interest

The concept of interest formed an important part of mercantilism even though there was no unanimity among the various mercantilists regarding its use and importance. For example, Mun justified charging of interest on the money because it could be profitably employed in trade and enabled the borrower to make huge profit. However, by and large the mercantilists favoured low rates of interests. They believed that the high rates of interests made the money scarce. Some of the mercantilist writers who favoured low rates of interests included Thomas Manley, John Locke, Nicholas Barbon etc. This stand of mercantilist was quite natural in view of the fact that it was an age of great scarcity of liquid funds, underdeveloped banking facilities and growing antagonism between the merchant manufacturers and the goldsmiths and big merchant financiers.

4. **Factors of Production**

The mercantilists Considered the land and the labour as the sole factors of production. Petty asserted, "Labour is the father and active principle of wealth, as lands are the Similarly, Josiah Child held that land and trade went hand in hand. Most of the mercantilists laid emphasis on the need of increasing production with a view to attain self-sufficiency in foodstuffs as well as encouragement of exports.

Emphasis was laid on the cultivation of waste lands to increase reduction of agriculture.

5. **Encouragement to Capitalism**

Mercantilism was meant to encourage capitalism. The capitalists invested their capital and made mercantilism more mobile. It was difficult on the part of Mercantilism to thrive without capital. This helped in the growth of trade and commerce.

6. **The Golden Principles**

The 'Golden Principles' of Mercantilism contained its chief characteristics. Those principles were self-dependency, industry, mine, commerce, naval power, colony, unity etc. Being guided by these principles, colonialism reached the pinnacle of success.

7. **Large Populations**

Mercantilism emphasized the need of possessing large population for increasing production and participation in the war. Highlighting the importance of large population Davenant said, "The people are the real strength of the community; dense population made inventions. It also developed industries which brought riches to the nation. In view of the importance of the population Samuel Fortrey plead for freedom of immigration and granting of equal rights to the immigrants. He argued the immigrants would bring riches with them and improve the condition of trade and industry in the country. Large population also made available cheap labour which helped a country to increase its domestic population and successfully compete with the foreign countries. In view of this the state encouraged matrimony and parenthood.

8. **Commercial Regulations**

Mercantilists accepted the need of commercial regulation for the smooth working of the economy and promotion of social welfare. Almost all the European countries framed regulations with a view to restrict the imports of foreign goods and encourage exports. Generally, the import of raw materials was preferred over import of finished product because it helped the industrial development of the country. Most of the states imposed artificial restraintson internal and external trade keeping in view the national interests. As the mercantilists believed that a country could obtain an advantage at the expense of another country only, the commercial regulations were framed keeping in view selfish national interests.

This explains why often the mercantilists did not permit the economic considerations to outweigh the political considerations and agreed to sub-serve the economic life to the political end.

Self-Check Exercise-1

Q.1 What is Mercantilism? Discuss various Characteristics of Mercantilism.

3.4 CAPITALISM

Capitalism is a system of economies based on the private ownership of capital and production inputs, and on the production of goods and services for profit. The production of goods and services is based on supply and demand in the general market (market economy) rather than through central planning (planned economy).

Capitalist is generally characterized by competition between producers. Other facets, such as the participation of government in production and regulation, vary across models of capitalism.

A capitalist economy is an economic system in which the production and distribution of commodities take place through the mechanism of free markets. Hence it is also called as market economy or free trade economy: Each individual be it a producer, consumer or resource owner has considerable economic freedom. An individual has the freedom to buy and sell any number of goods and services and to choose any occupation. Thus a market economy has no central coordinator guiding its operation. But self-organization emerges amidst the functioning of market forces namely supply, demand and price.

Features of Capitalist Economy

(i) **Private property:** in a capitalism system all the individuals have the right to own property. An individual can acquire property and use it for the benefit of his own family. There is no restriction on the ownership of land, machines, mines, factories and to earn profit and accumulate wealth. After the death of a person the property or wealth is transferred to the legal heirs. Thus the institution of private property is sustained over time by the right of inheritance.

(ii) **Freedom of enterprise:** In a capitalist economy the government does not coordinate production decisions of the citizens. Individuals are free to choose any occupation. Freedom of enterprise implies that business firms are free to acquire resources and use them in the production of any good or service. The firms are also free to sell their product in the markets Of their choice. A worker is free to choose his/her employer. In small business units owner himself takes the risk of production and earns profit or loss for himself. But in modern corporations the shareholders take risks whereas paid directors manage business. Thus the individual supervision of one's own capital is now no longer required to earn profit. Government or any other agency does not impose restrictions/obstacles in the way of workers to enter or leave a particular industry. A worker chooses that occupation where his income is maximum.

(iii) **Consumer's Sovereignty:** In a capitalist economy consumers are like a king They have the full freedom to spend their income on goods and services that give the maximum satisfaction. In capitalist system production is guided by consumer's choices. This freedom of consumers is called consumer's sovereignty.

(iv) **Profit Motive:** Self-interest is the guiding principle in capitalism. Entrepreneurs know that they will own the profit or loss after the payment to all other factors of production. Therefore they are always motivated to maximize their residual profit by minimizing cost and maximizing revenue. This makes the capitalist economy an efficient and self-regulated economy.

(v) **Competition:** There are no restrictions on the entry and exit of firms in a capitalism system. The large number of producers are available to supply a particular good or service and therefore no firm can earn more than normal profit. Competition is the fundamental feature of capitalist economy and essential to safeguard against consumer's exploitation. Although due to large-size and product distinction monopolistic tendencies have grown these days still the competition can be seen among a large number of firms.

(vi) **Importance of markets and prices:** The important features of capitalism like private property, freedom of choice, profit motive and competition make a room for free and efficient functioning of price mechanism. Capitalism is essentially a market economy where every commodity has a price. The forces of demand and supply in an industry determine this price. Firms which are able to adjust at a given price earn normal profit and those who fail to do so often quit the industry. A producer will produce those goods, which give him more profit.

(vii) **Absence of government interference:** In a free enterprise or capitalist economy the price system plays an important role of coordinating agent. Government intervention and support is not required. The role of government is to help in free and efficient functioning of the markets.

Self-Check Exercise-2

Q.1 Define Capitalism. Discuss various features of Capitalism.

3.5 SUMMARY

In this unit, we learnt about two more forms of economic system. In the first section we learnt about mercantilism economic system. In the next section we have discussed the capitalism economic system. In the next chapter we will discuss the Socialism, Communism and Mixed Economy type of economic system.

3.6 GLOSSARY

- **Mercantilism**: according to Laura Lahay, in the Library of Economics and Liberty, “is economic nationalism for the purpose of building a wealthy and powerful state."
- **Capitalist Economy**: is an economic system in which the production and distribution of commodities take place through the mechanism of free markets. Hence it is also called as market economy or free trade economy.

3.7 ANSWERS TO SELF-CHECK EXERCISES

Self-Check Exercise-1

Ans.1 Please refer to sections 3.3 and 3.3.3

Self-Check Exercise-2

Ans.1 Please refer to section 3.4

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3.9 TERMINAL QUESTIONS

Q1. What is an economy? Outline the key features of a Mercantilist economy.

Q2. What drives the choices of consumers and producers in a market economy?

Unit-04

DEMAND ANALYSIS

STRUCTURE

4.1 INTRODUCTION

Demand theory evinces the relationship between the demand for goods and services. Demand theory is the building block of the demand curve- a curve that establishes a relationship between consumer demand and the amount of goods available. Demand is shaped by the availability of goods, as the quantity of goods increases in the market the demand and the equilibrium price for those goods decreases as a result.

Demand theory is one of the core theories of microeconomics and consumer behaviour. It attempts at answering questions regarding the magnitude of demand for a product or service based on its importance to human wants. It also attempts to assess how demand is impacted by changes in prices and income levels and consumers preferences/utility. Based on the perceived utility of goods and services to consumers, companies are able to adjust the supply available and the prices charged. In economics, demand has a specific meaning distinct from its ordinary usage. In common language we treat ‘demand’ and ‘desire’ as synonymously. This is incongruent from its use in economics. In economics, demand refers to effective demand which implies three things:

• Desire for a commodity

• Sufficient money to purchase the commodity, rather the ability to pay

• Willingness to spend money to acquire that commodity

This substantiates that a want or a desire does not develop into a demand unless it is supported by the ability and the willingness to acquire it. For instance, a person may desire to own a scooter but unless he has the required amount of money with him and the willingness to spend that amount on the purchase of a scooter, his desire shall not become a demand. The following should also be noted about demand:

Demand always alludes to demand at price. The term ‘demand’ has no meaning unless it is related to price. For instance, the statement, 'the weekly demand for potatoes in city X is 10,000 kilograms' has no meaning unless we specify the price at which this quantity is demanded.

Demand always implies demand per unit of time. Therefore, it is vital to specify the period for which the commodity is demanded. For instance, the statement that demand for potatoes in city X at Rs. 8 per kilogram is 10,000 kilograms again has no meaning, unless we state the period for which the quantity is being demanded. A complete statement would therefore be as follows: 'The weekly demand for potatoes in city X at Rs. 8 per kilogram is 10,000 kilograms'. It is necessary to specify the period and the price because demand for a commodity will be different at different prices of that commodity and for different periods of time. Thus, we can define demand as follows:

“The demand for a commodity at a given price is the amount of it which will be bought per unit of time at that price”.

4.2 LEARNING OBJECTIVES

After going through this unit, you will be able to:

- Explain meaning and concept of demand.
- Elucidate on Law of Demand.

- Identify Demand Functions.
- Explain why demand curve slope downward
- Differentiate between the extension and contraction of demand curve and shifting of demand curve

4.3 MEANING OF DEMAND

In economics, demand refers to the different quantities of a good or service that consumers are both willing and able to purchase at various prices over a specific period. It is essential to distinguish between mere desire and actual demand. Simply wanting a product does not constitute demand unless it is supported by both purchasing power and a willingness to buy.

Demand does not indicate a single quantity at a particular price but represents a range of quantities associated with different prices. In other words, demand reflects the amount of a commodity that consumers are prepared to buy at a given price over a certain time period. For example, having a desire to own a car does not translate into demand unless you have the financial means to purchase it and are willing to spend that money. If you possess sufficient funds but choose not to allocate them toward buying the car, it remains a desire rather than demand.

Furthermore, specifying demand requires clarity regarding price and time. A statement like "the demand for cars in India is 10,000" is incomplete as it lacks price and time references. A more accurate way to express this would be: "The demand for cars in India is 10,000 per year at a price of ₹80,000 per car." Therefore, for a desire to become demand, a consumer must have the necessary financial resources and be prepared to spend them on the commodity at a specific price within a defined time frame. Even if you have ₹1,00,000 but are unwilling to buy a car priced at ₹80,000 today, you do not have demand for a car.

4.3.1 Definition of Demand

In general terms, demand refers to a desire for an object. However, in economics, demand involves more than just desire—it includes the quantity of goods or services that a person can buy with the necessary financial resources.

(i) **According to Prof. Hibdon**, "Demand refers to the various quantities of goods that would be purchased per time period at different prices in a given market." This means demand represents the willingness and ability of consumers to buy a commodity at different prices over a specified time frame. Essentially, demand reflects the behaviour of potential buyers in the market.

(ii) **Stonier and Hague define demand** as "desire backed by sufficient money to pay for the goods demanded." In other words, demand includes both the willingness to buy and the purchasing power to pay. Desire alone is insufficient—there must be adequate financial capability to complete the purchase. For example, while many people may want a luxury car like a Benz, only a few have the means to afford it. Therefore, demand has three key components: **desire, purchasing power, and willingness to buy.**

Self-Check Exercise-1

Q.1 What is the meaning of Demand ?

4.4 DEMAND FUNCTION

The functional relationship between the demand for a commodity and its various determinants may be expressed mathematically in terms of a demand function, thus:

Dx = f (Px, Py, M, T, A, U) where,

Dx = Quantity demanded for commodity X.

f = functional relation.

Px = The price of commodity X.

Py = The price of substitutes and complementary goods.

M = The money income of the consumer.

T = The taste of the consumer.

A = The advertisement effects.

U = Unknown variables or influences.

The above-stated demand function is a complicated one. Again, factors like tastes and unknown influences are not quantifiable. Economists, therefore, adopt a very simple statement of demand function, assuming all other variables, except price, to be constant.

Thus, an over-simplified and the most commonly stated demand function is: Dx = f (Px), which connotes that the demand for commodity X is the function of its price. The traditional demand theory deals with this demand function specifically.

It must be noted that by demand function, economists mean the entire functional relationship i.e. the whole range of price-quantity relationship and not just the quantity demanded at a given price per unit of time. In other words, the statement, 'the quantity demanded is a function of price' implies that for every price there is a corresponding quantity demanded.

In other words, the demand for a commodity refers to the complete demand schedule, which outlines the different quantities of a good that consumers are willing to purchase at various price levels during a specific period. Demand for a commodity is not fixed; it fluctuates based on changing circumstances.

Therefore, we will now examine the key factors that influence consumer demand for a commodity, whether at the individual or household level (household demand) or on a broader scale, representing the total demand across the entire market (market demand).

4.4.1 Individual Demand

The demand for a product by an individual or household is influenced by several key factors:

(a) Income

A household's income plays a crucial role in determining the demand for a commodity. Assuming other factors remain constant, an increase in income generally leads to a higher demand for goods, whereas a decrease in income results in reduced demand. With rising income levels, people tend to purchase more superior goods, luxury items, and comfort-related products, while the demand for

inferior goods decreases. Conversely, when income declines, the consumption of luxury and comfort goods diminishes.

(b) Price of the Commodity

The demand for a commodity generally shares an inverse relationship with its price. A decrease in price often leads to higher consumer purchases, whereas an increase in price typically results in lower demand, assuming all other factors remain constant.

(c) Consumer Preferences and Trends

Consumer choices, tastes, and fashion trends significantly impact demand. If a product becomes popular or aligns with consumer preferences, its demand rises. On the other hand, if a product becomes outdated or falls out of favor, its demand declines.

(d) Prices of Related Goods

The demand for a commodity is also affected by the prices of related goods, which are categorized as either complementary or substitute goods. Complementary goods are those that are typically used together, such as petrol and scooters. An increase in petrol prices may result in a decline in the demand for scooters. Likewise, a change in the price of refills can impact the demand for ball pens. In contrast, substitute goods are alternatives to one another. For instance, tea and coffee function as substitutes—if the price of coffee rises, consumers may opt for tea instead, increasing its demand even if its price remains constant.

4.4.2 Market Demand

In addition to the factors affecting individual household demand, two additional factors influence overall market demand:

(e) Population Size and Composition

The overall size of the population affects demand—larger and growing populations typically lead to higher demand for various goods. Additionally, the demographic composition, such as the proportion of children, adults, and elderly individuals, also shapes demand patterns. For instance, a higher number of children in a population would increase the demand for products like toys, baby food, and biscuits.

(f) Income Distribution

The way income is distributed within a country impacts demand patterns. If national income is unevenly distributed, with a few individuals holding significant wealth while the majority have lower earnings, demand for luxury and comfort goods will be higher, while mass-consumption goods will experience lower demand. Conversely, in economies where income distribution is more equal, demand for essential and mass-consumption goods tends to be higher, while luxury goods see relatively lower demand.

By considering these factors, businesses and policymakers can better understand consumer behavior and market trends, allowing for more effective decision-making.

Self-Check Exercise-2

Q.1 Give the functional relationship between the demand for a commodity and its various determinants, in mathematical terms of a demand function?

4.5 LAW OF DEMAND

The Law of Demand explains the correlation between the price of a product and the quantity that consumers are willing and able to purchase. It asserts that, provided all other influencing factors remain unchanged, a reduction in the price of a good leads to a higher quantity demanded, whereas an increase in price causes demand to decline. This principle highlights an inverse relationship between the price of a commodity and the amount demanded, meaning that as prices fall, consumer demand typically rises, and conversely, when prices increase, demand tends to diminish.

The assumption that "all other factors remain constant" is crucial to the law of demand. These factors include the consumer's income, their tastes and preferences, the prices of substitute and complementary goods, and other external influences. The phrase **ceteris paribus**, commonly used in economics, means "all else being equal" and emphasizes that the law of demand holds true only when these external factors do not change.

In simple terms, the law of demand suggests that when the price of a commodity decreases, consumers are more likely to purchase a larger quantity of it, and when the price rises, they tend to buy less. This fundamental principle is widely observed in real-world markets and plays a crucial role in economic analysis, helping businesses and policymakers understand consumer behavior and market dynamics.

4.5.1 Assumptions of the Law of Demand

The law of demand holds true only when all other influencing factors remain unchanged. These factors are considered the fundamental assumptions of the law. The key assumptions are as follows:

(i) Constant Income Level: The law of demand applies only if the buyer's income remains stable. If income increases while the price of a commodity remains the same, demand may still rise. Therefore, maintaining a consistent income level is essential for the law to function properly.

(ii) Unchanging Consumer Preferences: Any shift in consumer tastes or preferences can disrupt the operation of the law of demand. Changes in fashion or trends often cause individuals to modify their choices, leading to a decline in demand for certain products, even if their prices remain unchanged.

(iii) Stable Prices of Other Goods: The demand for a commodity is influenced by the prices of related goods. If the price of a complementary or substitute good fluctuates, it can impact the demand for the given product. For the law of demand to remain valid, the prices of other goods should remain constant.

(iv) No Introduction of New Substitutes: The emergence of new substitute products in the market can reduce the demand for an existing commodity. Consumers may shift their preferences to newer alternatives, decreasing demand for the original product, even if its price does not change. Thus, the law of demand assumes that no new substitutes enter the market.

(v) **No Expectation of Future Price Increases:** If consumers anticipate a price hike in the future, they may increase their current demand, which contradicts the law of demand. Therefore, for the law to operate effectively, buyers should not expect future price rises.

(vi) **Fixed Advertising Expenditure:** A rise in advertising spending can boost consumer interest and increase demand for a product. To ensure the validity of the law of demand, advertising efforts must remain unchanged.

4.5.2 Demand Schedule

The law of demand can be illustrated graphically through a demand curve, which depicts the relationship between price and quantity demanded. This curve represents different price-quantity combinations, indicating the quantity of a good that consumers are willing to buy at various price levels over a specific period, assuming all other factors influencing demand remain unchanged. Below is a demand schedule for reference.

Table 4.1: Demand Schedule for Ice-cream

Price of Ice-cream	Quantity Demanded of Ice-cream
10	20
8	40
6	60
4	80
2	100

4.5.3 Demand Curve

The law of demand can be represented graphically using a demand curve. This curve illustrates the relationship between price and quantity demanded, depicting various possible price-quantity combinations. It indicates the amount of a commodity that consumers are willing to purchase at different price levels within a given time period, assuming other factors remain constant. For instance, an individual's demand curve for ice cream, as shown in Figure 4.1, can be derived by plotting the data presented in Table 4.1.

In Fig. 4.1, the curve from point A to point G passing through points B, C, D and E is the demand curve DD. Each point on the demand curve DD' shows a unique price-quantity combination. The combinations read in alphabetical order should decreasing price of ice-cream and increasing number of cups of tea demanded per day.

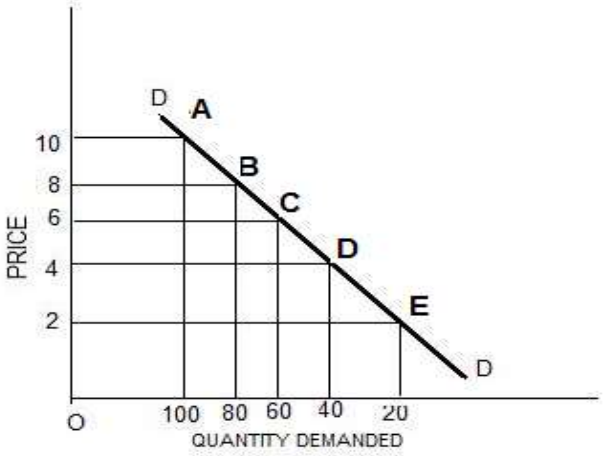

Fig. 4.1

In reverse alphabetical order, price-quantity combinations illustrate a rise in the price of tea per cup alongside a decline in the number of ice creams consumed daily by an individual. The demand curve as a whole represents the functional relationship between the varying prices of a commodity and the corresponding quantities a consumer is willing to purchase within a specific timeframe—whether daily, weekly, monthly, seasonally, or annually. This curve highlights the inverse relationship between price and quantity demanded, leading to its characteristic downward slope from left to right.

In economic analysis, price is typically plotted on the vertical axis, while quantity demanded is displayed on the horizontal axis. The demand curve visually represents the quantity of a good or service that consumers are both willing and able to buy at different price levels. Its downward slope is consistent with the law of demand, emphasizing the negative correlation between price and quantity demanded. Each point on the curve reflects a different price-quantity combination.

4.5.4 Market Demand

The quantity of a product that an individual purchases depends on its price, provided other factors remain unchanged. However, understanding market behavior requires analyzing the total demand from all consumers. Market demand refers to the overall quantity of a commodity that all buyers in a market are willing to purchase at various price levels within a specific time frame. It is calculated by adding the quantities demanded by each consumer at a given price to obtain the total demand at that price. This process is repeated across different price levels to create a market demand schedule.

Market demand is influenced by the same factors that impact individual demand, along with the number of buyers in the market. Graphically, the market demand curve is obtained by horizontally summing the individual demand curves of all consumers. To simplify, consider a market with only two consumers, A and B. Their individual demand schedules, along with the overall market demand schedule, are presented in the table below.

Table 4.2: Market demand schedule

Individual A		Individual B		Market Demand	
Price	**Quantity Demanded**	**Price**	**Quantity Demanded**	**Price**	**Quantity Demanded**
8	2	8	2	8	2+2=4
6	4	6	4	6	4+4=8
4	8	4	6	4	8+6=14

4.5.5 Market Demand Curve

When the data from the table is represented graphically, it forms the market demand curve. This curve, labeled as DmDm, is derived by aggregating the individual demand curves of consumer A (D1D1) and consumer B (D2D2), as depicted in separate graphs.

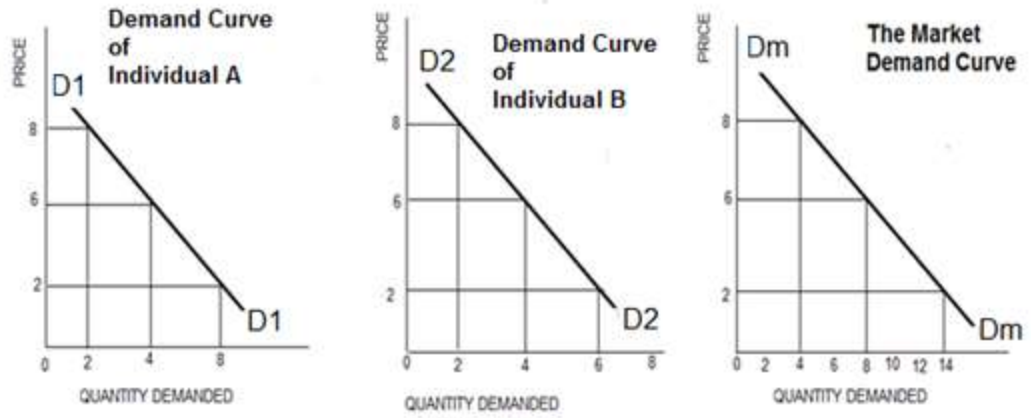

Fig. 4.2

This graphical representation confirms that the market demand curve is derived by horizontally adding the demand curves of all individual consumers in the market. Typically, the market demand curve slopes downward from left to right, following the general trend of individual demand curves, which also exhibit a downward slope. In the above example, for simplicity, we considered only two consumers purchasing a commodity (such as oranges). The market demand schedule and curve were obtained by aggregating their individual schedules and curves. However, in reality, markets consist of numerous consumers, making it impractical to compute the individual demand schedules or curves for every buyer.

An alternative approach to determining market demand involves selecting a representative or average consumer. By identifying the demand schedule of this typical consumer, we can estimate market demand by multiplying the average quantities demanded at various price levels by the total number of consumers in the market. This method helps construct the market demand schedule and, subsequently, the market demand curve.

4.5.6 Why is the demand curve typically downward sloping from left to right?

The demand curve generally slopes downward from left to right, signifying that as the price of a product declines, consumer purchases tend to increase, whereas a price rise leads to reduced demand. But what causes this pattern? In other words, what underlying factors explain the downward slope of the demand curve and the operation of the law of demand? Several key reasons account for this behavior:

(i) **Diminishing Marginal Utility:** This principle plays a crucial role in explaining why demand increases as price declines. When individuals buy a product, they exchange their money for the commodity to maximize their satisfaction. A consumer continues purchasing as long as the marginal utility of the commodity (MUC) exceeds the marginal utility of money (MUm). Consumers adjust their purchases until MUC equals MUm. When the price of a product drops, the equilibrium (MUm = Pc) is disturbed since MUm becomes lower than MUC. To restore equilibrium, the consumer buys more of the commodity, leading to a decrease in its marginal utility. This explains why demand rises when prices fall.

(ii) **Entry of New Consumers:** Market demand is the sum of individual consumer demands. When a product is expensive, only a small segment of affluent buyers can afford it, leaving lower-income groups to either forgo the product or opt for cheaper alternatives. However, as prices decline, more consumers,

including those from middle-income groups, can afford the product. A further drop in price makes it accessible to an even larger consumer base. This expansion in the number of buyers contributes to the overall increase in market demand.

(iii) **Income Effect:** A change in a product's price directly influences a consumer's purchasing power or real income. A price decrease boosts consumers' real income, enabling them to buy more of the product. On the other hand, a price increase reduces purchasing power, resulting in lower demand. This phenomenon, referred to as the income effect of a price change, illustrates why consumers generally buy more when prices drop and less when they rise.

(iv) **Substitution Effect:** When the price of a product declines, consumers experience an increase in their purchasing power, making the product more appealing in comparison to its alternatives. Consequently, they may opt to replace other goods with the now more affordable option. For instance, if the price of tea drops, consumers might purchase more tea instead of coffee. On the other hand, if tea becomes costlier, they could shift to coffee, leading to a decrease in tea consumption. This substitution effect plays a key role in shaping the downward slope of the demand curve.

Due to these factors, the demand curve generally slopes downward from left to right, reflecting the inverse relationship between price and quantity demanded—more is purchased at lower prices, and less is purchased at higher prices.

4.5.7 Exceptions to the Law of Demand

Generally, the demand curve slopes downward from left to right, signifying that consumers tend to buy more of a product when its price decreases and less when the price rises. However, there are exceptions where a price reduction results in lower demand and vice versa, causing the demand curve to slope upward. These exceptions include:

(i) **Expectation of Future Price Increases or Scarcity**: If consumers anticipate that a product will become scarce or its price will rise in the future, they may increase their purchases even at a higher price. Similarly, if the price of a good rises but buyers believe it will continue to escalate, they might purchase more now to avoid higher costs later. Conversely, if prices decline but consumers expect them to drop further, they may postpone their purchases, waiting for an even lower price.

(i) **Goods Associated with Social Prestige:** Certain goods, such as diamonds, are valued not just for their utility but also for the social status they confer. Wealthy individuals purchase these items precisely because they are expensive. If the prices of such goods decrease, their exclusivity diminishes, reducing their appeal. On the other hand, if prices increase, demand may also rise due to their enhanced prestige.

(ii) **Giffen Goods:** The most notable exception to the law of demand is the case of Giffen goods. These are inferior goods for which demand increases when prices rise and decreases when prices fall. This occurs because a price reduction in an inferior good effectively increases the consumer’s

purchasing power, allowing them to shift to superior alternatives. As a result, demand for the inferior good declines. Conversely, when the price of an inferior good rises, consumers with limited income may be forced to allocate a larger portion of their budget to it, reducing their ability to afford more expensive alternatives and leading to an increase in demand for the inferior good.

This phenomenon was first observed by economist Sir Robert Giffen in 19th-century Britain. He noted that when the price of bread—a staple food for low-income workers—rose, these workers purchased more bread instead of less. Since bread was a necessity, they had to spend more on it and could no longer afford other food items like meat. To compensate, they bought even more bread to meet their dietary needs. This resulted in a direct relationship between price and demand, contrary to the typical law of demand. Goods that exhibit this behavior are termed *Giffen goods*.

There is a distinction between an inferior good and a Giffen good. A Giffen good is a specific type of inferior good where the price and demand exhibit a direct relationship—meaning that as the price rises, demand also increases, and vice versa. This unique behavior is illustrated in Diagram 4.3.

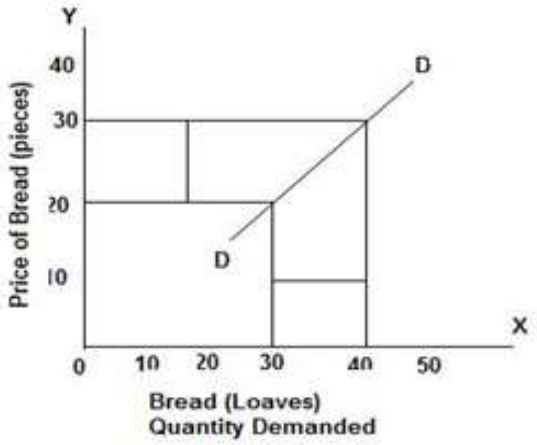

fig. 4.3 Giffen Good

In the given figure, when the price of a loaf of bread is 20 paise, the consumer purchases 30 loaves. However, as the price rises to 30 paise per loaf, the consumer increases their purchase to 40 loaves. This indicates that as the price of bread rises, the consumer buys more, and vice versa. Such a scenario represents a direct or positive relationship between the price of a good and its quantity demanded. Consequently, the demand curve slopes upward from left to right, as illustrated by the demand curve DD in Diagram 4.3. In this context, bread is classified as a 'Giffen good.' The concept of Giffen goods will be explored further in the section on Indifference Curve Analysis of Demand. However, identifying real-life examples of Giffen goods remains highly challenging, if not nearly impossible.

Self-Check Exercise-3

Q. 1. Why does the demand curve slope downwards? Discuss.

Q. 2. Explain Law of Demand, in detail?

Q. 3. Suggest a possible exception to the "law of demand," in which people buy less of a good as its price increases?

4.6 DETERMINANTS OF DEMAND

Several factors influence the demand for a product, including income levels, the prices of related goods, consumer preferences, expectations, market size, and income distribution. These elements, known as non-price determinants of demand,

are considered constant when formulating the demand schedule and demand curve. However, any change in these factors leads to shifts in demand. Let's examine how each of these determinants impacts demand:

(i) **Income**: The purchasing power of consumers plays a crucial role in determining demand. Typically, as income increases, people tend to buy more goods and services, leading to higher demand. These goods are known as normal goods since their demand rises with income. However, certain products, called inferior goods, exhibit an inverse relationship with income. As consumers' income grows, they may opt for higher-quality alternatives, reducing their demand for such goods.

(ii) **Prices of Related Goods:** Products can be related in two primary ways—substitutes or complements. A substitute is a good that can replace another, such as tea and coffee. When the price of one substitute rises, consumers shift towards the other, increasing its demand. Conversely, complementary goods are consumed together, such as petrol and scooters. A decrease in the price of one complement boosts the demand for the other. For example, a drop in scooter prices would likely lead to an increase in demand for petrol.

(iii) **Consumer Preferences and Tastes**: Demand is also influenced by changes in consumer preferences and trends. Companies invest heavily in advertisements to shape consumer preferences in favor of their products. If a product aligns with current consumer tastes, its demand rises. Conversely, if a product becomes outdated or falls out of favor, its demand declines.

(iv) **Consumer Expectations:** The anticipation of future changes in price and income affects purchasing decisions. If consumers expect prices to rise, they may buy more of the product in the present to avoid paying a higher price later. On the other hand, if prices are expected to fall, they may delay purchases. Similarly, expectations regarding future income influence spending behavior—if people foresee an income rise, they may increase their current consumption, whereas concerns about a future income decline may lead to reduced spending.

(v) **Number of Buyers in the Market:** The overall demand for a product is directly linked to the number of consumers in the market. A larger population generally leads to higher demand for most goods and services. Population growth, urbanization, and demographic changes can significantly influence demand patterns.

(vi) **Income Distribution:** The way income is distributed within a society impacts overall demand. A more equitable income distribution results in a higher collective propensity to consume, leading to increased demand for goods and services. In contrast, when income is concentrated among the wealthy, overall demand may be lower, as affluent individuals tend to save more and spend a smaller proportion of their income compared to those with lower earnings.

Self-Check Exercise-4

Q.1. What are the factors, which determine the demand of a commodity? Explain

4.7 DIFFERENCE BETWEEN EXPANSION AND CONTRACTION OF DEMAND AND INCREASE AND DECREASE IN DEMAND

4.7.1 Expansion and Contraction of Demand:

The demand for a commodity is affected by multiple factors. However, the law of demand specifically examines how price fluctuations influence demand, assuming that all other factors—such as consumer income, preferences, fashion trends, and the prices of related goods—remain constant. When demand changes solely due to a shift in price, it is referred to as the expansion or contraction of demand. This concept is also known as a change in quantity demanded or movement along the same demand curve.

When the quantity demanded increases solely due to a decrease in the price of a commodity, it is called expansion of demand. Conversely, when the quantity demanded decreases due to a price increase, it is termed contraction of demand. For example, if the price of oranges drops from ₹3.00 per dozen to ₹2.50 per dozen, leading to an increase in demand from 1 dozen to 2 dozens, it represents expansion of demand. On the other hand, if the price rises from ₹1.50 per dozen to ₹2.00 per dozen, causing demand to decrease from 4 dozens to a lower quantity, it illustrates contraction of demand. Here, we assume that only price changes are influencing demand, with all other determining factors remaining constant. We can explain them with the help of the fig. 4.4.

This concept can be illustrated using a demand curve (DD), which depicts the different quantities of a commodity demanded at various price levels, assuming external influences such as income, tastes, and prices of substitutes or complementary goods remain unchanged. In the diagram, when the price is OP, the quantity demanded is OS. If the price falls from OP to OQ, demand increases from OS to OT, and this increase (ST) is termed expansion of demand. Conversely, if the price rises from OP to OM, demand falls from OS to OR, and this reduction (RS) is termed contraction of demand.

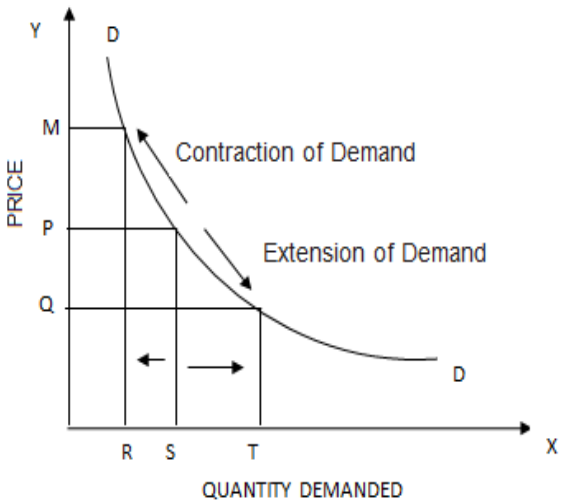

fig. 4.4

Thus, expansion and contraction of demand occur solely due to price fluctuations and are represented as movements along the same downward-sloping demand curve.

4.7.2 Increase and Decrease in Demand:

The variation in demand for a commodity due to factors other than its price—such as changes in consumer income, preferences, fashion trends, or the prices of related goods—is referred to as an increase or decrease in demand. If a consumer's income rises while the price of the commodity remains unchanged, their purchasing power increases, leading to a higher demand for the product. This phenomenon is known as an increase in demand. Conversely, if the consumer's income declines, their purchasing power decreases, resulting in lower demand, which is termed a

decrease in demand. While expansion and contraction of demand are depicted as movements along the same demand curve, an increase or decrease in demand is illustrated by a shift in the demand curve either upward or downward. This is explained in fig. 4.5.

Consider the initial demand curve as DD. At price OP, the quantity of commodity X demanded is OM. If the price remains constant but consumer income increases or the commodity becomes more fashionable, consumers can afford to purchase more. As a result, the demand curve shifts rightward to D_1D_1, and the new quantity demanded becomes ON instead of OM, reflecting an increase in demand. Conversely, if consumer income decreases or the popularity of the product declines, the demand curve shifts leftward to D_2D_2, reducing the quantity demanded to OR at the same price OP, which represents a decrease in demand.

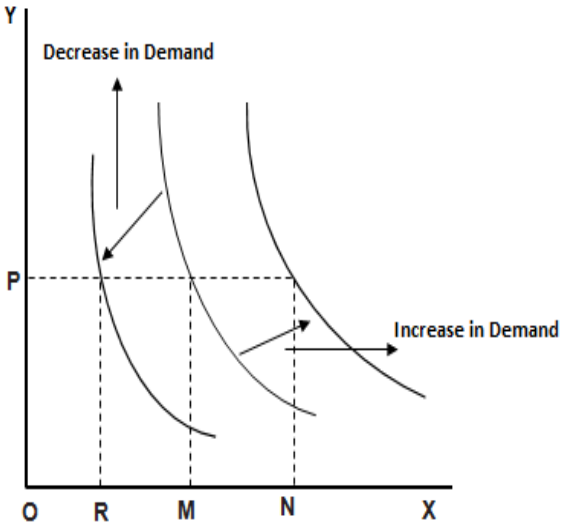

fig. 4.5

In summary, expansion and contraction of demand occur solely due to price fluctuations while keeping other factors constant, leading to movements along the same demand curve. In contrast, increases and decreases in demand arise due to changes in external factors such as income, tastes, and fashion, and are represented by shifts in the demand curve.

Self-Check Exercise-5

Q.1. Explain the difference between a change in quantity demanded and a change in demand.

4.8 SUMMARY

This unit explores various aspects of demand. The Law of Demand states that there is an inverse relationship between the price of a commodity and its demand. In other words, when the price of a good rises, its demand decreases, and vice versa. However, this law operates under specific assumptions, such as a constant income level for consumers, unchanged tastes and preferences, and stable prices of related goods. Typically, the demand curve slopes downward from left to right, primarily due to three key factors: diminishing marginal utility, the income effect, and the substitution effect. However, certain goods do not follow this pattern. Giffen goods, luxury items that confer social status, and goods expected to become scarce or experience a price increase in the future are exceptions to the law of demand.

Several factors influence demand, including income levels, prices of related goods, consumer preferences, future expectations, the number of buyers in the market, and income distribution. A change in demand caused solely by price variations is referred to as extension (when demand increases due to a price drop) and contraction (when demand decreases due to a price hike). On the other hand,

shifts in demand due to non-price factors, such as changes in income, consumer preferences, fashion trends, or prices of related goods, are categorized as increase or decrease in demand.

4.9 GLOSSARY

- **Demand:** The quantity of a commodity that consumers are willing and able to purchase at a given price within a specific period.
- **Law of Demand:** A principle stating that, assuming all other factors remain constant (ceteris paribus), the demand for a commodity increases when its price decreases and decreases when its price rises.
- **Market Demand:** The total quantity of a commodity that all consumers are willing to purchase at a given price during a specific time period, assuming no changes in other influencing factors. It is essentially the sum of individual demands from all buyers.
- **Individual Demand:** The quantity of a good that a single consumer is both willing and able to purchase at a given price.
- **Demand Function:** A mathematical representation of the relationship between demand and its determinants.
- **Demand Curve:** A graphical representation that shows the relationship between the price of a commodity and the quantity demanded by consumers.
- **Income Effect:** The change in consumption patterns due to a change in a consumer's real income, assuming prices remain constant.

4.10 ANSWERS TO SELF-CHECK EXERCISES

Self-Check Exercise-1

Ans.1 Please refer Section 4.3 and 4.3.1

Self-Check Exercise-2

Ans.1 Please refer Section 4.4, 4.4.1 and 4.4.2

Self-Check Exercise-3

Ans.1 Please refer Section 4.5 and from 4.5.1 to 4.5.7

Self-Check Exercise-4

Ans.1 Please refer Section4.6

Self-Check Exercise-5

Ans.1 Please refer Sections 4.7, 4.7.1 and 4.7.2

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4.12 TERMINAL QUESTION

Q.1. State the law of demand and show it through a demand schedule and a demand curve. What are the exceptions to the law of demand?

Q.2. Briefly state the reasons for the downward sloping demand curve?

Q.3. State the differences between changes in quantity demanded and change in demand?

Unit-05

ELASTICITY OF DEMAND

STRUCTURE

5.1 INTRODUCTION

The demand for a commodity is influenced by various factors, including its own price, the prices of other goods, consumer incomes, preferences, advertisements, government policies such as taxes or subsidies, as well as external factors like weather conditions and future price expectations. According to the law of demand, assuming all other factors remain constant, the quantity demanded of a good generally increases when its price decreases and vice versa. Additionally, demand patterns change in response to variations in consumer income and the prices of related goods. For instance, the demand for ice tends to rise with higher temperatures.

However, these economic principles only indicate the direction of change in demand rather than quantifying the extent of such changes. In both theoretical analysis and practical decision-making, it is crucial to assess how sensitive demand is to different influencing factors. This involves measuring the degree of responsiveness of demand to each factor individually and comparing their relative effects. The concept of elasticity of demand serves as a tool for evaluating this responsiveness.

Elasticity of demand is used to measure how the quantity demanded of a good responds to changes in various determinants, provided they are quantifiable. Some factors, however, cannot be precisely measured, making it difficult to assess their impact on demand. Generally, elasticity of demand is categorized into three types:

(i) **Price Elasticity of Demand** – measures the responsiveness of the quantity demanded to changes in the price of the good itself.

(ii) **Income Elasticity of Demand** – evaluates how demand for a good changes in response to variations in consumer income.

(iii) **Cross Elasticity of Demand** – assesses the impact of changes in the price of one good (Y) on the demand for another related good (X).

By understanding these different types of elasticities, businesses and policymakers can make informed decisions regarding pricing strategies, production planning, and market interventions.

5.2 LEARNING OBJECTIVES

After going through this unit, you will be able to:

- Elucidate Elasticity of Demand
- Explain different types of elasticity of demand
- List Determinant factors of Elasticity of Demand

5.3 ELASTICITY OF DEMAND

The law of demand explains the connection between a product's price and the quantity demanded but does not indicate the strength of this relationship. As previously mentioned, this relationship is generally inverse, with a few exceptions. To quantify the degree of responsiveness, the concept of elasticity of demand is analyzed. Elasticity of demand measures how demand reacts to fluctuations in price and income levels.

5.3.1 Meaning of Elasticity

The law of demand describes the direction of changes in demand, stating that a decrease in price results in an increase in quantity demanded, and vice versa. However, it does not indicate the rate at which demand responds to price fluctuations. To address this, Alfred Marshall introduced the concept of elasticity of demand, which measures the relationship between price changes and the corresponding variations in quantity demanded. In simple terms, it quantifies the extent to which demand changes in response to price adjustments.

Elasticity of demand is defined as the degree of responsiveness of quantity demanded to changes in price. Essentially, it represents the rate at which demand shifts due to price variations. There are three primary types of demand elasticity:

1. Price Elasticity of Demand.

2. Income Elasticity of Demand and

3. Cross Elasticity of Demand.

5.3.1.1 Price Elasticity of Demand

Price elasticity of demand quantifies how the quantity demanded of a good responds to changes in its price. It is expressed as the percentage change in quantity demanded relative to the percentage change in price. This relationship can be calculated using the following formula.

$$\text{Price Elasticity} = (-)\frac{Proportinate\ change\ in\ quantity\ demanded\ for\ Commodity\ X}{Proportinate\ change\ in\ price\ of\ Commodity\ X}$$

OR

$$Ep = (-)\frac{\frac{Change\ in\ Quantity\ Demanded}{Quantity\ Demanded}}{\frac{Change\ in\ Price}{Price}}$$

OR

$$Ep = (-)\frac{\frac{Q2-Q1}{Q1}}{\frac{P2-P1}{P1}} \text{ or } \frac{Q2-Q1}{Q1} \times \frac{P1}{P2-P1}$$

Where: Q1 = Quantity demanded before price change

Q2 = Quantity demanded after price change

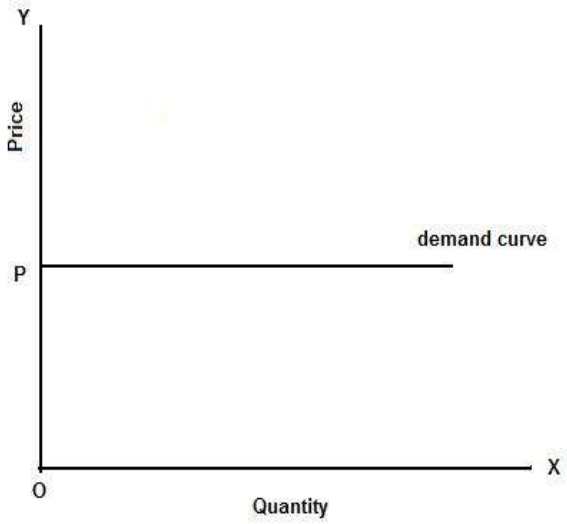
P1 = Price charged before price change

P2 = Price charge after price change.

The price elasticity of demand can be classified into five distinct types based on its degree. These include perfectly elastic demand, perfectly inelastic demand, relatively elastic demand, relatively inelastic demand, and unitary elastic demand.

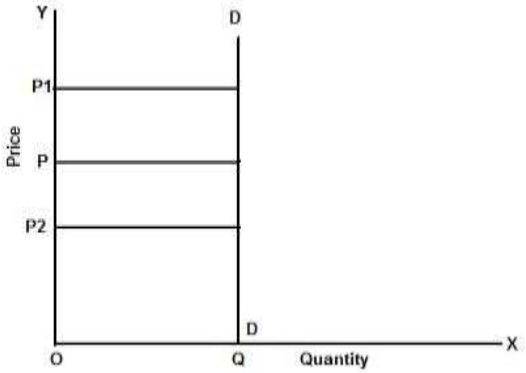
1) Perfectly elastic demand (infinitely elastic)

When even a minimal change in price results in an unlimited or infinite change in the quantity demanded, the demand is said to be perfectly elastic. This means that consumers are highly sensitive to price fluctuations, and even a slight increase in price will cause the quantity demanded to drop to zero, while a small decrease in price will lead to an infinitely large demand. Graphically, a perfectly elastic demand curve is represented as a horizontal straight line, indicating that the price remains constant regardless of the quantity demanded. Mathematically, the price elasticity of demand in this scenario is denoted as Ep= ∞



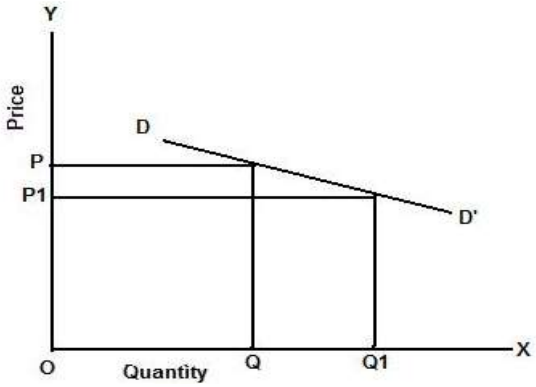
2) Perfectly inelastic demand

In this scenario, even a significant change in price does not lead to any variation in the quantity demanded. This means that regardless of whether the price increases or decreases, consumers continue to demand the same quantity of the good. As a result, the demand curve takes the shape of a vertical line, indicating perfectly inelastic demand. The price elasticity of demand (Ep) in this case is equal to zero, signifying that price fluctuations have no impact on the quantity demanded.



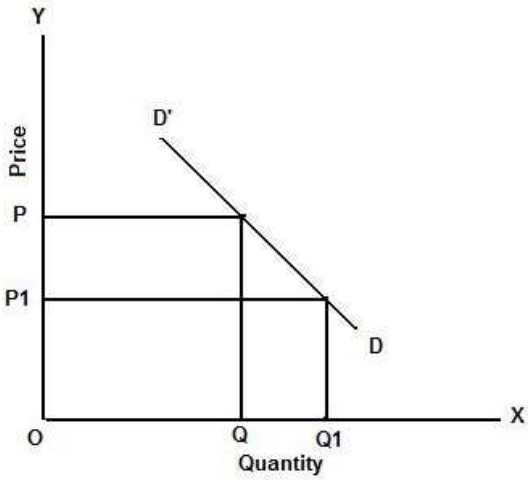
3) Relatively elastic demand

In this scenario, even a slight change in price results in a substantial change in the quantity demanded. As a result, the demand curve appears relatively flatter, indicating a highly elastic demand. Mathematically, the price elasticity of demand (Ep) is greater than 1 (Ep > 1), signifying that the percentage change in quantity demanded exceeds the percentage change in price.



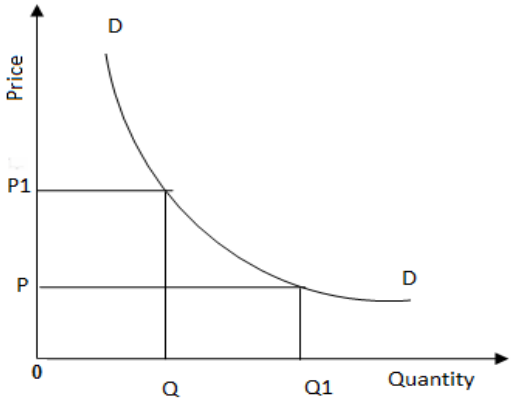
4) Relatively inelastic demand

In this scenario, the percentage change in quantity demanded is smaller than the percentage change in price. This means that even a significant increase or decrease in price results in only a relatively small adjustment in the quantity demanded by consumers. As a result, the demand curve appears steeper, indicating that demand is relatively inelastic. Mathematically, the price elasticity of demand (Ep) in this case is less than 1 (Ep < 1), signifying that consumers are less responsive to price fluctuations.



5) Unit elasticity of demand (unitary elastic)

In this scenario, the percentage change in demand corresponds precisely to the percentage change in price. When the proportional variations in both demand and price are identical, the price elasticity of demand (ep) equals 1. This condition is referred to as unitary elasticity, indicating that a given change in price leads to an equivalent percentage change in the quantity demanded.



The above five types of elasticity can be summarized as follows

Sr. No.	Type	Numerical Expression	Description	Shape of Curve
1.	Perfectly Elastic	∞	infinity	Horizontal
2.	Perfectly inelastic	0	zero	Vertical
3.	Unitary	1	one	Rectangular hyperbola
4.	Relatively Elastic	>1	More than one	Flat
5.	Relatively inelastic	<1	Less than one	Steep

5.3.1.2 Income Elasticity of Demand

Income elasticity of demand measures the responsiveness of the quantity demanded for a good or service to changes in the income level of consumers. It indicates how demand varies when there is an adjustment in consumers' income. Mathematically, income elasticity of demand can be expressed using the following formula:

$$E_y = \frac{Proportinate\ change\ in\ quantity\ demanded}{Proportinate\ change\ in\ Income}$$

Income elasticity of demand mainly of three types:

1) Zero income Elasticity.

2) Negative income Elasticity

3) Positive income Elasticity.

1). Zero income elasticity –In this scenario, the quantity demanded remains unchanged despite an increase in monetary income. In other words, variations in income have no impact on the amount of the product consumers demand. This typically applies to essential goods such as salt and sugar, where consumption remains stable regardless of income fluctuations. The income elasticity of demand (Ey) in such cases is equal to zero, indicating that demand is perfectly inelastic concerning income changes.

2). Negative income elasticity- In this scenario, as income rises, the quantity demanded for a particular good decreases. Such goods are classified as inferior goods, meaning that consumers tend to purchase less of them as their financial situation improves. This relationship is represented by the income elasticity of demand (Ey), which is negative (Ey < 0), indicating an inverse correlation between income levels and demand for these goods.

3). Positive income Elasticity - In this scenario, a rise in income typically results in a higher quantity demanded, meaning that as individuals experience an increase in their earnings, their demand for goods and services also increases. Mathematically, this is represented as **Ey =>0**, indicating a non-negative income elasticity of demand. This relationship can be categorized into three distinct types:

a) **Unitary Income Elasticity of Demand:** When the percentage change in the quantity demanded of a good is exactly equal to the percentage change in income, the income elasticity of demand is said to be unitary (Ey = 1). This implies that an increase or decrease in income results in a proportional change in the quantity demanded.

b) **Income Elasticity Greater than One:** If the income elasticity of demand is greater than one (Ey > 1), it indicates that a rise in income leads to a more than proportionate increase in the quantity demanded of the good. This characteristic is commonly observed in luxury or high-end goods, where consumer demand significantly increases as income levels rise.

c) **Income Elasticity Less than One:** When the income elasticity of demand is less than one (Ey < 1), it means that as income increases, the quantity demanded also rises but at a slower rate. In other words, the proportionate change in demand is smaller than the proportionate change in income. This is typically seen in necessities, where consumption grows at a diminishing rate despite an increase in income.

Types of Goods	Numerical Measure of Income Elasticity	Verbal description
(1) Inferior Goods	Negative	Quantity demanded decreases as income increases.
(2) Normal Goods	Positive	Quantity demanded increases an income increases.
(2.1) Necessity	Less than one	Quantity demanded increases less than proportion to increase in income.
(2.2) Luxury	Greater than one	Quantity demanded increases more than proportion to increase in income.

5.3.1.3 Cross Elasticity of Demand

Cross elasticity of demand measures the responsiveness of the quantity demanded for one good when there is a change in the price of another related good. These related goods can either be substitutes or complements. Substitute goods, such as tea and coffee, are those that can replace each other in consumption. On the other hand, complementary goods, like cars and petrol, are typically used together.

The cross elasticity of demand is calculated using the following formula:

$$\text{Cross Elasticity} = \frac{Proportinate\ change\ in\ quantity\ demanded\ for\ a\ Commodity}{Proportinate\ change\ in\ price\ of\ related\ Commodity}$$

A positive cross elasticity indicates that the two goods are substitutes. For instance, if the price of tea rises, consumers may reduce their consumption of tea and switch to coffee, thereby increasing the demand for coffee. This positive relationship signifies that tea and coffee are substitute goods.

Conversely, a negative cross elasticity suggests that the goods are complements. For example, if the price of cars increases, the demand for petrol is likely to decline because fewer people may purchase cars, leading to lower petrol consumption. This negative relationship confirms that cars and petrol are complementary goods.

Understanding cross elasticity of demand is crucial for businesses, particularly in pricing strategies. It helps managers make informed decisions regarding the pricing of products that have close substitutes or complementary goods. By analyzing cross elasticity, firms can anticipate consumer behavior and adjust their pricing strategies to maximize revenue and market competitiveness.

Following table terminology of Cross Elasticity of Demand

Type of goods	Numerical measure of cross elasticity	Verbal description
Substitutes	Positive	Quantity demanded of a good increase if the price of substitutes increases.
Complementary	Negative	Quantity demanded of a good decrease if the price of complements increases.
Independent	Zero	Quantity demanded of a good remains unchanged to change in the price of other good.

Self-Check Exercise-1

Q.1 Write notes on the following:

1. Elasticity of Demand
2. Price Elasticity
3. Cross elasticity and income elasticity.

5.4 Factors Determining Elasticity of Demand for Different Goods

Factors Influencing the Elasticity of Demand for Various Goods

The price elasticity of demand varies across different goods. Some products exhibit high elasticity, meaning that demand responds significantly to price changes, while others have low or even inelastic demand, where price fluctuations have minimal impact. This variation arises due to multiple influencing factors, only a few of which are highlighted below.

(i) Availability of Close Substitutes: One of the primary factors affecting a product's price elasticity of demand is the presence of close substitutes. Goods such as toothpaste, shaving blades, soaps, and shoe polish have multiple alternative brands. When the price of one brand rises while others remain

unchanged, consumers tend to shift their preference toward cheaper substitutes. Consequently, goods with several close alternatives generally have high elasticity. Conversely, products with few or no substitutes, such as salt, exhibit inelastic demand, as consumers have limited options to replace them.

(ii) Nature of the Commodity: The classification of a good as either a necessity or a luxury significantly influences its price elasticity. Essential commodities, such as staple foods, exhibit inelastic demand since consumers must continue purchasing them despite price changes. On the other hand, luxury items, which are non-essential, tend to have highly elastic demand, as people can easily reduce or eliminate their consumption when prices rise.

(iii) Price Level of the Commodity: Price elasticity also depends on whether a product is priced very high or very low. At extreme price levels, demand tends to be inelastic. For instance, a minor reduction in the cost of an expensive car may not significantly impact sales, as only affluent consumers can afford such goods. Similarly, a slight price decrease in inexpensive products like pencils is unlikely to lead to a substantial increase in demand, as these items are already affordable.

(iv) Proportion of Income Spent on the Good: The extent to which a product affects a consumer's budget plays a crucial role in determining its demand elasticity. When a good accounts for a small portion of income, such as matchboxes, newspapers, or salt, a price increase does not substantially impact the consumer’s overall expenditure, resulting in inelastic demand. However, for goods that constitute a significant share of a household’s budget, such as groceries, a price rise may compel consumers to seek cheaper alternatives, making demand relatively more elastic.

(v) Entry of New Consumers into the Market: The affordability of a product also affects its demand elasticity. When prices are high, only wealthier consumers can afford the product. However, as prices drop, more individuals from lower-income groups may be able to purchase it. This effect contributes to higher demand elasticity since price reductions attract new buyers across various income levels.

(vi) Possibility of Postponing Purchases: Goods for which purchases can be delayed tend to have more elastic demand. Consumers can postpone buying durable items like furniture, refrigerators, or televisions if prices are high and wait for better deals in the future. In contrast, essential goods such as medicines and basic necessities have inelastic demand, as consumers cannot delay their consumption regardless of price changes.

(vii) Time Period Considered: The responsiveness of demand to price changes also depends on the duration under consideration. In the short term, consumers may take time to adjust their consumption habits or find substitutes, making demand relatively inelastic. Over a longer period, however, people adapt by altering their buying behaviour or switching to alternatives, leading to greater elasticity.

Multiple factors collectively influence the elasticity of demand for a given product. For example, salt is a necessity, has no close substitutes, is relatively inexpensive, and constitutes a minimal portion of household expenditure. Additionally, its consumption cannot be postponed. These factors collectively

contribute to its low price elasticity. Therefore, when analyzing demand elasticity, it is essential to consider all potential influences affecting consumer behaviour.

Self-Check Exercise-2

Q.1. What are the factors that determine the Elasticity of Demand for different Goods?

5.5 SUMMARY

The responsiveness of demand for a good to variations in consumer income is referred to as income elasticity of demand. Similarly, the degree to which the demand for one good (X) responds to changes in the price of a related good (Y) is known as cross elasticity of demand.

The law of demand establishes a link between a product's price and its quantity demanded, typically indicating an inverse relationship—though there are exceptions. However, this law does not quantify the strength of this relationship. To measure this precisely, economists study elasticity of demand, which assesses how sensitive demand is to changes in price and income.

The concept of elasticity of demand refers to the extent to which the quantity demanded of a product reacts to variations in its price. In simple terms, it indicates how sensitive consumer demand is to price adjustments. There are three primary types of demand elasticity: (i) Price Elasticity of Demand, which assesses the change in quantity demanded resulting from price fluctuations; (ii) Income Elasticity of Demand, which examines how variations in consumer income influence the demand for a product; and (iii) Cross Elasticity of Demand, which measures the percentage change in demand for one product in response to price changes in a related product.

The price elasticity of demand differs across products. Some goods exhibit high elasticity, meaning demand changes significantly with price adjustments, while others are inelastic, showing minimal response to price fluctuations. Several factors influence demand elasticity, though not all can be discussed here.

5.6 GLOSSARY

- **Elasticity of Demand**: It refers to the extent to which the quantity demanded of a good responds to a change in its price. In other words, it measures the rate at which demand fluctuates due to variations in price.
- **Perfectly Elastic Demand (Infinitely Elastic)**: When a slight change in price results in an infinite change in the quantity demanded, the demand is said to be perfectly elastic.
- **Perfectly Inelastic Demand**: In this scenario, the quantity demanded remains constant regardless of changes in price. No matter how much the price increases or decreases, demand remains unchanged.
- **Relatively Elastic Demand**: A small variation in price leads to a significant change in the quantity demanded, indicating a high sensitivity of demand to price changes.
- **Relatively Inelastic Demand**: Here, the quantity demanded changes at a lower proportion compared to the change in price. Even if the price changes significantly, the resulting impact on demand is minimal.

- **Unit Elastic Demand (Unitary Elasticity)**: This occurs when the percentage change in quantity demanded is exactly equal to the percentage change in price.
- **Income Elasticity of Demand**: It measures how the quantity demanded of a good changes in response to variations in consumers' income.
- **Zero Income Elasticity**: The quantity demanded remains constant even if consumers' income increases or decreases, implying that income changes have no effect on demand.
- **Negative Income Elasticity**: When an increase in income results in a decline in quantity demanded, typically seen in inferior goods.
- **Positive Income Elasticity**: An increase in income leads to a higher quantity demanded, usually associated with normal or luxury goods.
- **Cross Elasticity of Demand**: It refers to the responsiveness of the quantity demanded of one commodity due to a change in the price of another related commodity, such as substitutes or complementary goods.

5.7 ANSWERS TO SELF-CHECK EXERCISES

Self-Check Exercise-1

Ans. 1. Refer to sections 5.3.1, 5.3.2 and 5.3.3

Self-Check Exercise-2

Ans 1 Refer to section 5.4

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5.9 TERMINAL QUESTIONS

Q1. What do you understand by elasticity of demand? What are the different types of elasticity explain in detail?

Unit-06

SUPPLY ANALYSIS

STRUCTURE

6.1 INTRODUCTION

In the previous unit, we examined the concept of demand. Now, our focus shifts to supply. Supply refers to the various quantities of a good or service that sellers are both willing and able to offer for sale at different price levels within a specific time frame. It represents the relationship between a product's price and the quantity that producers are prepared to supply in the market. Like demand, supply is not limited to a single quantity at a particular price but instead encompasses a range of quantities corresponding to different prices. It signifies a desired flow, reflecting the amount producers intend to sell over a given period rather than the actual sales figures.

Supply indicates the quantity of a product that sellers are prepared to offer in the market at a certain price during a specific period. However, the total stock of goods held by producers should not be confused with supply, as they may not

choose to sell their entire inventory at once. Only the portion of stock that sellers are willing to make available at a given price and time constitutes supply.

Just as demand fluctuates with changes in price, the quantity supplied also varies based on price adjustments. However, unlike demand—where price and quantity demanded have an inverse relationship—supply follows a direct relationship. This means that as the price of a product rises, the quantity supplied generally increases, whereas a price decline results in a lower quantity supplied.

6.2 LEARNING OBJECTIVES

After going through this unit, you should be in a position to

- Explain the meaning of supply.
- Identify supply function
- State the law of supply
- Explain the factors determining the supply
- State reason why there is a direct relationship between price and quantity supplied.

6.3 SUPPLY FUNCTION

Similar to demand, supply is influenced by multiple factors. Typically, the quantity supplied of a product is determined by its own price, the prices of related goods, input costs, technological advancements, market expectations, and the number of sellers in the market. These factors can be collectively represented in a supply function.

$Q_S = f (Px, Pr, Pi, T, E, N)$

Where,

Q_S = Quantity supplied of commodity x

Px = Price of the commodity x

Pr = Prices of related products

Pi = Prices of inputs

T = State of technology

E = Expectations

N = Number of producers in the market

To develop a basic theory of price, it is essential to understand how the quantity supplied changes in response to the product's own price while keeping all other factors constant. This relationship can be expressed through the supply function as:

$Q_S = f (Px)$

The quantity supplied of commodity X depends on its own price, assuming all other influencing factors remain unchanged.

6.4 LAW OF SUPPLY

The law of supply explains the relationship between the price of a good and the quantity that producers are willing to offer in the market. It states that, under constant conditions, a decrease in price leads to a reduction in the quantity supplied, while an increase in price results in a higher quantity being supplied. This demonstrates a direct correlation between the price of a product and the willingness of producers to supply it.

6.4.1 Supply Curve

The law of supply can be illustrated through a supply schedule and a supply curve. A supply schedule is a tabular representation that shows the quantities of a product or service that sellers are willing to offer at different price levels over a given period. An example of a supply schedule is provided below. This table demonstrates that as the price of a good rises, the quantity supplied also increases (Table 6.1). When this data is plotted on a graph, it forms the supply curve.

Table 6.1 Supply Schedule

Price	Quantity Supplied
5	40
10	60
15	80
20	100
25	120

A supply curve is a graphical representation of the relationship between price and quantity supplied. It slopes upwards, reflecting the direct correlation between price and the amount of goods sellers are willing to supply. It is important to note that the entire curve represents supply, whereas any specific point on the curve indicates the quantity supplied at a particular price.

fig. 6.1

6.4.2 Why does a direct relationship exist between price and quantity supplied?

The primary reason behind this direct relationship is that higher prices act as an incentive for producers to supply more. Manufacturers and sellers aim to maximize profits, and an increase in price means greater potential earnings, encouraging them to expand production and supply. Additionally, higher prices may attract new producers into the market, further increasing the total quantity supplied.

Self-Check Exercise-1

Q. 1. What do you understand by supply?

Q. 2. State law of supply?

Q. 3. Explain supply Function?

6.5 Factors Determining the Supply

The amount of a good or service that sellers are willing and able to supply in the market largely depends on its price. However, various non-price factors also significantly impact supply. These factors include the prices of related goods, production costs, technological advancements, future market expectations, and the number of sellers in the industry. Let's examine each factor in detail:

(i) **Price of the Commodity:** Producers strive to maximize profits. When the price of a product rises, they are inclined to supply more of it, whereas a lower price leads to reduced supply, assuming other conditions remain constant. This direct relationship between a product's price and its supplied quantity is referred to as the **Law of Supply**.

(ii) **Prices of Related Goods:** If the prices of alternative goods increase while the price of the current product remains unchanged or rises at a slower rate, producers may find it more profitable to switch to the production of higher-priced alternatives. Consequently, the supply of the original good may decrease. In contrast, when the prices of other goods decline, the supply of the initially produced commodity may rise.

(iii) **Costs of Production:** The cost of production is influenced by changes in the prices of inputs such as labor, raw materials, and machinery. If the cost of any factor of production rises, the overall cost of producing the good increases, reducing profitability. As a result, producers may reduce the supply of that product and shift resources towards more profitable alternatives.

(iv) **Technological Advancements:** Continuous improvements in technology enable producers to manufacture goods more efficiently and at lower costs. Advanced technology often leads to increased production and, consequently, a higher supply of various commodities.

(v) **Producers' Objectives:** While profit maximization is typically the primary goal, some producers may prioritize increasing sales volume, even if it results in lower profits. In such cases, they may increase production, leading to a greater supply of the commodity. Additionally, if producers are willing to take risks, they may be more inclined to supply goods with uncertain market conditions.

(vi) **Number of Sellers in the Market:** The total supply in a market depends on the number of producers. When more sellers enter the market, the overall supply of a good or service tends to increase. Conversely, if the number of producers decreases, market supply will decline.

6.6 CHANGES IN QUANTITY SUPPLIED

A change in quantity supplied refers to a variation in the amount of a good or service that sellers are willing to offer due to a change in its price, while keeping all other factors constant. This means that a shift in the commodity's price does not alter

the overall supply but rather affects the quantity supplied. Since price and quantity supplied share a direct relationship, an increase in price leads to a higher quantity supplied, whereas a decrease results in a lower quantity supplied.

This variation is depicted as a shift along the existing supply curve from one point to another, as shown in Figure 6.2. At price P1, the quantity supplied corresponds to Q1. When the price rises to P2, the quantity supplied increases to Q2. This adjustment in quantity supplied is represented by a movement along the same supply curve, transitioning from point C to point D in the diagram.

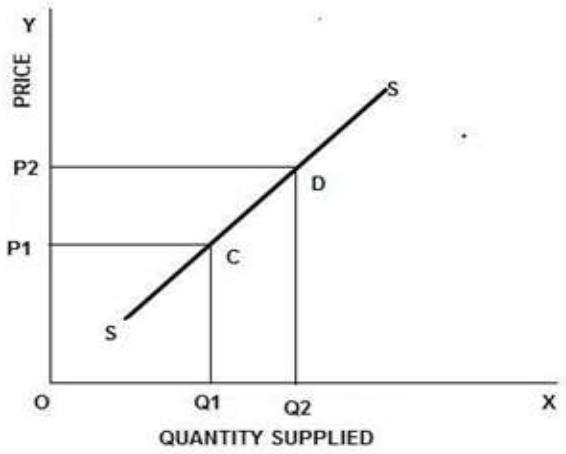


Fig 6.2

6.7 CHANGES IN SUPPLY

A supply shift occurs when the entire supply curve moves due to factors unrelated to the product's price. These factors include changes in input costs, technological progress, prices of related goods, producer expectations, and the number of suppliers in the market. Since these elements influence supply independently of price, they are referred to as "supply shifters."

An increase in supply means that producers are offering a greater quantity of the product at every price level, causing the supply curve to shift to the right. This shift occurs due to various factors, such as:

(a) A decline in the price of production substitutes
(b) A rise in the price of production complements
(c) A decrease in input costs
(d) Technological advancements that lower production expenses
(e) A rise in the number of producers

The increase in supply is represented graphically in Figure 6.3, where the initial supply curve (SS) shifts rightward to the new curve (S1S1). This shift indicates that at any given price, a larger quantity is now supplied.

Fig 6.3

Conversely, a decrease in supply means that producers supply a lower quantity at each price level, causing a leftward shift in the supply curve. This means

that less of the product is available in the market at every price. The primary factors leading to a decrease in supply include:

(a) An increase in the price of production substitutes
(b) A decline in the price of production complements
(c) A rise in input costs
(d) A reduction in the number of producers
(e) Government-imposed taxes on sales or production

Figure 6.4 illustrates a decrease in supply, where the initial supply curve (SS) shifts leftward to the new curve (S0S0). This shift implies that at any given price, a smaller quantity is supplied.

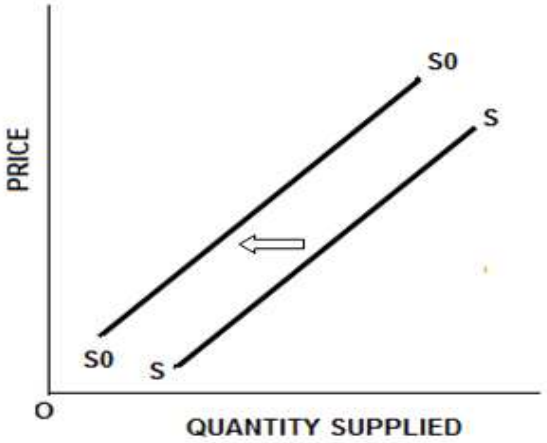


Fig 6.4

Self-Check Exercise-2

Q.1. What are the factors that determine supply?

Q.2. What are the changes that leads to changes in Quantity supplied?

Q.3. What are the factors responsible for increase and decrease in supply?

6.8 MARKET EQUILIBRIUM

Market equilibrium occurs when the price of a good ensures that the quantity demanded equals the quantity supplied. This equilibrium price and quantity result from the interactions between consumers and producers in the market. Consumers generate demand by purchasing goods to meet their needs, while producers provide goods with the goal of earning profits. The relationship between supply and demand ultimately determines the prices at which goods and services are traded.

At equilibrium, the amount of goods that buyers intend to purchase corresponds exactly to the quantity that sellers are willing to offer at the given price. This balance removes any immediate motivation for buyers or sellers to change their behavior. Once established, equilibrium generally remains stable unless influenced by external factors. Examining demand and supply schedules helps in understanding how market forces determine the equilibrium price and quantity of a product. The table below presents a hypothetical demand and supply schedule for commodity X.

Price of Commodity X (in Rupees)	Quantity Supplied (Q_S)	Quantity Demanded (Q_D)	Surplus (+) Shortage(-)	Pressure on Price
5	140	20	120	Downward
4	100	40	60	Downward
3	60	60	0	Equilibrium
2	40	80	-40	Upward
1	20	100	-80	Upward

When the price of commodity X is set at Rs 1, consumers demand 100 units, but sellers are only willing to supply 20 units, creating a shortage of 80 units. In contrast, when the price rises to Rs 5, the quantity demanded drops to 20 units, while sellers are prepared to supply 140 units, resulting in a surplus of 120 units. At a price of Rs 3, both buyers and sellers agree on a quantity of 60 units, indicating market equilibrium where supply matches demand. This price (PX = Rs 3) is known as the equilibrium price, and the corresponding equilibrium quantity is 60 units.

If the market price deviates from this equilibrium, market forces work to restore balance. When the price exceeds Rs 3, the quantity supplied surpasses the quantity demanded. For example, at Rs 4, sellers offer 100 units, but buyers demand only 40 units, creating a surplus. To sell excess stock, sellers lower prices, which increases demand while reducing supply until equilibrium is restored at Rs 3.

Conversely, when the price drops below Rs 3, demand exceeds supply. For instance, at Rs 2, buyers seek 80 units, but sellers provide only 40 units, leading to a shortage. This shortage prompts buyers to offer higher prices, motivating sellers to increase production. This adjustment continues until the price reaches Rs 3, where supply and demand are balanced.

The market remains stable only at an equilibrium price of ₹3, where there is no pressure for further adjustments. The quantity exchanged at this price is known as the equilibrium quantity. A market achieves equilibrium when the quantity demanded equals the quantity supplied at a specific price. This relationship can also be represented graphically by plotting the demand and supply curves together, as shown in Figure 6.5.

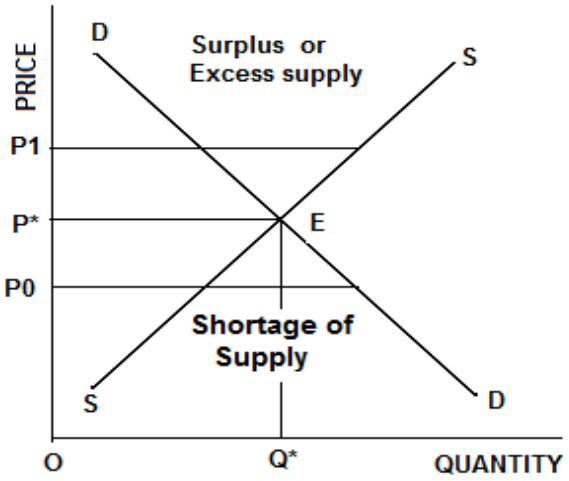


Fig. 6.5

The equilibrium price (P*) and equilibrium quantity (Q*) are established at the point where the market demand curve (DD) intersects the market supply curve (SS) at point E. At this price, the quantity of goods demanded matches the quantity

supplied, preventing any surplus or shortage in the market. Since there is neither excess demand nor oversupply, there is no immediate pressure for price fluctuations.

However, the market does not achieve equilibrium instantly. Instead, adjustments occur before price and quantity stabilize. If the price is initially set above the equilibrium level, such as at P1, excess supply results in a surplus. To clear their inventory, sellers lower prices, which leads to an increase in demand and a decrease in supply. This process continues until the market returns to equilibrium, where quantity demanded equals quantity supplied at P*. Conversely, if the price starts below equilibrium, say at P0, excess demand creates a shortage. Consumers, unable to purchase the desired quantity at the lower price, push prices upward. This rise in price encourages suppliers to produce more until equilibrium is restored at P*.

Through these continuous price and quantity adjustments, the market eventually reaches a stable state where supply aligns with demand. As long as demand and supply remain unchanged, equilibrium price and quantity stay constant. However, external factors can cause temporary deviations from equilibrium, though market forces naturally work to restore balance unless price controls interfere.

6.8.1 Changes in Market Equilibrium

Market equilibrium is subject to changes due to variations in demand and supply. Several factors continuously influence both, leading to fluctuations in equilibrium price and quantity. When demand rises or falls while supply remains constant, the market equilibrium adjusts accordingly. Likewise, alterations in supply, with demand remaining unchanged, also impact equilibrium. In some instances, both demand and supply shift simultaneously, further influencing market conditions.

Economists utilize comparative statics to examine these shifts in equilibrium. This analytical approach starts with an initial equilibrium state, introduces a change in demand or supply, and then compares the resulting equilibrium with the original one. By assessing the differences between these states, economists can determine the specific effects of market changes.

6.8.1.1 Adjustments to changes in demand

The market demand curve shifts in response to various factors, including fluctuations in consumer income, changes in preferences, variations in the prices of related goods (such as substitutes and complements), the number of buyers, and income distribution patterns. When the supply curve remains constant, any change in demand alters the market equilibrium.

For example, an increase in consumer income or other non-price determinants can cause the demand curve to shift rightward. This shift results in a higher equilibrium price and an increase in the quantity of goods traded in the market, as depicted in Figure 6.6.

The initial market demand and supply curves are denoted as DD and SS, respectively, intersecting at point E, which represents the equilibrium price (OP) and equilibrium quantity (OQ). When demand rises, the demand curve shifts rightward to its new position, D1D1, while the supply curve remains unchanged. At the original price level (OP), this increase in demand creates a shortage, leading to upward pressure on the price, which subsequently adjusts to OP1..

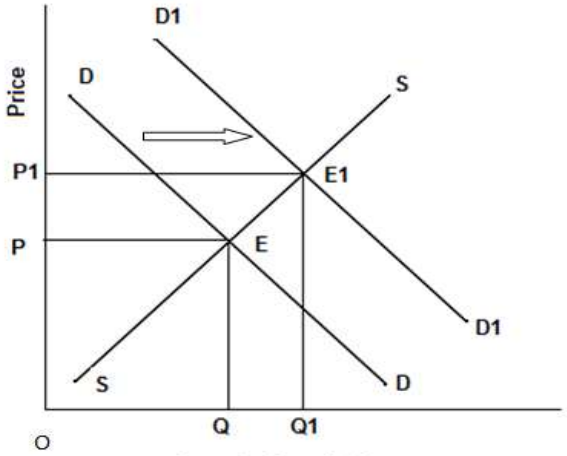


Fig. 6.6

At this adjusted price, the quantity demanded aligns with the quantity supplied, creating a new market equilibrium at E1. As a result, a rise in demand causes the price to increase to OP1 for buyers and prompts sellers to supply a greater quantity, reaching OQ1.

On the other hand, a decline in demand causes the demand curve to shift to the left, influenced by factors such as reduced consumer income or a decrease in the price of substitute goods. This drop in demand leads to a lower equilibrium price and quantity, as depicted in Figure 6.7. The equilibrium price (OP) and equilibrium quantity (OQ) are established at the intersection of the initial market demand curve (DD) and the supply curve (SS).

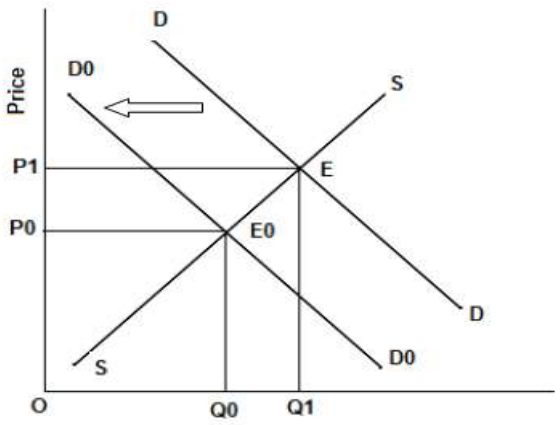


Fig. 6.7

When there is a decrease in demand, the demand curve shifts leftward to a new position (DODO), while the supply curve remains unchanged. As a result, a new equilibrium is established at point EO, where both the equilibrium price (OPO) and equilibrium quantity (OQO) are lower than their initial levels. This happens because, with supply remaining constant, the decline in demand creates a surplus in the market, putting downward pressure on prices until the excess supply is adjusted.

6.8.1.2 Adjustments to changes in supply

Let’s analyze how variations in supply influence the equilibrium price and quantity of a commodity while keeping demand unchanged. The market supply curve can shift due to factors such as fluctuations in input costs, changes in the prices of related products, technological progress, the number of suppliers, and market expectations. When supply increases, the supply curve moves to the right, whereas a decrease in supply causes it to shift to the left.

First, let’s examine the impact of an increase in supply. When supply expands, producers make a larger quantity of the commodity available, often due to factors such as reduced production costs or improvements in technology. If demand remains constant, this rise in supply results in a lower equilibrium price and a higher equilibrium quantity of the commodity exchanged, as shown in Figure 6.8.

The market's initial demand and supply curves, denoted as DD and SS, intersect at point E, determining the equilibrium price at OP and the equilibrium quantity at OQ. A reduction in input costs results in an increase in supply, shifting the supply curve rightward to S1S1. Since demand remains unchanged, this surplus in supply creates an excess in the market. To eliminate this surplus, sellers reduce their prices, leading to a decline in the price to OP1.

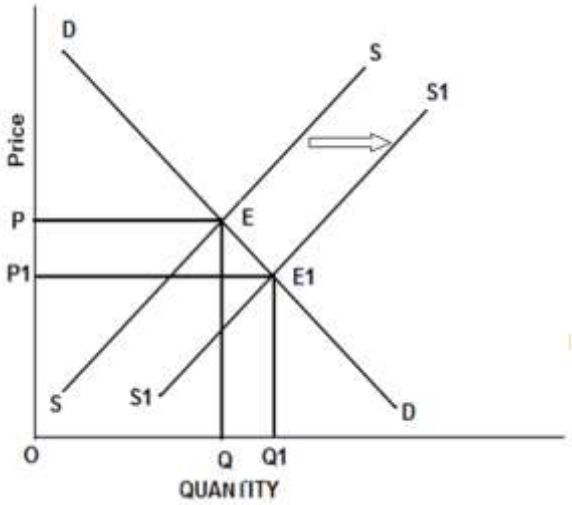
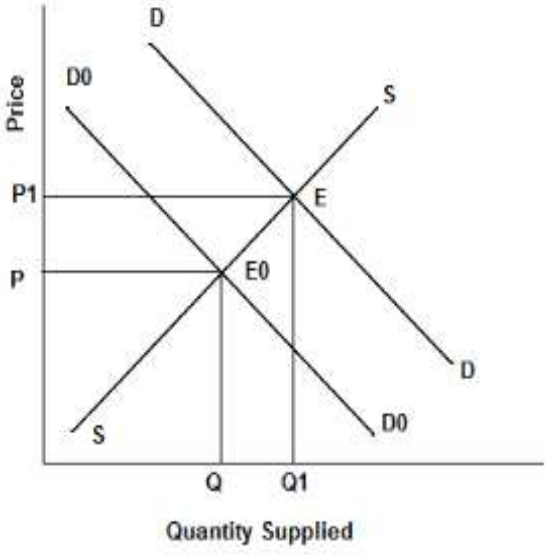


Fig. 6.8

The new equilibrium price is established where the adjusted supply curve (S1S1) intersects with the demand curve (DD). As prices decrease, the quantity demanded increases, leading to a new equilibrium quantity at OQ1. Therefore, an increase in supply results in a lower equilibrium price and a greater equilibrium quantity. On the other hand, a reduction in supply impacts equilibrium price and quantity differently. Factors such as higher input costs, rising prices of substitute goods, or government-imposed taxes on production or sales can lead to a decrease in supply. When supply contracts while demand remains unchanged, the equilibrium price rises, and the equilibrium quantity declines. This shift represents the market's adaptation to new conditions, as illustrated below.

The initial equilibrium in the market is determined by the intersection of the demand curve (DD) and the supply curve (SS), resulting in an equilibrium price of OP and an equilibrium quantity of OQ. If supply decreases, such as due to higher input costs, the supply curve shifts leftward to S_0S_0. This shift leads to a new equilibrium at point E_1, where the updated supply curve meets the original demand curve (DD). Consequently, the equilibrium price rises to OPl, while the equilibrium quantity declines to OQl. Thus, a decrease in supply leads to a higher price and a lower equilibrium quantity.



Self-Check Exercise-3

Q.1. What causes changes in Market Equilibrium from demand and supply side? Discuss in detail.

6.9 SUMMARY

Supply denotes the quantity of a commodity that producers are prepared to offer for sale in the market at a particular price over a specified period. Various factors affect supply, including the product's own price, the prices of related goods, production costs, technological progress, future market expectations, and the number of sellers. This relationship is typically expressed through a supply function.

QS = f (Px, Pr, Pi, T, E, N)

According to the law of supply, a decrease in the price of a commodity results in a lower quantity supplied, while an increase in price leads to a higher quantity supplied, provided all other factors remain unchanged. This demonstrates a direct correlation between price and supply. Higher prices serve as a motivation for producers to increase supply, as they can earn greater revenue. Besides price, supply is also affected by factors such as production costs, the availability of substitutes, technological advancements, market expectations, and the number of sellers.

6.10 GLOSSARY

- **Supply**: Supply refers to the quantity of a good or service that producers are prepared to sell in the market at a particular price over a specified period.
- **Supply Function**: The amount of a product supplied depends on various factors, such as its own price, the prices of related goods, production costs, technological progress, future price expectations, and the number of suppliers in the market.
- **Law of Supply**: The law of supply establishes a direct correlation between price and quantity supplied. It states that, provided other factors remain unchanged, an increase in a product's price leads to a higher quantity supplied, whereas a decrease in price results in a lower quantity supplied.
- **Supply Schedule**: A supply schedule is a table that illustrates the different quantities of a good or service that sellers are willing to provide at various price points within a specific time frame.
- **Supply Curve**: The supply curve is a graphical representation of the supply schedule, depicting the relationship between price and quantity supplied. It typically slopes upward, indicating that as price increases, the quantity supplied also rises.

6.11 ANSWERS TO SELF-CHECK EXERCISES

Self-Check Exercise-1

Ans1. Please Refer to Section 5.2.1

Ans 2. Please Refer to Section 5.3

Ans 3. Please Refer to Section 5.4

Self-Check Exercise-2

Ans1. Please Refer to Section 5.5

Ans 2. Please Refer to Section 5.6

Ans 3. Please Refer to Section 5.7

Self-Check Exercise-3

Ans1. Please Refer to Section 3.8.1

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6.13 TERMINAL QUESTIONS

Q.1. State the law of supply and show it through a supply schedule and a supply curve. Explain supply function?

Q.2. What causes changes in Market Equilibrium from demand and supply side? Discuss in detail.

Unit-07

ELASTICITY OF SUPPLY

STRUCTURE

7.1 INTRODUCTION

In the previous unit, we explored the concept of demand elasticity. Now, we will delve into the elasticity of supply and how it is measured. The idea of supply elasticity is quite similar to that of demand elasticity. Although various factors affect the quantity supplied, our primary focus will be on the influence of the commodity's own price. In other words, we will specifically examine the price elasticity of supply.

7.2 LEARNING OBJECTIVES

After studying this unit, student will be able to

- State elasticity of supply.
- List degrees of elasticity of supply.
- Explain the different types of degrees of elasticity of supply.
- Explain the different methods of measuring elasticity.

7.3 ELASTICITY OF SUPPLY

The price elasticity of supply measures the extent to which the quantity of a good supplied responds to changes in its price. It is determined by dividing the percentage change in quantity supplied by the percentage change in price. Representing the price elasticity of supply with the Greek letter epsilon (ε), we express it as:

$$Es = \frac{\text{Percentage change in quantity supplied}}{Percentage\ change\ in\ price}$$

Self-Check Exercise-1

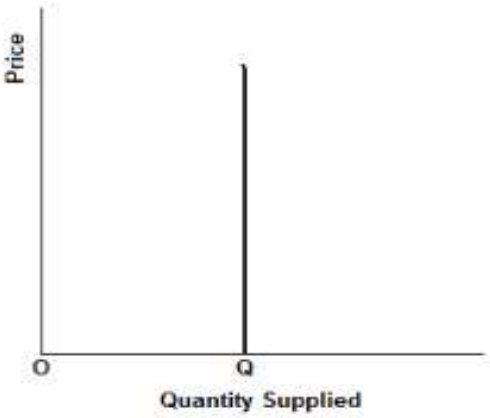
Q.1. What is elasticity of supply?

7.4 DEGREES OF SUPPLY ELASTICITY

When the supply curve slopes upward, the elasticity of supply can range from zero to infinity. Based on the coefficient of elasticity, supply can be categorized into five types: (i) Perfectly inelastic supply, (ii) Inelastic supply, (iii) Unitary elastic supply, (iv) Elastic supply, (v) Perfectly elastic supply. Let us each one of them in detail.

7.4.1 Perfectly Inelastic Supply

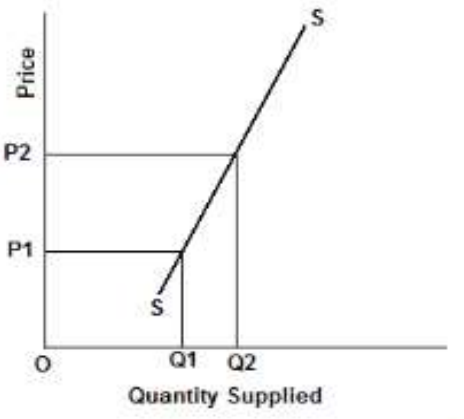
Supply is considered **perfectly inelastic** when the quantity supplied remains unchanged despite fluctuations in price. In this case, the elasticity of supply (Es) is zero, and the supply curve appears as a vertical straight line. This indicates that regardless of the price level, the quantity supplied remains constant.



7.4.2 Inelastic Supply

When the percentage change in the quantity supplied is lower than the percentage change in price, the supply is considered inelastic. This means that the responsiveness of producers to price fluctuations is relatively limited. In such cases, the coefficient of elasticity of supply (Es) falls within the range of greater than zero but less than one ($0 < Es < 1$).

A supply curve that intersects or touches the horizontal axis (quantity axis) represents inelastic supply. This is illustrated in the diagram, where a shift in price from P_1 to P_2 results in a less than proportional increase in the quantity supplied, changing from Q_1 to Q_2. This indicates that despite a rise in price, the quantity supplied does not increase significantly, reflecting the inelastic nature of supply.

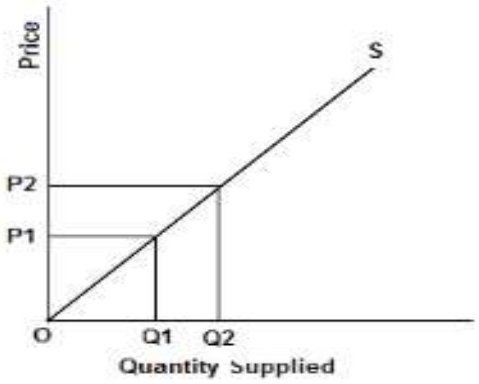


7.4.3 Unitary Elastic Supply

When the percentage change in the quantity supplied matches the percentage change in price, the supply is considered to have unitary elasticity. In this case, the elasticity coefficient (Es) is exactly equal to one (Es = 1). This means that a proportional increase or decrease in price leads to an identical proportional change in the quantity supplied.

A significant characteristic of unitary elastic supply is observed when a linear supply curve passes through the origin. Regardless of the curve's slope or steepness, if it originates from the point (0,0), the supply remains unitary elastic at all points along the curve.

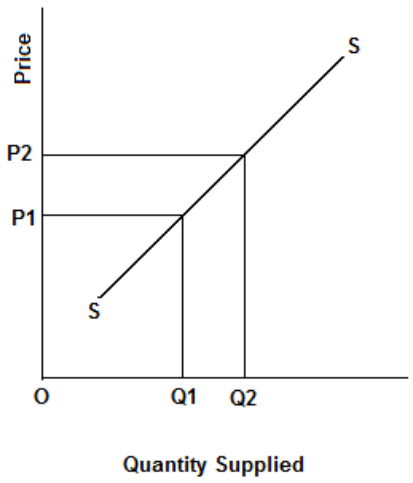
This concept can be visually represented through a graphical illustration. In such a diagram, a straight-line supply curve passing through the origin maintains a constant unitary elasticity. This implies that between any two points on the curve, the percentage change in quantity supplied is always equal to the percentage change in price.



7.4.4 Elastic Supply

When the percentage change in the quantity supplied exceeds the percentage change in price, the supply is considered elastic. In such cases, the elasticity coefficient (Es) has a value greater than one (Es > 1). This indicates that producers are highly responsive to price changes, adjusting the quantity supplied significantly in response to even small price variations

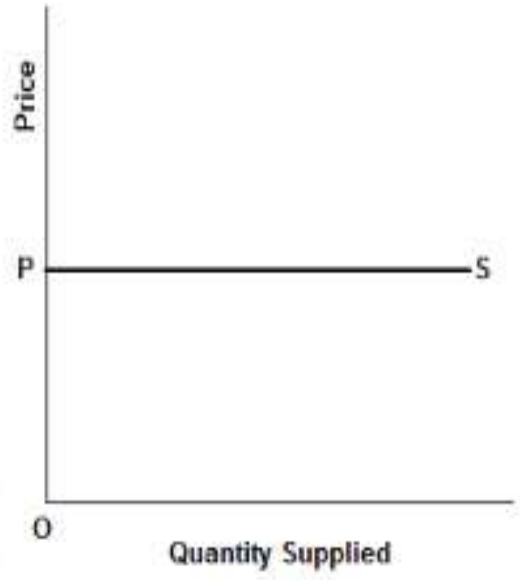
A supply curve is classified as elastic if it intersects the vertical (price) axis, signifying that a slight increase in price results in a more than proportional increase in the quantity supplied. For instance, when the price rises from P1 to P2, the corresponding increase in quantity supplied from Q1 to Q2 is relatively larger, reflecting the high responsiveness of suppliers to price changes.



7.4.5 Perfectly Elastic Supply

When the supply of a good or service remains limitless at a particular price level, it is referred to as perfectly elastic supply. In this case, the price elasticity of supply (Es) is infinite (∞), indicating that even a slight change in price would cause an extreme response in the quantity supplied. The graphical representation of a perfectly elastic supply curve is a horizontal line parallel to the quantity axis.

At a specific price level, denoted as OP, producers are willing to supply an unlimited quantity of the good. However, if the price falls below OP, the supply drops to zero, meaning no units will be made available in the market. Conversely, as long as the price remains at OP, suppliers are prepared to provide an infinitely large quantity. This scenario typically occurs in highly competitive markets, where sellers can produce and supply goods at a constant cost. Any decrease in price below OP makes production unviable, leading to zero supply, while an increase above OP is unnecessary as the supply is already infinite at that price.



Self-Check Exercise-2

Q.1. List and explain different degrees of elasticity of supply?

7.5 MEASUREMENT OF ELASTICITY

There are various methods for the measurement of elasticity of demand. Following are the important methods:

7.5.1. Proportional or Percentage Method:

This method determines the elasticity of demand by calculating the ratio of the percentage change in the quantity demanded to the percentage change in price. Since this approach relies on relative or proportional changes, it is also referred to as

the Formula Method. The elasticity of demand using this method is mathematically expressed as:

$$Ed = (-)\frac{Proportinate\ change\ in\ quantity\ demanded\ for\ Commodity\ X}{Proportinate\ change\ in\ price\ of\ Commodity\ X}$$

OR

$$Ep = (-)\ \frac{\frac{Change\ in\ Quantity\ Demanded}{Initial\ Quantity\ Demanded}}{\frac{Change\ in\ Price}{Initial\ Price}}$$

OR

$$Ep = (-)\ \frac{\frac{Q2-Q1}{Q1}}{\frac{P2-P1}{P1}} \text{ or } \frac{Q2-Q1}{Q1} \times \frac{P1}{P2-P1}$$

Where: Q1 = Quantity demanded before price change

Q2 = Quantity demanded after price change

P1 = Price charged before price change

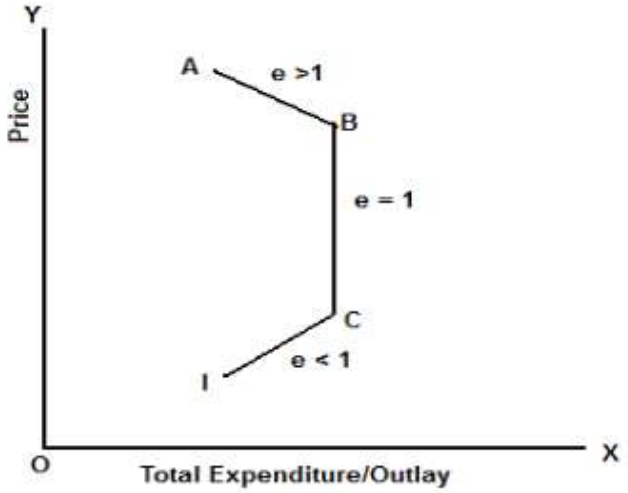
P2 = Price charge after price change.

7.5.2. Expenditure or Outlay Method:

Unitary Elastic Demand: If a change in price does not alter the total expenditure, the demand is said to exhibit unitary elasticity. This means that the proportionate change in quantity demanded offsets the price change, keeping total expenditure unchanged.

1. **Elastic Demand (Elasticity > 1)**: When a price fluctuation leads to an inverse change in total expenditure—meaning that as the price decreases, total expenditure increases, and vice versa—the demand is considered elastic. This indicates that consumers are highly responsive to price variations.
2. **Inelastic Demand (Elasticity < 1)**: If total expenditure moves in the same direction as the price change—meaning an increase in price results in higher total expenditure, and a decrease in price leads to lower total expenditure—the demand is classified as inelastic. This suggests that consumers' purchasing behavior is relatively unresponsive to price shifts.

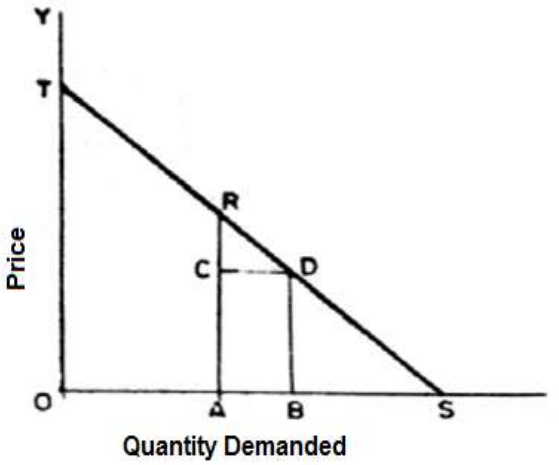
This approach, originally formulated by Alfred Marshall, assesses elasticity by analyzing variations in total expenditure in response to changes in price and the corresponding quantity demanded. It comprises three key components:



7.5.3 Graphical Method of Measuring Elasticity (Point Elasticity):

Actually this method is only a graphical version of the 'Percentage change method' discussed above. The demand curve is only a graphical representation of demand schedule. Therefore, the results obtained through the two methods must necessarily be identical. In order to illustrate how value of elasticity is measured with the help of a demand curve, we draw a straight-line demand curve such as TS in the diagram 7.2.

Referring to Diagram 7.2, when the price decreases from AR to BD, the quantity demanded rises from OA to OB. As a result, the change in quantity demanded (ΔQ) corresponds to AB (or CD), while the change in price (ΔP) is represented by CR. The initial quantity demanded (Q) is OA, and the original price (P) is AR. Using the percentage method, the price elasticity of demand can be determined as follows:



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

In terms of the above diagram we have:

$$e = \frac{AB}{CR} \times \frac{AR}{OA}$$

$$= \frac{CD}{CR} \times \frac{AR}{OA} \quad \text{(because AB = CD)}$$

$$= \frac{AS}{AR} \times \frac{AR}{OA} \quad \text{(because RCD and RAS are similar triangles).}$$

Therefore,

$$= \frac{CD}{CR} \times \frac{AS}{AR}$$

$$= \frac{AS}{OA}$$

$$= \frac{RS}{TR}$$

(because AR, being parallel to OT, divides OS and TS in the same ratio)

Note that in the fraction RS/TR the numerator RS is the lower segment and TR is the upper segment of the straight-line demand curve which meets the two axis in T and S. Therefore, for measuring elasticity at any point on a downward sloping straight-line demand curve which meets the two axis, we can devise a rule of thumb and say that value of elasticity at any point on a downward sloping straight-line demand curve which meets the two axis is equal to the lower segment divided by the upper segment of the demand curve.

7.5.4. Arc Method:

The point method is used when there are very small changes in price and demand. On the other hand, arc elasticity calculates elasticity between two points and represents the average elasticity. As stated by Watson, "Arc elasticity refers to the elasticity at the midpoint of an arc on a demand curve." The formula for measuring elasticity is:

$$Ed = \frac{\Delta Q}{\Delta P} \times \frac{P1+P2}{Q1+Q2}$$

or

$$Ed = \frac{Change\ in\ Demand}{Average\ Demand} \times \frac{Average\ Price}{Change\ in\ Price}$$

Where, ΔQ = change in quantity

Q1 = original quantity

P1 = original price

Q2= new quantity

P2 = New price

ΔP= change in price

Self-Check Exercise-3

Q.1. What are the different methods of measurement of elasticity of supply? Explain the arc method in detail?

7.6 DETERMINANTS OF ELASTICITY OF SUPPLY

The elasticity of supply is determined by several key factors that influence how producers respond to changes in price. The major determinants include:

(i) **Time Horizon:** The duration under analysis significantly influences the price elasticity of supply. In the short term, producers may struggle to substantially increase the quantity supplied, even if prices rise, due to fixed production levels. However, over a longer period, supply becomes more flexible as sellers have greater ability to adjust production and respond to price fluctuations.

(ii) **Cost of Production Adjustments:** The extent to which output can be increased without a major rise in production expenses affects supply elasticity. If producers can efficiently reallocate resources between different goods in response to price variations, supply tends to be more elastic. For instance, in agriculture, if land and labor can be swiftly shifted between crops, the supply of a particular crop will be more responsive to changes in price.

(iii) **Storage Costs:** The ability to store goods at a low cost influences supply elasticity. Non-perishable goods with low storage costs tend to have a more elastic supply because sellers can withhold products when prices drop and release them when prices rise. In contrast, perishable goods and those with high storage costs have a relatively inelastic supply since they cannot be stored for extended periods.

(iv) **Producer Responsiveness:** Supply elasticity also depends on how quickly and efficiently producers can respond to price changes. If producers do not increase supply despite rising prices, the supply will remain inelastic. A rational producer is expected to increase production to maximize profits when prices rise. However, in reality, not all producers follow profit-maximizing behavior, leading to variations in supply responsiveness.

(v) **Availability of Substitutes and Complementary Products:** The presence of substitutes and complementary goods in production affects supply elasticity. If a product has many substitutes in production, its supply is likely to be elastic since producers can easily switch resources to produce alternative goods when prices fluctuate. Conversely, for joint products—goods that are produced together—the supply of the secondary product is usually inelastic, as its production depends on the primary product.

By understanding these factors, businesses and policymakers can better anticipate supply responses to market conditions and make informed economic decisions.

7.7 SUMMARY

The concept of supply elasticity is analogous to demand elasticity, as both measure responsiveness to changes in influencing factors. Although various elements affect the quantity supplied, the primary consideration here is the influence of the commodity's own price. This brings us to the price elasticity of supply, which quantifies how sensitive the quantity supplied is to price fluctuations. It is determined by dividing the percentage change in quantity supplied by the percentage change in price. When the supply curve has an upward slope, the elasticity of supply can vary from zero to infinity. Based on the elasticity coefficient, supply elasticity is classified into five categories: (i) Perfectly Inelastic Supply, (ii) Inelastic Supply, (iii) Unitary Elastic Supply, (iv) Elastic Supply, and (v) Perfectly Elastic Supply.

7.8 GLOSSARY

- **Price Elasticity of Supply**: This concept measures how much the quantity supplied of a product responds to changes in its price. It is determined by dividing the percentage change in quantity supplied by the percentage change in price.
- **Perfectly Inelastic Supply**: When the quantity supplied remains constant regardless of price changes, supply is considered perfectly inelastic. In this scenario, the elasticity of supply (Es) is zero, and the supply curve appears as a vertical line.
- **Inelastic Supply**: Supply is classified as inelastic when the percentage change in quantity supplied is smaller than the percentage change in price. The elasticity coefficient falls between zero and one ($0 < Es < 1$).
- **Unitary Elastic Supply**: Supply exhibits unitary elasticity when the percentage change in quantity supplied matches the percentage change in price. The elasticity coefficient in this case equals one.
- **Elastic Supply**: When the percentage change in quantity supplied is greater than the percentage change in price, supply is considered elastic. The elasticity coefficient exceeds one in this situation.

- **Perfectly Elastic Supply**: If an infinite quantity is supplied at a specific price, the supply is perfectly elastic. The elasticity coefficient in this case is infinite (Es = ∞).
- **Proportional or Percentage Method**: This technique determines elasticity by calculating the ratio of the proportional or percentage change in quantity supplied to the proportional change in price.
- **Expenditure or Outlay Method**: Proposed by Alfred Marshall, this approach evaluates elasticity by examining how total expenditure fluctuates with changes in price and quantity demanded.
- **Arc Method**: Unlike the point method, which focuses on small variations in price and demand, the arc method assesses elasticity between two points on a curve. As stated by Watson, "Arc elasticity is the elasticity at the midpoint of an arc of a demand curve," offering an average measure of elasticity.

7.9 ANSWERS TO SELF-CHECK EXERCISES

Self-Check Exercise-1

Ans.1. Refer to section 7.3

Self-Check Exercise-2

Ans.1 Refer to sections 7.4, 7.4.1 to 7.4.5

Self-Check Exercise-3

Ans 1 Refer to sections 7.5, 7.5.1 to 7.5.4

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7.11 TERMINAL QUESTIONS

Q1. Explains in detail the different methods of measurement of elasticity?

Q2. What are the different factors that determine the elasticity of supply?

Unit-08

THEORY OF CONSUMER BEHAVIOUR-I

STRUCTURE

8.1 INTRODUCTION

Every consumer has a limited income, yet there is an extensive range of goods and services they may desire. Regardless of whether one's income is relatively high or low, it is never enough to acquire everything they wish to purchase. As a result, individuals must make thoughtful decisions about what to buy, in what quantities, and what to forgo. A consumer's spending choices are considered rational when they allocate their income in a way that maximizes their overall satisfaction. The theory of consumer demand explores the economic principles that guide this allocation of limited income across different goods and services to achieve maximum satisfaction. This study will focus on the key economic principles a rational consumer should follow to optimize their spending and derive the highest possible satisfaction from their purchases.

8.2 LEARNING OBJECTIVES

The objective of this unit is to relate how individual consumers take decisions of consumption in a situation where market prices are given to them and they can't influence the market prices by altering their consumption. This unit will enable you to:

- Explain the meaning of utility.
- State the ordinal and cardinal utility.
- Explain in detail the marginal utility theory of demand.

8.3 CONCEPT OF UTILITY

The concept of utility was first introduced into social thought by Jeremy Bentham in 1789 and later into economic thought by Jevons in 1871. Utility refers to the ability of a commodity or service to satisfy a person's wants. Individuals demand specific goods based on the satisfaction they derive from consuming them. Essentially, utility represents the usefulness or value in use of a commodity or service, as the satisfaction gained from its consumption defines its worth.

Utility is inherently subjective and varies from person to person, making it a psychological concept. It encompasses the sense of satisfaction, pleasure, happiness, or well-being that an individual experiences from using or possessing a good or service. Even if a commodity is harmful or dangerous to health, it still holds utility for those who seek it. Therefore, utility is not associated with any ethical considerations.

There are multiple approaches to understanding consumer demand, among which two prominent theories are the "Utility Analysis" and the "Indifference Curve Analysis." Utility analysis, developed by British economist Alfred Marshall, is often referred to as "Marshallian Utility Analysis." In contrast, J.R. Hicks, another British economist, introduced the "Indifference Curve Analysis" as an alternative explanation of consumer behavior. While utility analysis assumes that the utility derived from a good can be quantitatively measured, indifference curve analysis challenges this assumption, arguing that measuring utility in absolute terms is unnecessary to understand consumer decision-making.

8.3.1 Cardinal and Ordinal Utility

For a consumer to achieve maximum utility, they must assess the satisfaction gained from various combinations of goods that fit within their budget. Utility comparison is primarily analyzed through two key perspectives: the Cardinalist approach and the Ordinalist approach.

The Cardinalist approach assumes that utility can be measured numerically. According to this perspective, consumers assign specific values or "utils" to the satisfaction gained from consuming different goods or combinations of goods. While some economists proposed measuring utility in monetary terms, others introduced subjective units known as utils.

In contrast, the Ordinalist approach argues that utility cannot be measured precisely but can only be ranked in order of preference. This means that a consumer does not need to quantify the exact level of utility derived from different goods but can instead determine which combination is preferred over another. While ordinal utility establishes a ranking of consumption bundles, cardinal utility assigns a measurable index to satisfaction levels.

8.4 CARDINAL UTILITY THEORY

No one is willing to pay for something that holds no value or usefulness for them. For instance, I buy a book because it serves a purpose for me. Similarly, a vegetarian does not buy meat simply because it is of no use to them. Price, after all, requires a consumer to make a sacrifice, and people are only willing to sacrifice something if they receive a benefit in return.

According to Marshallian utility analysis, the utility of a commodity for a consumer can be determined by the highest amount of money they are willing to pay

for a unit of that commodity rather than go without it. For example, if you are only willing to pay 50 paisa for an orange, then its utility for you is worth 50 paisa. On the other hand, if your friend is willing to pay one rupee for the same orange rather than go without it, then its utility for them is one rupee. Thus, the utility of any good for a consumer can be indirectly measured by the maximum amount they are willing to pay for it. This serves as an indirect method of assessing utility.

8.4.1 Assumptions of the Marshallian Utility Theory

The Marshallian utility analysis is grounded in the concept of cardinal utility. The cardinal utility theory operates under the following key assumptions:

(i) **Rational Consumer**: The consumer is rational and seeks to maximize utility while adhering to income constraints.

(ii) **Cardinal Utility**: Utility is considered a quantifiable and additive concept.

(iii) **Measurability in Money**: Utility can be measured in monetary terms.

(iv) **Constant Marginal Utility of Money**: If money is used as a measure of utility, its marginal utility is assumed to remain constant.

(v) **Diminishing Marginal Utility**: As the consumer acquires additional units of a commodity, the utility derived from each successive unit decreases.

(vi) **Complete Knowledge of Commodities**: The consumer has full awareness of the availability and technical characteristics of goods.

(vii) **Perfect Knowledge of Choices**: The consumer is well-informed about all available alternatives.

(viii) **Stable Utility Perception**: The consumer accurately knows the prices of commodities, and changes in price do not alter their utility.

(ix) **Absence of Close Substitutes**: The goods in question do not have close substitutes.

Law of Cardinal Utility

Cardinal utility analysis explains two basic laws of consumption.

8.4.2 Law of Diminishing Marginal Utility and

8.4.3 Law of Equi-Marginal Utility

8.4.2 Law of Diminishing Marginal Utility

Hermann Heinrich Gossen was the first to formulate the law of diminishing marginal utility in 1854. However, it was Alfred Marshall who later popularized the concept and gave it its name. The law states that as an individual consumes more units of a commodity, the additional utility derived from each successive unit decreases. In other words, with continued consumption, the utility gained from each additional unit diminishes.

The law of diminishing marginal utility implies that total utility increases but at a decreasing rate. If consumption continues within a given time frame, the marginal utility of each additional unit eventually declines to zero and may even become negative. This psychological phenomenon is referred to as the law of diminishing marginal utility. According to Marshall, “the additional benefit which a person derives from a given increase of his stock of a thing diminishes with every increase in the

stock that he already has." This principle reflects a fundamental aspect of human behavior and has been derived through both introspection and observation of consumer behavior. The following table illustrates the total and marginal utilities obtained by an individual from consuming oranges.

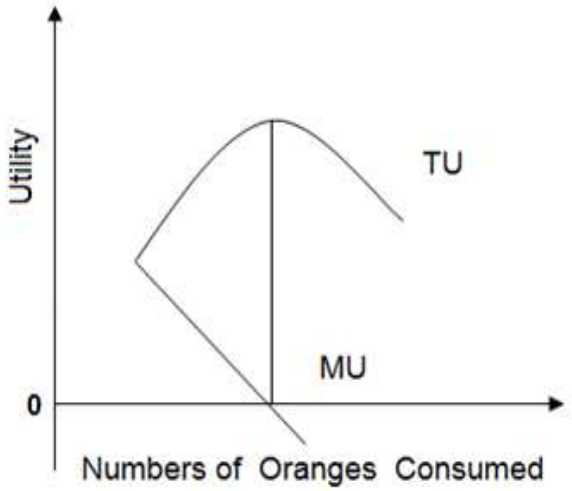
Table 8.1

No of oranges consumed	Total Utility (In utils)	Marginal Utility (In utils)
1	10	10
2	18	8
3	24	6
4	28	4
5	30	2
6	30	0
7	28	-2
8	24	-4

Marginal utility refers to the satisfaction or benefit gained from consuming an additional unit of a good. For instance, the first orange consumed provides a certain level of utility, which is termed its marginal utility. Similarly, the second orange also has its own marginal utility. The concept of "marginal" is not static; rather, it shifts with each additional unit consumed. Since all units are identical, each one should be regarded as a marginal unit, and the satisfaction derived from it is the marginal utility.

As shown in Table 8.1, the marginal utility of oranges decreases as consumption increases. It can even drop to zero or become negative. When marginal utility is negative, the consumer no longer experiences positive satisfaction but instead incurs dissatisfaction. Total utility, on the other hand, represents the cumulative utility derived from consuming all units of the good, which is the sum of individual marginal utilities. The table further demonstrates that as more oranges are consumed, marginal utility declines, meaning total utility rises at a decreasing rate. However, once the consumption reaches seven oranges, marginal utility turns negative, causing total utility to decline. This relationship is visually represented through the law of diminishing marginal utility.

The figure illustrates that while total utility (TU) continues to rise, its rate of increase slows down. Marginal utility (MU) declines over time, and when TU reaches its peak, MU becomes zero. If TU begins to decrease, MU turns negative. The principle of diminishing marginal utility plays a crucial role in demand theory, as it explains why the quantity demanded of a good increases when its price decreases, and vice versa. Consequently, the downward slope of the demand curve can be attributed to this phenomenon.



8.4.3 Law of Equi-Marginal Utility and Consumer's Equilibrium

In economic analysis, it is generally assumed that consumers act rationally, allocating their income in a way that maximizes their satisfaction. While consumer income is finite, the desire for various goods and services is virtually limitless. This limitation means that no consumer can afford to purchase everything they wish to, given their available income. Regardless of whether an individual's income is high or low in absolute terms, it is always insufficient to satisfy all possible wants.

Due to this constraint, consumers must make rational choices about how to allocate their income among different goods and services. Each consumer aims to distribute their limited financial resources in a way that yields the highest possible satisfaction under the given circumstances.

A consumer is said to be in equilibrium when they have allocated their income in a manner that provides the greatest possible satisfaction, given their income level, preferences, and the prevailing market prices of goods and services. The concept of equilibrium suggests that any deviation from this allocation would reduce overall satisfaction rather than improve it. The Law of Equi-Marginal Utility states that a consumer reaches equilibrium—or maximum total satisfaction—when the marginal utility derived from each good consumed is equal.

At any point in time, multiple goods compete for a consumer's limited income, offering varying levels of utility. Consumers strive to make the best possible use of each unit of currency spent. When every rupee of a consumer's income is allocated to its most efficient use, overall satisfaction is maximized, signifying equilibrium.

To illustrate this concept, consider a consumer with a daily income of Rs. 15, intending to purchase goods X, Y, and Z, each priced at Rs. 1 per unit. The table 8.2 presents the marginal utility schedules for these three goods, demonstrating how the consumer makes purchasing decisions to achieve equilibrium.

Table 8.2

Unit of Goods	Marginal Utility Schedule of X (MUx)	Marginal Utility Schedule of Y (MUy)	Marginal Utility Schedule of Z (MUz)
1	18 (1)	10 (5)	9
2	16 (2)	9 (6)	7
3	14 (3)	8 (9)	5
4	12 (4)	7 (10)	3
5	8 (8)	6 (12)	
6	5 (13)	5 (14)	
7	3	3	

The marginal utility derived from different units of the three goods presents the consumer with various options for allocating their income. To maximize overall satisfaction, the consumer seeks the most advantageous use for each rupee spent. Each of the three goods provides a different level of utility for the first rupee. If the consumer spends the first rupee on good X, they receive 18 units of utility; on good

Y, 10 units; and on good Z, 9 units. Naturally, the consumer will opt for the highest utility and spend the first rupee on X rather than Y or Z.

By analyzing the marginal utility schedules, it becomes evident that the first four rupees are best allocated to X, yielding 18, 16, 14, and 12 units of utility, respectively. Once these optimal choices are exhausted, the next best option is to allocate the fifth rupee to Y, which offers 10 units of utility. The consumer will then allocate the sixth rupee to the second unit of Y and the seventh rupee to the first unit of Z, proceeding systematically to ensure each rupee is spent in the most beneficial way.

If a rupee spent on one good yields more utility than on another, the consumer will always prioritize the higher return. This process continues until the marginal utility of the last rupee spent is the same across all goods—6 units in this case—signaling equilibrium. At this point, the consumer has distributed their Rs. 15 income efficiently, purchasing 6 units of X, 6 units of Y, and 3 units of Z. When summing the marginal utilities obtained from these purchases, the consumer achieves the maximum total utility of 139.

Total Utility from X = 18 + 16 + 14 + 12 + 8 + 5 = 73

Total Utility from Y = 10 + 9 + 8 + 7 + 6 + 5 = 45

Total Utility from Z = 9 + 7 + 5 = 21

Total Utility from X, Y and Z = 139

If the consumer allocates their income to any other combination of goods X, Y, and Z, their total utility will be lower than 139. For instance, if they purchase 7 units of X, 5 units of Y, and 3 units of Z, the total utility would be 76 + 40 + 21 = 137, which is less than the maximum attainable utility. Therefore, to achieve optimal satisfaction, the consumer must allocate their income in a way that ensures the marginal utility derived from the last rupee spent on each good is equal. In this scenario, the last rupee spent on X, Y, or Z yields the same utility of 5 units. In other words, the consumer will be in equilibrium if

MUx = MUy = MUz

MUx, MUy and MUz are the marginal utilities of X, Y and Z commodities.

In the previous example, we assumed that all three goods had the same price, i.e., Rs. 1 per unit. However, in reality, different goods are priced differently. Despite this variation, our conclusion remains unaffected. By dividing the marginal utilities of various goods by their respective prices, we obtain the ratios of marginal utility to price. These ratios represent the marginal utility derived per rupee spent on each good. If we denote the marginal utilities of goods X, Y, and Z as MUx, MUy, and MUz, respectively, and their corresponding prices as Px, Py, and Pz, the equilibrium condition can be expressed as:

$$\frac{MU_X}{P_X} = \frac{MU_Y}{P_Y} = \frac{MU_Z}{P_Z}$$

Alternatively, this condition signifies that the marginal utility per rupee spent on goods X, Y, and Z must be equal for optimal allocation of expenditure.

8.4.4 Limitations of Law of Equi-marginal Utility

The law of equi-marginal utility is a fundamental principle that helps consumers allocate their limited income across various goods to achieve maximum satisfaction. However, in real-life scenarios, applying this principle can be challenging.

Firstly, determining the marginal utilities of different goods is not straightforward for consumers. They often lack the necessary knowledge or tools to measure and compare the satisfaction derived from each product. Secondly, many consumers may not have the ability to assess which goods provide greater utility, leading to irrational purchasing decisions. Additionally, habitual consumption can override rational choices—for example, individuals addicted to smoking or drinking may continue spending on these goods despite knowing they could obtain greater satisfaction from other products. In extreme cases, a worker might prioritize purchasing alcohol over essential food items for his family, even when fully aware of the negative consequences.

Thus, various factors make it difficult for consumers to allocate their income precisely according to the law of equi-marginal utility. Some of the key limitations are discussed below:

(i) **Utility Cannot Be Measured:** The theory of consumer demand, based on the utilitarian approach, assumes that utility can be quantified. It suggests that to determine how much of a good an individual will buy at a given price, one must first measure the utility obtained from each unit of different goods. However, no scientific method exists for accurately measuring utility. Utility is a subjective experience, influenced by personal preferences and psychological factors, rather than an inherent property of a good. Since utility is not a measurable quantity but rather an indication of personal preferences, the theoretical foundation of the law becomes arbitrary.

(ii) **The Assumption of Independent Utilities is Flawed**: According to the law of diminishing marginal utility, the additional satisfaction (marginal utility) derived from a good depends solely on its own quantity, without being affected by the presence of other goods. This assumption implies, for instance, that the total utility derived from consuming oranges is independent of the quantity of any other product. However, in reality, most goods are interrelated—they may function as substitutes (e.g., tea and coffee) or complements (e.g., cars and petrol).

For example, an increase in tea consumption may lower the marginal utility of tea, but it could also reduce the marginal utility of coffee without any change in the stock of coffee. Similarly, if a consumer owns two cars but does not increase their petrol supply, the second car’s utility may be lower than the first, but the marginal utility of petrol may rise. This interdependence challenges the core assumption of the law and weakens its applicability in real-world consumer behavior.

(iii) **Marginal Utility of Money is Assumed Constant:** Another key assumption of the utilitarian approach is that the marginal utility of money remains constant, implying that an individual's demand for goods is not influenced by changes in income. This suggests that when income increases or decreases, the utility derived from money does not change, leading to the erroneous conclusion that demand for goods is solely responsive to price changes and not to income variations.

In reality, income is a crucial factor in determining consumer demand. Generally, as income rises, the demand for most goods increases (except for inferior goods, which exhibit the opposite trend). If the marginal utility of money truly remained constant, no additional goods would be purchased despite a rise in income, which is an unrealistic assumption. Thus, this limitation further weakens the practical applicability of the law.

Self-Check Exercise-1

Q.1. What do you mean by Cardinal Utility. Discuss various assumptions of cardinal utility theory?

Q.2. Explain in detail the Law of Equi-Marginal Utility? Also discuss its limitations.

8.5 SUMMARY

Jeremy Bentham introduced the concept of utility to social thought in 1789, while Jevons incorporated it into economic theory in 1871. Utility refers to the ability of a commodity or service to satisfy human wants. Individuals demand goods based on the satisfaction they derive from consuming them. It represents the value in use of a commodity or service, as the pleasure or fulfillment obtained from consumption determines its worth.

Utility is subjective and varies among individuals, making it a psychological phenomenon. The cardinalist school of thought suggests that utility can be measured, assigning numerical values or "utils" to the satisfaction gained from consuming goods. Some economists propose measuring utility in monetary terms, while others advocate subjective units. According to Marshall's utility analysis, a commodity's utility can be assessed by the maximum amount a consumer is willing to pay for it. The cardinal utility theory is based on key assumptions, including consumer rationality, measurable utility in monetary terms, constant marginal utility of money, and perfect knowledge of available commodities and their prices.

The law of diminishing marginal utility, initially formulated by Hermann Heinrich Gossen in 1854 and later popularized by Alfred Marshall, states that as consumption of a commodity increases, the additional satisfaction (marginal utility) derived from each extra unit decreases. This implies that total utility rises at a decreasing rate.

The law of equi-marginal utility helps consumers allocate their income efficiently across different goods to maximize satisfaction. However, in practice, consumers often struggle to apply this principle due to difficulties in assessing marginal utilities, lack of knowledge, and habitual consumption patterns. For instance, individuals may continue purchasing addictive goods like cigarettes or alcohol despite knowing that essential items such as food provide greater utility.

8.6 GLOSSARY

- **Utility**: Satisfaction derived by a consumer from consumption of a good.
- **Law of Diminishing Utility**: states that marginal utility of a commodity diminishes as an individual consume more and more of the commodity. That is, as we consume more and more of commodity the utility derived from the addition unit diminishes. The law of diminishing marginal utility means that the total utility increases at a decreasing rate.
- **Law of Equi-marginal Utility**: states that a consumer will allocate their income across different goods in a way that ensures the marginal utility (satisfaction gained from the last unit consumed) of each good is equal, maximizing their overall satisfaction from their limited budget.

8.7 ANSWERS TO SELF-CHECK EXERCISES

Self-Check Exercise-1

Ans.1. Please refer to sections 8.3, 8.3.1,8.4 and 8.4.1

Ans.2. Please refer to sections 8.4.3 and 8.4.4

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8.9 TERMINAL QUESTIONS

Q1. State and explain the cardinal utility theory of demand?

Unit-09

THEORY OF CONSUMER BEHAVIOUR-II

STRUCTURE

9.1 INTRODUCTION

Various methods are used to analyze consumer behavior, all of which assume that consumers act rationally. This implies that a consumer aims to maximize utility by selecting the most preferred commodity bundle, given a fixed income and set prices. The ordinal approach measures utility qualitatively rather than numerically, allowing consumers to rank their preferences without assigning specific values. This method provides a more realistic assessment of satisfaction. While the previous unit covered the cardinal approach to demand, this section focuses on the ordinal utility theory.

9.2 LEARNING OBJECTIVES

This unit aims to explore how individual consumers make consumption decisions when market prices are fixed and beyond their control. By the end of this chapter, you will be able to:

- Identify the consumer's optimal choice.
- Understand the indifference curve theory of demand.
- Describe the indifference curve and its key properties.

9.3 INDIFFERENCE CURVE ANALYSIS

The concept of indifference curve analysis in demand was initially introduced by Slutsky and later refined and widely promoted by J.R. Hicks. This approach emerged as an alternative to the utility analysis of consumer demand. A fundamental limitation of utility analysis is its reliance on the cardinal number system, which assumes that utility can be measured quantitatively, added, subtracted, and expressed in monetary terms. However, since utility is a subjective experience, it

cannot be precisely quantified. To address this issue, Hicks developed the 'Indifference Curve Analysis,' which explains consumer behavior without requiring the direct measurement of utility.

Indifference curve analysis is based on the ordinal number system, which does not assign numerical values to utility. Instead, it assumes that consumers can rank their preferences for different combinations of goods. In other words, a consumer can determine whether a particular combination of two goods, such as X and Y, provides greater, lesser, or equal satisfaction compared to another combination without quantifying the level of satisfaction. The combinations that offer higher satisfaction are ranked higher, while those that provide equal satisfaction place the consumer in a state of indifference.

An indifference curve is a graphical representation of consumer preferences. It illustrates different combinations of goods that yield the same level of satisfaction to the consumer, making them indifferent to choosing between those combinations. Essentially, an indifference curve depicts various pairings of commodities X and Y that provide the consumer with an equal degree of utility.

9.3.1 Basic assumptions of the theory

The analysis of indifference curves is built upon the following key assumptions:

(i) **Rationality:** Consumers are considered rational decision-makers. Given their income and the prices of goods, they strive to maximize their satisfaction. They possess complete knowledge of the different combinations of two goods that provide them with varying levels of satisfaction and are aware of their preferences.

(ii) **Independence of Preference Scale:** A consumer's preference ranking is assumed to be independent of external factors such as income, commodity prices, or the choices made by other consumers.

(iii) **Consistency and Transitivity of Choices:** Consumers are expected to be consistent in their decision-making. If they prefer bundle A over bundle B at one point, they will not later prefer B over A when both options are available. Mathematically, if A > B, then B cannot be > A. Transitivity implies that if a consumer prefers bundle A over B and B over C, then A is also preferred over C. This can be represented as: If A > B and B > C, then A > C.

(iv) **Stability of Preferences:** Consumer preferences, including tastes, habits, and income levels, are assumed to remain unchanged throughout the analysis.

(v) **Ordinal Utility:** Consumers can rank different combinations of goods based on the level of satisfaction each provides. However, this ranking is ordinal, meaning it only indicates relative preference rather than exact numerical differences in utility.

(vi) **Diminishing Marginal Rate of Substitution (MRS):** The Marginal Rate of Substitution (MRS) refers to the rate at which a consumer is willing to exchange one good for another while ensuring their overall satisfaction remains unchanged. It is expressed as $MRS_{xy} = \Delta Y/\Delta X$, where ΔX and ΔY represent small changes in the quantities of goods X and Y, respectively. The principle states that as a consumer continues to substitute one good for

another, the willingness to trade further units decreases. This results in an indifference curve that is convex to the origin, reflecting the declining MRS.

9.4 INDIFFERENCE CURVE

An indifference curve represents a set of points that depict different combinations of goods providing the consumer with the same level of satisfaction or utility. It is derived from the consumer's indifference schedule, which outlines various combinations of two commodities to which the consumer remains indifferent. Table 9.1 presents a hypothetical indifference schedule illustrating different combinations of goods X and Y.

Table 9.1: Indifference Schedule

Combination		Good X	Good Y
1	L	1	18
2	M	2	13
3	N	3	9
4	P	4	6
5	Q	5	4
6	R	6	3

In the given schedule, the consumer derives the same level of satisfaction from different combinations of goods. Whether choosing the first combination (18 units of Y and 1 unit of X), the second combination (13 units of Y and 2 units of X), or any other listed combination, the consumer remains indifferent. To illustrate this concept visually, we can represent the schedule using a diagram known as an indifference curve (Figure 9.1).

An indifference curve (IC) represents a series of points—L, M, N, P, Q, and R—that illustrate different combinations of goods X and Y, between which a consumer is equally satisfied. This curve, also known as an iso-utility curve, signifies that every point along it provides the same level of satisfaction. Each indifference curve corresponds to a specific level of utility, but multiple indifference curves can exist, each representing varying levels of satisfaction.

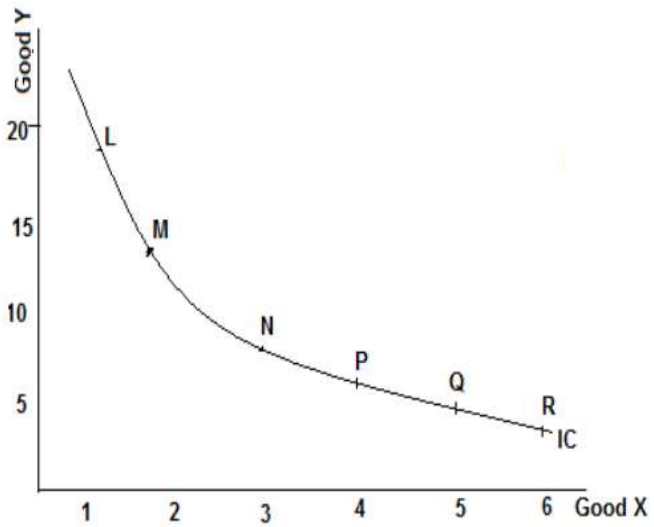

Fig. 9.1

When these curves are plotted together, they form an indifference map, which ranks a consumer's preferences. As shown in Figure 9.2, curves positioned further from the origin indicate higher satisfaction levels due to greater quantities of goods X and Y. For instance, all points on IC_3 offer greater satisfaction than those on IC_2 or IC_1, making IC_3 preferable to IC_2, which, in turn, represents a higher satisfaction level than IC_1.

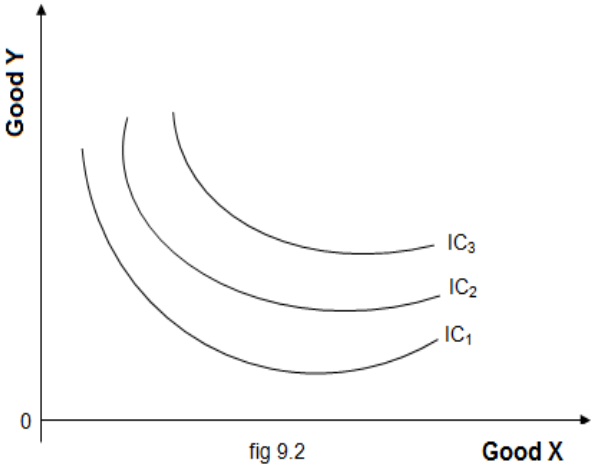

fig 9.2

9.4.1 Properties of Indifference Curves

(i) A higher IC represents a higher level of satisfaction: A higher IC to the right of another represents a higher level of satisfaction and preferable combinations of goods. In the figure 9.3, IC2 represents higher levels of satisfaction. For example, combination A on IC_2 is preferable to any combinations like M or N on IC_1.

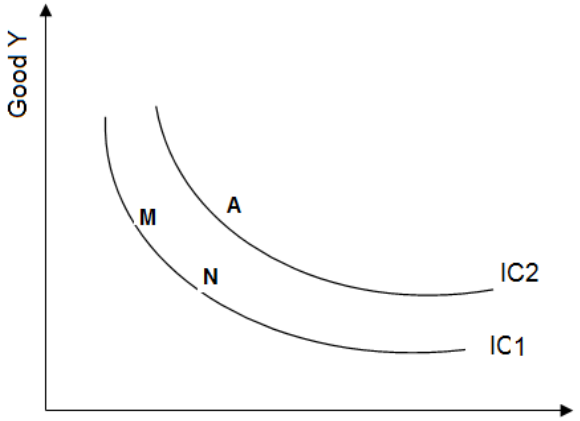

Fig 9.3

(ii) Indifference Curves Have a Negative Slope

Indifference curves slope downward from left to right, indicating that if a consumer wishes to maintain the same level of satisfaction, a reduction in the quantity of one good (Y) must be offset by an increase in the quantity of another good (X) within the combination. In other words, to keep the consumer indifferent, the loss of utility from consuming less of one commodity must be balanced by a gain in utility from consuming more of the other.

As shown in Figures 9.4(a), 9.4(b), and 9.4(c), combination B is preferred over A since it includes a greater quantity of at least one good. However, in Figure 9.4(d), only the indifference curve is represented, as points A and B provide the same level of satisfaction to the consumer.

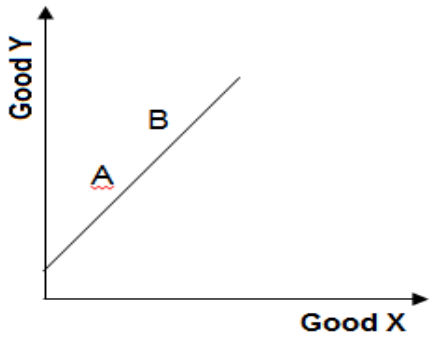

Fig 9.4 (a)

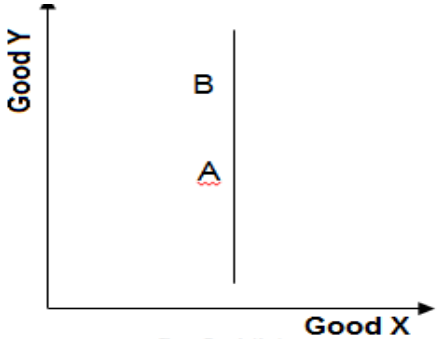

fig 9.4(b)

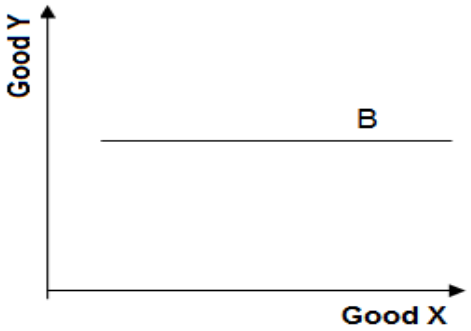

Fig 9.4 (c)

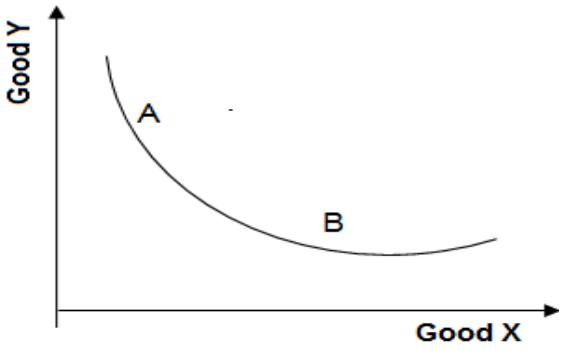

fig 9.4 (d)

(iii) An indifference curve can neither intersect nor touch another indifference curve. If such an intersection were to occur, it would imply two different levels of satisfaction at the same point, which is logically inconsistent. This contradiction is illustrated in Figure 9.5.

Point A on IC1 represents a higher level of satisfaction compared to point B on IC2 because it is positioned farther from the origin. However, point C, which lies on both curves, would indicate the same level of satisfaction as both A and B. This creates a contradiction since A is preferred over B. The same inconsistency arises if two indifference curves merely touch—A is preferred to B, but B is equal to C, and A is also equal to C, which is illogical.

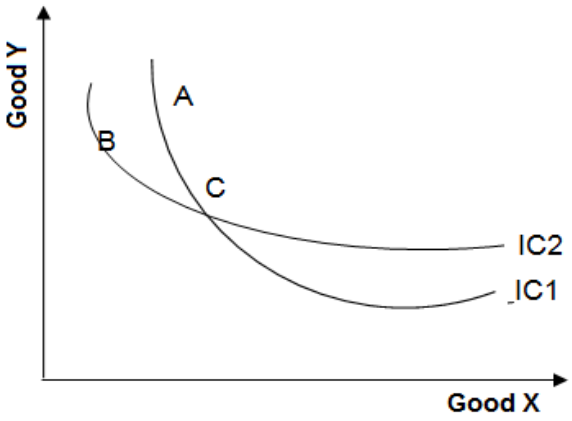

Fig 9.5

(iv) An indifference curve (IC) cannot touch either axis: because it represents a set of combinations of two goods that provide the same level of satisfaction to the consumer. If an IC were to touch an axis, it would imply that one of the goods is absent from the combination.

For instance, at point L, the bundle contains no units of good X, and at point M, there are no units of good Y. This contradicts the fundamental assumption that the consumer purchases both goods in some combination.

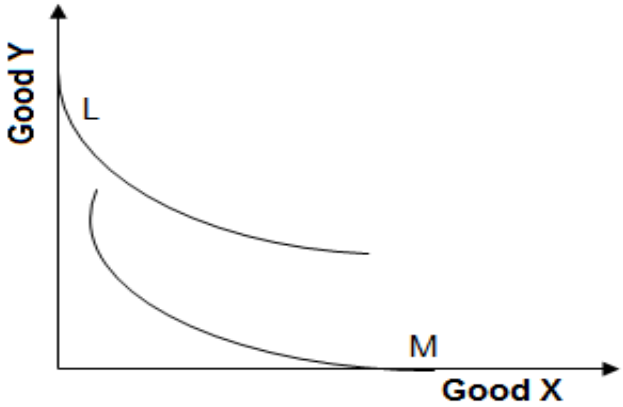

Fig 9.6

(v) Indifference curves are convex to the origin: The convexity rule implies that as the consumer substitutes X for Y, the marginal rate of substitution diminishes. It means that as the amount of X increases by equal amounts that of Y diminishes by smaller amounts. This implies that the slope of the curve becomes smaller as we move to the right

In a concave curve such as in the figure: 9.7a, MRS (Marginal Rate of Substitution) of X for Y increases. i.e., more of Y is giving up having additional unit of X: ab < cd < ef unit of Y for bc = de =fg

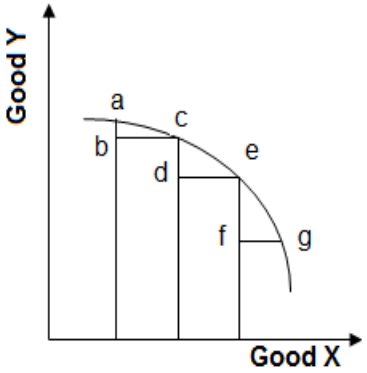

Fig. 9.7 (a)

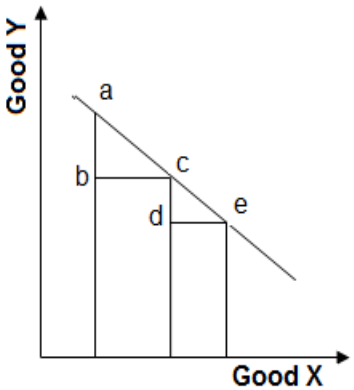

Fig. 9.7 (b)

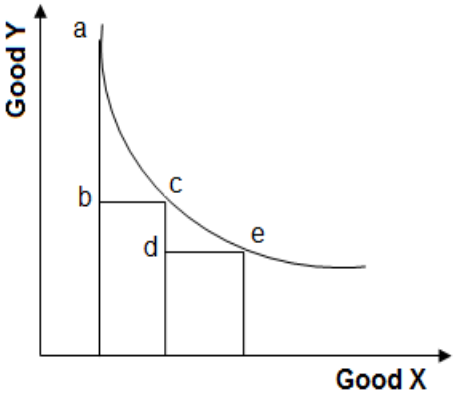

Fig. 9.7 (c)

In the case of a straight line (Fig 9.7 b), MRS between the two goods will be constant. i.e., ab of Y = bc of X and cd of Y = de of X. In a convex curve (Fig 9.7c), the consumer is giving up lesser and lesser amounts of Y in order to have equal additional units of X. i.e., ab > cd of Y for bc = de of X. Therefore an IC is always convex to the origin because the marginal rate of substitution between two goods decline.

(vi) Indifference curves do not always run parallel to each other. While they generally slope downward to the right, the rate at which they decline can differ. This variation occurs due to differences in the Marginal Rate of Substitution between the two goods.

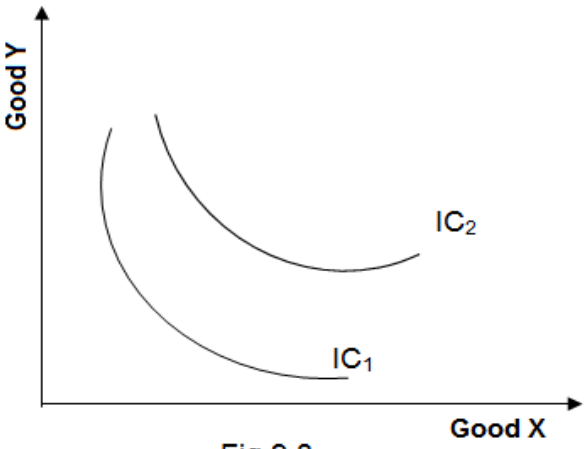

Fig 9.8

9.5 MARGINAL RATE OF SUBSTITUTION (MRS)

The marginal rate of substitution (MRS) of X for Y refers to the quantity of commodity Y that a consumer is willing to forgo in order to acquire an additional unit of commodity X while maintaining the same level of satisfaction. It represents the rate at which a consumer is prepared to exchange one good for another, ensuring they remain on the same indifference curve. This concept is illustrated in Table 9.2.

Table 9.2: Marginal Rate of substitution Between Commodity X and Y

Combination	Good X	Good Y	MRSxy
1	1	18	-
2	2	13	5:1
3	3	9	4:1
4	4	6	3:1
5	5	4	2:1
6	6	3	1:1

To maintain the same level of satisfaction while choosing the second combination in the table, the consumer is willing to sacrifice 5 units of Y to acquire an additional unit of X. At this point, the marginal rate of substitution (MRS) of X for Y is 5:1. However, when moving to the third combination, the consumer is willing to give up only 4 units of Y for one extra unit of X, resulting in an MRS of 4:1. As the consumer progresses from left to right, their stock of X increases while that of Y decreases. Consequently, their willingness to forgo Y diminishes gradually. This decreasing willingness to sacrifice Y for additional units of X illustrates the **principle of the Diminishing Marginal Rate of Substitution (DMRS)**. This concept is further explained in Figure 9.9.

The MRS of X for Y is in fact the slope of the IC. i.e., MRSxy $=\frac{\Delta Y}{\Delta X}$. It means that MRSxy is the ratio of change in good Y to a given change in good X. In the figure, the vertical sides of the triangle represent and the horizontal sides represent. Accordingly at point c MRSxy = ab/bc, at point e, MRSxy= cd/de and at point g MRSxy = ef/fg. Moreover it could be seen that ab > cd > ef. It follow that, as the

consumer moves from left to right, he possesses additional units of X and then give up lesser and lesser units of Y for extra units of X. i.e., MRSxy diminishes.

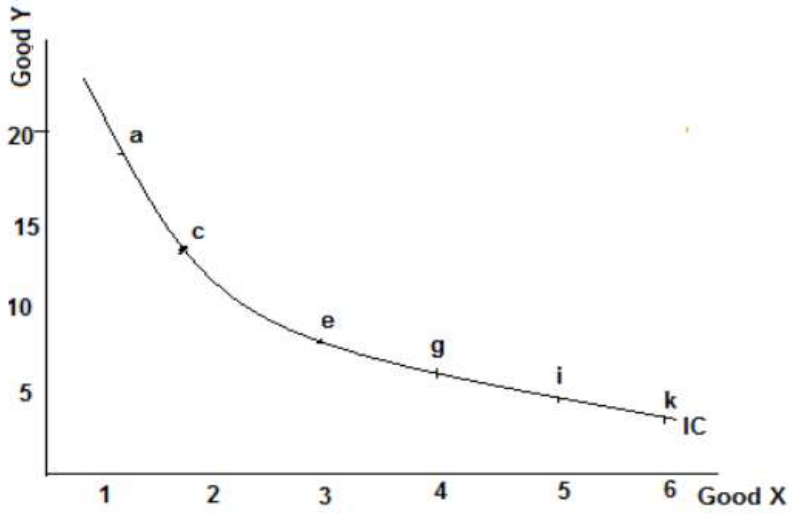

Fig. 9.9

The principle of diminishing marginal rate of substitution (MRS) is considered more advanced than the law of diminishing marginal utility (DMU). According to Prof. Hicks, replacing the diminishing marginal utility concept with the diminishing MRS principle represents a significant improvement in consumer demand theory rather than just a simple reinterpretation. Since the principle of diminishing MRS relies on ordinal utility measurement and evaluates goods in combination, it is regarded as a more scientific and realistic approach. In contrast, the Marshallian utility analysis, which employs cardinal measurement and focuses on individual commodities, is considered less comprehensive.

Self-Check Exercise-1

Q.1. Explain indifference curve theory? What are the basic assumptions of the theory?

Q.2. How Indifference curve is drawn? Explain the properties of indifference curve?

9.6 SUMMARY

Consumer behavior can be analyzed using various approaches, all of which assume that consumers act rationally. This implies that a consumer aims to maximize utility by selecting the most preferred bundle of goods from the available options, given their income and the prevailing prices.

The **ordinal approach** measures utility qualitatively rather than numerically. The concept of **indifference curve analysis**, initially introduced by Slutsky and later refined and popularized by J.R. Hicks, is a graphical representation of consumer preferences. An **indifference curve (IC)** illustrates different combinations of two goods that provide the same level of satisfaction to the consumer, making them indifferent to choosing one combination over another. In this unit the properties of indifference curve have been discussed in detail.

9.7 GLOSSARY

- **Indifference Curve**: A graphical illustration depicting various combinations of two goods that provide a consumer with the same level of satisfaction.
- **Marginal Rate of Substitution (MRS)**: It refers to the quantity of commodity Y that a consumer must forgo to obtain an additional unit of commodity X while maintaining the same satisfaction level. MRS represents the trade-off between two goods that the consumer considers equally desirable. It indicates the rate at which one good can be substituted for another without altering overall utility, ensuring the consumer remains on the same indifference curves.

9.8 ANSWERS TO SELF-CHECK EXERCISES

Self-Check Exercise-1

Ans1. Please refer to section 9.3 and 9.3.1

Ans 2 Please refer to section 9.4 and 9.4.1

9.9 REFERENCES/SUGGESTED READINGS

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9.10 TERMINAL QUESTIONS

Q1. Explain the properties of Indifference curve with the help of suitable diagrams.

Unit-10

THEORY OF CONSUMER BEHAVIOUR-III

STRUCTURE

10.1 INTRODUCTION

A consumer reaches equilibrium when they distribute their income among different goods in a manner that maximizes their total satisfaction. According to Marshallian utility analysis, equilibrium is achieved when the marginal utility per unit of currency spent is equal for all goods.

10.2 LEANING OBJECTIVES

After going through this unit you will be able to learn

- Consumer Equilibrium through Indifference curve analysis.
- Budget line or Price Line.
- Separation of Income effect and Price effect.

10.3 CONSUMER'S EQUILIBRIUM THROUGH INDIFFERENCE CURVE ANALYSIS

When a consumer allocates their income across various goods in a manner that maximizes their satisfaction, they are considered to have reached an equilibrium state. According to the Marshallian utility analysis, which has been previously discussed, a consumer attains equilibrium when the ratio of marginal utilities of different goods to their respective prices is equal. Now, we will examine how consumer equilibrium can be determined using indifference curve analysis.

To analyze consumer equilibrium through indifference curves, the following information is required:

(a) The consumer's preference ranking for two goods, represented by a series of indifference curves.

(b) The consumer's total income, which is assumed to be entirely spent on both goods without any savings.

(c) The prices of the two commodities, which are considered fixed in the market.

In other words, understanding consumer equilibrium requires knowledge of their preference ranking (also known as an indifference map) and their budget constraint, represented by the price line.

10.3.1 Scale of Preferences of the Consumer or Indifference Map

Consumers derive varying levels of satisfaction from different combinations of two goods. Some combinations provide greater satisfaction, placing them higher in the consumer's preference ranking, while others offer lower satisfaction and rank accordingly lower. If multiple combinations yield the same level of satisfaction, they will occupy the same position in the preference order.

By systematically ranking these combinations in terms of higher, lower, or equal satisfaction levels, we obtain what economists refer to as an indifference map or a consumer's scale of preferences. This map visually represents how different combinations of goods are ordered based on the consumer's satisfaction levels, helping to illustrate their choices and decision-making process.

In Table 10.1, we considered five combinations of commodities X and Y: 1X + 25Y, 2X + 20Y, 3X + 16Y, 4X + 13Y, and 5X + 11Y. Each of these combinations provides the same level of satisfaction to the consumer, making them indifferent to choosing any one of them. Based on these combinations, an indifference curve was drawn in the previous unit's diagram. Every point on this curve represents different combinations of X and Y that offer equal satisfaction to the consumer. However, there are numerous other combinations of these two commodities that may provide either higher or lower satisfaction than the five mentioned above. A single indifference curve cannot represent all these variations, necessitating multiple indifference curves to illustrate different levels of satisfaction. To clarify this concept further, we refer to the example presented in Table 10.1.

Table 10.1

A		B		C	
Indifference Curve I		**Indifference Curve II**		**Indifference Curve III**	
X	Y	X	Y	X	Y
1	18	1	25	1	31
2	13	2	16	2	25
3	9	3	16	3	20
4	6	4	13	4	17
5	4	5	11	5	15

When the various combinations listed in the table are represented graphically, we can draw three indifference curves—labeled I, II, and III—as illustrated in Diagram 7.1. Each combination of goods X and Y in column (A) provides the consumer with the same level of satisfaction and is therefore represented by indifference curve I. Similarly, the combinations in column (B) yield an identical level of satisfaction and are depicted by indifference curve II. The combinations in column (C) correspond to indifference curve III.

Since the combinations in column (B) offer greater satisfaction than those in column (A), indifference curve II is positioned above indifference curve I. Likewise, the combinations in column (C) provide even higher satisfaction than those in column (B), placing indifference curve III above indifference curve II. Hence, while a single indifference curve represents a specific satisfaction level, multiple indifference curves indicate varying levels of satisfaction.

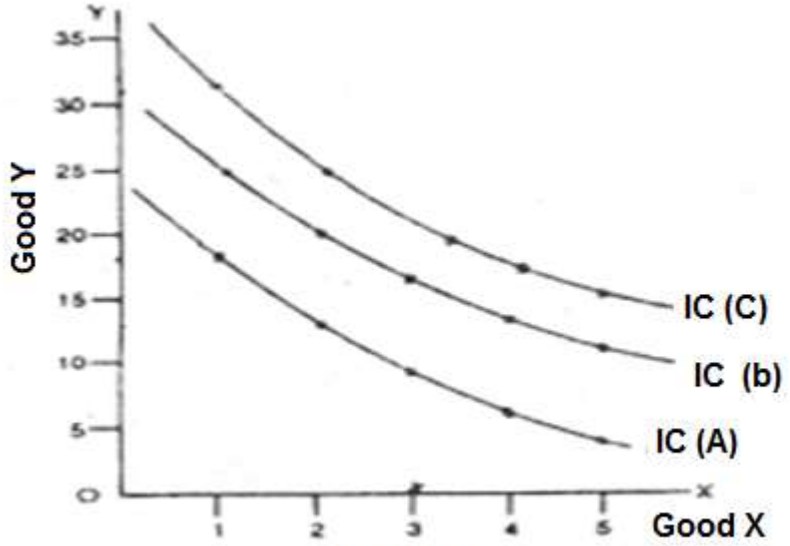


Fig. 10.1

A higher indifference curve represents a greater level of satisfaction compared to a lower indifference curve. In Figure 10.1, we have illustrated three indifference curves— I, II, and III— based on different combinations of goods X and Y as shown in Table 10.1. However, numerous other combinations of X and Y could be represented by additional indifference curves. The graphical depiction of all possible indifference curves relevant to a consumer is known as their indifference map or scale of preference. Each consumer has a unique indifference map that reflects their tastes and preferences regarding different combinations of two goods.

As long as these tastes and preferences remain constant, the indifference map remains unchanged. However, if the consumer's preferences shift, a new indifference map must be created to reflect the updated preferences.

10.4 BUDGET LINE OR PRICE LINE

A higher indifference curve represents a greater level of satisfaction compared to a lower one. Since a consumer's primary goal is to maximize satisfaction, they will aim to reach the highest possible indifference curve. However, in attempting to achieve the most satisfying combination of two goods, the consumer faces two constraints: first, they must consider the prices of the goods, and second, they have a limited income. Therefore, the quantity a consumer can afford depends on both the prices of goods and their available income.

Given the consumer's income and prevailing market prices, a budget constraint can be represented graphically by a budget line or price line, which indicates the maximum combination of goods they can afford. For instance, if a consumer has a weekly income of ₹20 and wishes to spend it on rice and wheat, with market prices of ₹2 per kg for rice and ₹1 per kg for wheat, their purchasing options are limited. If the entire income is spent on wheat, they can buy 20 kg, whereas if all the money is allocated to rice, they can afford 10 kg.. With this information his budget line equation can be given on

20 = 1 (Wheat) + 2 (Rice)

Symbolically M = PxX + PyY

Where M = income, Px = Price of X, X being wheat

Py = Price of Y, Y being Rice

Let's illustrate this with a diagram. In Diagram 10.2, wheat is represented along the X-axis, while rice is plotted on the Y-axis. If the consumer allocates their entire income of ₹20 solely to purchasing wheat, they can buy 20 kg, represented as point B (OB) on the X-axis. Conversely, if they spend the entire amount on rice, they can acquire 10 kg, denoted as point A (OA) on the Y-axis. Connecting points A and B forms a straight line, and the slope of this line indicates the market exchange rate between rice and wheat.

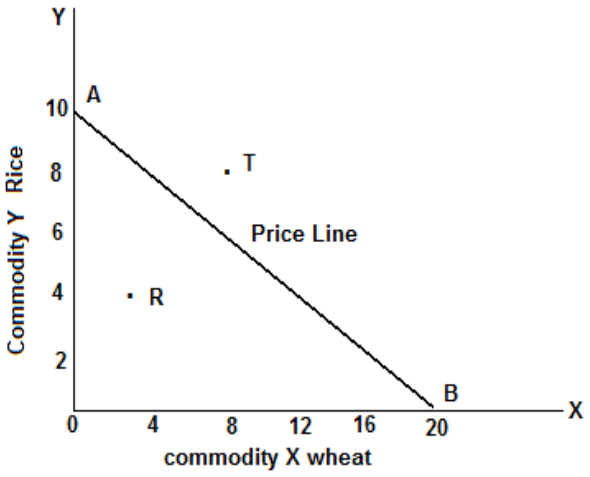


Fig. 10.2

The line in question is commonly known as the price line or budget line, representing the purchasing options available to a consumer based on their fixed income and prevailing market prices. It illustrates all possible combinations of two goods that a consumer can afford, given their financial constraints and the prices of the commodities.

The slope of the price line (OA/OB) is determined by the ratio of the prices of the two goods (Price of X/Price of Y). This line is constructed based on the consumer's available income and the cost of the goods. Consequently, any alteration in the consumer's income or changes in the price of the goods will result in a shift of the price line.

If the prices of goods remain unchanged but the consumer's income increases, the price line will shift upward and to the right, remaining parallel to its original position. Conversely, if the consumer's income decreases, the price line will shift downward and to the left while maintaining its parallel orientation. This concept is illustrated in Diagram 10.3.

When the consumer's weekly income increases from ₹20 to ₹24, the budget line AB shifts upward in a parallel manner, taking the new position represented by A1B1. Likewise, the lines A2B2 and A3B3 correspond to the consumer's budget constraints when their income rises to ₹28 and ₹32 per week, respectively. Conversely, if the consumer's income decreases to ₹16 per week, the budget line AB shifts downward to the left in a parallel manner, assuming the position represented by A4B4.

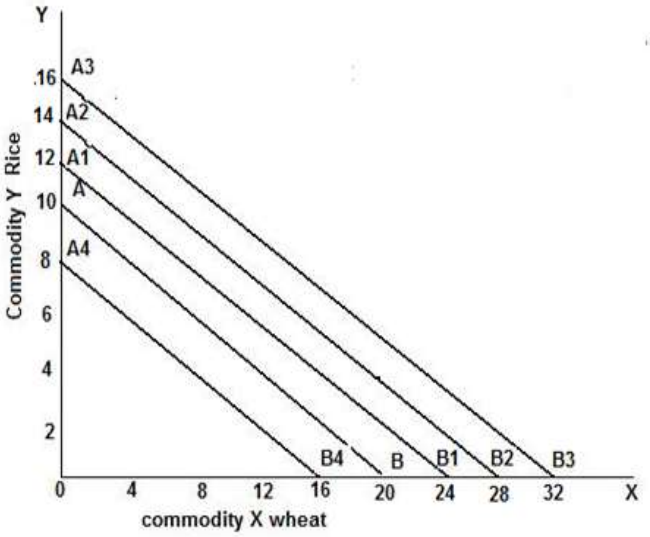


Fig. 10.3

If a consumer's money income remains unchanged but the price of a commodity fluctuates, it leads to a shift in the consumer's price line, as illustrated in Diagram 10.4. For example, if the price of wheat decreases from ₹1 per kg to ₹0.50 per kg, the consumer, with a fixed income of ₹20, could initially purchase OB quantity (20 kg) of wheat if they allocated their entire income to it. However, with the price reduction to ₹0.50 per kg, the same income would now allow the consumer to buy OB1 quantity (40 kg) of wheat. As a result, the price line shifts to the right, forming AB1. Conversely, if the price of wheat increases from ₹1 per kg to ₹1.25 per kg, the consumer's purchasing capacity decreases, allowing them to buy only OB2 quantity (16 kg). Consequently, the price line shifts to the left, forming AB2.

The price line, also known as the income line, represents the range of choices available to a consumer. Referring to Diagram 10.4, the consumer is unlikely to select a point like R, which lies below the price line, as this would mean not utilizing their entire income, leaving some money unspent. Similarly, the consumer cannot opt for a point such as T, located beyond the price line, because their income is insufficient to afford that combination of goods. Therefore, the consumer's choice must be confined to a point along the price line.

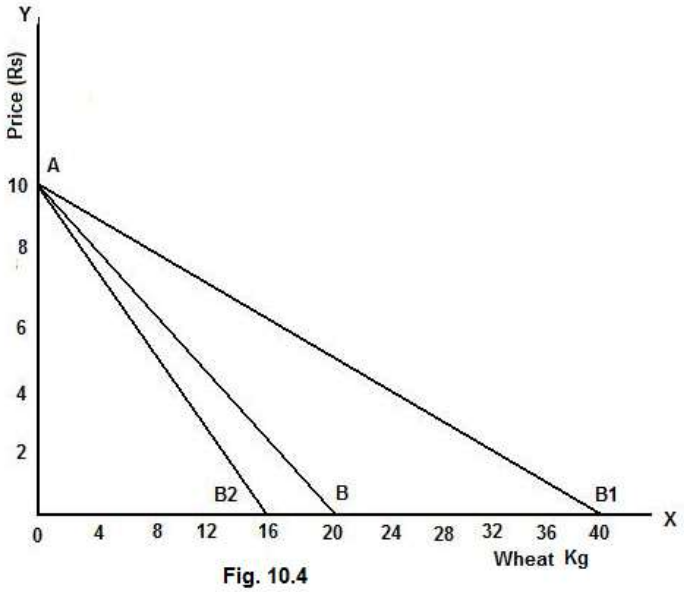


Fig. 10.4

Self-Check Exercise-1

Q.1 What is Budget Line? Discuss the effect of change in budget line**.**

10.5 CONSUMER'S EQUILIBRIUM

The optimal combination of wheat and rice that provides the highest satisfaction to the consumer can be determined by integrating the indifference map (representing the consumer's preferences) with the budget constraint (price line). This process is illustrated by combining diagrams 10.1 and 10.2, as shown in diagram 10.5.

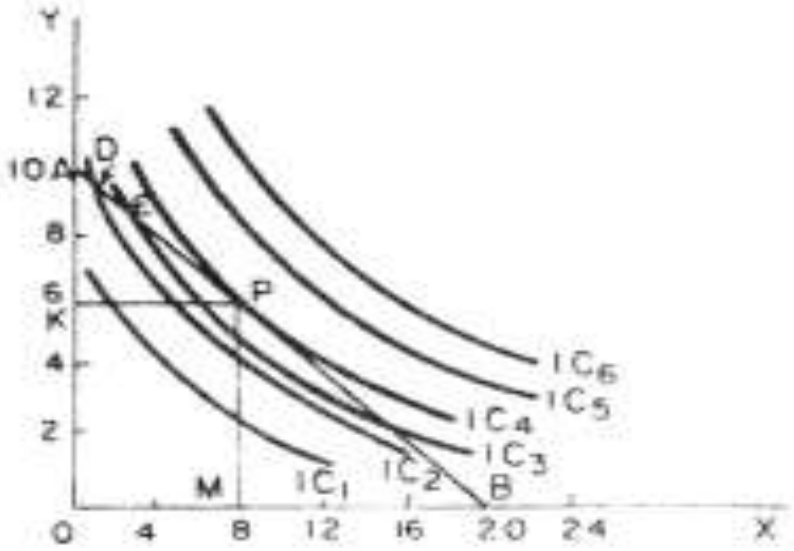


Fig 10.5

A consumer determines the optimal combination of wheat and rice that maximizes satisfaction by using an indifference map (representing preferences) and the budget constraint. This process is illustrated in Diagram 10.5, which depicts the price line AB, reflecting the consumer's limited income (Rs. 20) and the given market

prices of wheat (Re. 1 per kg) and rice (Rs. 2 per kg). The indifference curves IC1, IC2, IC3, IC4, IC5, and IC6 represent the consumer's preferences. The goal is to reach the highest possible indifference curve while staying within the constraints of income and market prices, as indicated by the price line AB. The consumer's choice is restricted to the triangular area OAB.

Although the consumer can select any point within OAB, doing so would mean not fully utilizing available income. Moving beyond AB is not feasible due to income limitations. Therefore, the consumer must choose a point along the price line AB that maximizes satisfaction. Through a process of trial and error, the consumer initially selects point D on the price line, which lies on indifference curve IC2. However, upon evaluating other options, they realize that moving to point E on IC3 offers higher satisfaction. Consequently, point D is rejected in favour of E. Similarly, upon reaching E, the consumer notices that point P, located on IC4, provides even greater satisfaction. Thus, they choose P over E.

At point P, any movement in either direction results in a decrease in satisfaction. Here, the budget line is tangent to the indifference curve IC4, indicating that the consumer has achieved the highest possible level of satisfaction within their financial constraints. At this optimal point, the consumer purchases OK (6 kg) of rice and OM (8 kg) of wheat.

Now, we can outline the conditions under which a consumer maximizes satisfaction within the limits of their income and prevailing market prices. A consumer reaches maximum satisfaction when they choose a point where the budget line is tangent to the indifference curve. This represents the highest satisfaction level achievable under given circumstances, as any deviation from this point results in a lower level of satisfaction. It is important to recall that the slope of an indifference curve at any given point reflects the marginal rate of substitution (MRS) between the two goods. At the tangency point (P in the diagram), the slopes of the indifference curve and the budget line (OA/OB) are identical. This signifies that the consumer's marginal rate of substitution (MRSxy), as represented by the indifference curve, equals the price ratio of the two goods (Px/Py). Therefore, consumer equilibrium is achieved when the marginal rate of substitution between the two goods matches their price ratio.

However, the tangency between the budget line and the indifference curve—or the equality of the marginal rate of substitution and the price ratio—is a necessary but not a sufficient condition for consumer equilibrium. The additional requirement for equilibrium is that the indifference curve must be convex to the origin at the equilibrium point. In other words, the marginal rate of substitution of X for Y must be diminishing at this point; otherwise, equilibrium will not be stable. This concept can be further illustrated with Diagram 10.6.

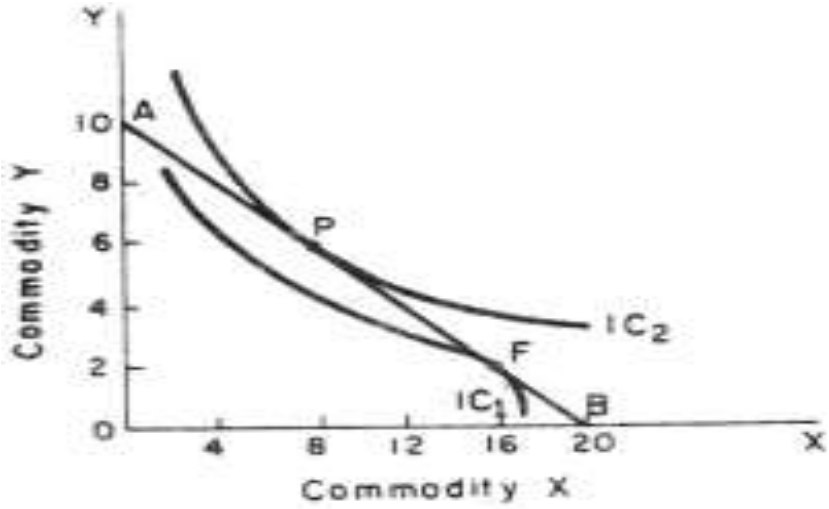


Fig 10.6

In the given diagram, the price line AB touches the indifference curve IC_1 at point F, suggesting that F could be the consumer's equilibrium. However, this is not a stable equilibrium since maximum satisfaction is not achieved at this point. At F, the indifference curve is concave to the origin, meaning that the marginal rate of substitution of X for Y is increasing. As a result, the consumer can attain a higher level of satisfaction by moving either left or right along the price line. By doing so, the consumer can reach point P, where the price line AB is tangent to a higher indifference curve, IC_2. At P, not only is the price line tangent to IC_2, but the curve is also convex to the origin, making P the consumer's stable equilibrium position.

For a consumer to be in equilibrium, the following two conditions must be met:

(a) The price line must be tangent to an indifference curve, meaning the marginal rate of substitution of X for Y must be equal to the price ratio between the two goods.

(b) The indifference curve must be convex to the origin at the point of tangency.

Self-Check Exercise-2

Q.1. Discuss Consumer Equilibrium with Indifference curve approach,

10.6 EFFECT OF THE CHANGES IN THE CONSUMER'S INCOME AND PRICES OF GOODS

Up to this point, we have explored how a consumer determines which goods to purchase and in what quantities, given their monetary income and the prevailing prices of goods. However, both a consumer's income and the prices of goods are subject to change. These fluctuations influence the consumer's equilibrium, impacting their purchasing decisions.

10.6.1 Effects of the Changes in Income on Consumer's Demand: Income Effect

Let's explore how changes in a consumer's monetary income impact their equilibrium, assuming that the prices of goods remain constant. What occurs when a consumer's income rises or falls while all other factors stay unchanged? If the prices of two goods are fixed, an increase in income shifts the consumer to a higher budget line, allowing them to choose a combination of goods on a higher indifference curve. Simply put, when income rises, the consumer can afford to purchase more of one or

both goods. The relationship between changes in a consumer's income and the demand for a commodity is known as the income effect.

In Diagram 10.7, wheat is represented on the X-axis, while rice is on the Y-axis. Suppose the consumer has a weekly income of Rs. 20, with the price of wheat set at Rs. 1 per kg and rice at Rs. 2 per kg.

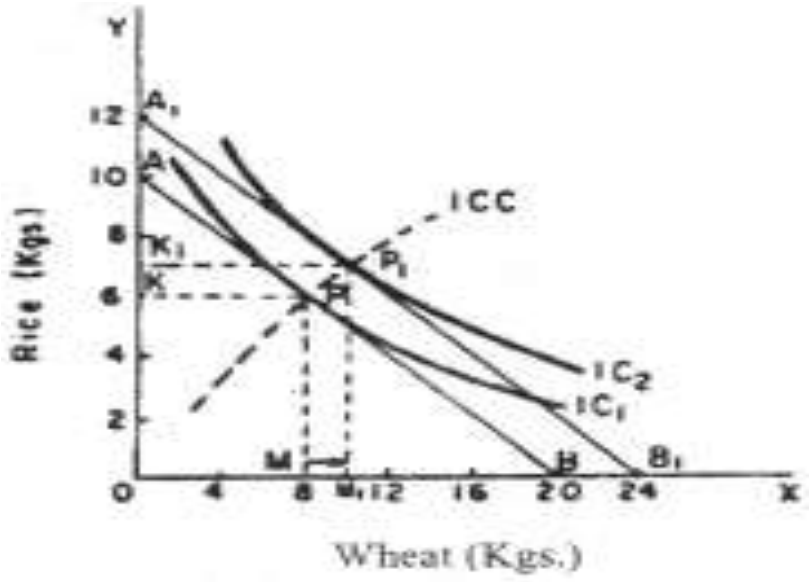


Fig 10.7

If the consumer allocates his entire income to purchasing wheat, he can afford OB (20 kg) of it. Alternatively, if he spends all his income on rice, he can buy OA (10 kg) of rice. As a result, AB represents his budget constraint. This budget line is tangent to the indifference curve IC_1 at point P, indicating his equilibrium position. At this point, he utilizes his entire income (Rs. 20) to purchase OM (8 kg) of wheat and OK (6 kg) of rice.

Now, if his income increases to Rs. 24 per week while the prices of both goods remain unchanged, his budget line shifts upward and parallel to AB, forming a new budget line A1B1. With the increase in income, the consumer moves to a higher indifference curve. His new equilibrium position is at P1, where the new budget line A1B1 is tangent to the indifference curve IC_2. Previously, with an income of Rs. 20, he purchased OM (8 kg) of wheat and OK (6 kg) of rice. With an increased income of Rs. 24, he now buys OM1 (10 kg) of wheat and OK1 (7 kg) of rice, meaning he consumes more of both goods.

The shift in equilibrium from P to P1 due to increased income is referred to as the **income effect**, which in this case is positive. By connecting P and P1, we obtain the **Income Consumption Curve (ICC)**, which generally slopes upward to the right.

It is important to note that the income effect can be either positive or negative. If a rise in income leads to higher demand for a commodity, the income effect is **positive**. Conversely, if an increase in income causes a decline in demand for a commodity, the income effect is **negative**. Typically, the income effect is positive. However, in the case of **inferior goods**, the income effect is negative—meaning that as income rises (or real income increases due to a price drop), the demand for an inferior good decreases, and vice versa.

10.6.2 Case of Inferior Goods

Inferior goods are products that consumers tend to purchase when their income levels are low. As their financial situation improves, they typically transition from consuming inferior goods to higher-quality alternatives. In other words, an increase in income leads to a decrease in the demand for inferior goods. The concept of the negative income effect for inferior goods can be illustrated using Diagram 10.8.

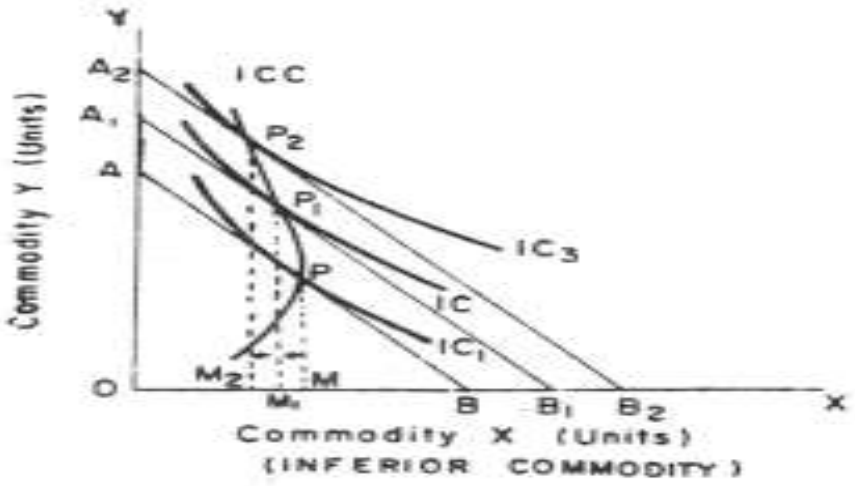


Fig10.8

In the given diagram, the X-axis represents commodity X, which is considered an inferior good, while the Y-axis represents commodity Y, which is not inferior. The initial budget line is AB, and the consumer reaches equilibrium at point P, purchasing OM units of commodity X. When the consumer's income increases, the budget line shifts upwards to A1B1, touching the new indifference curve IC2 at point P1. As a result, the new equilibrium is at P1, where the consumer now purchases OM1 units of commodity X—less than the previous OM units. The reduction in quantity purchased, represented by MM1, indicates a negative income effect despite the increase in income.

If the consumer’s income continues to rise, the budget line shifts further to A2B2, leading to a new equilibrium at P2. At this point, the consumer purchases OM2 units of X, which is even lower than OM1. The decline in consumption by M1M2 again reflects a negative income effect. This occurs because commodity X is an inferior good, causing the income consumption curve (ICC) to slope backward to the left.The income effect can also arise due to price changes, assuming the consumer's monetary income remains constant. A decrease in the price of a commodity increases the consumer's real income or purchasing power, thereby raising the demand for the commodity. This aspect will be explored in further detail.

10.6.3 Effects of Price Changes on Consumer’s Demand: Price Effect

We have analyzed how changes in a consumer’s money income affect their equilibrium position while keeping the prices of goods constant. Now, let’s explore how a change in the price of one commodity influences consumer equilibrium, assuming that the price of the other commodity, as well as the consumer’s income and preferences, remain unchanged.

When the price of a particular good, say X, changes while the price of another good, say Y, and the consumer's income stay the same, the price line shifts accordingly. As illustrated in Diagram 10.4, this shift alters the consumer's equilibrium position.

If the price of X decreases, the price line moves to the right, allowing the consumer to attain a higher indifference curve. Conversely, if the price of X rises, the price line shifts to the left, resulting in an equilibrium position on a lower indifference curve. The overall impact of a price change on the quantity demanded of a commodity is referred to as the price effect, which is depicted in Diagram 10.9.

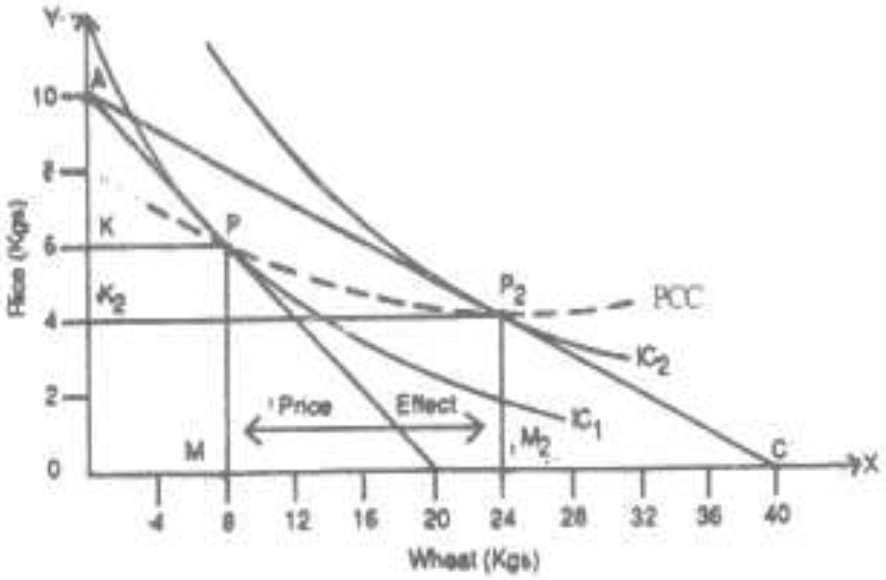


Fig 10.9

If a consumer has a total income of Rs. 20, with the price of rice set at Rs. 2 per kg and wheat at Rs. 1 per kg, the budget constraint is represented by the price line AB. At point P, this price line is tangent to the indifference curve IC1, indicating the consumer's equilibrium. At this equilibrium, the consumer purchases OM quantity of wheat and OK quantity of rice.

Now, suppose the consumer's income and the price of rice remain unchanged, but the price of wheat decreases from Rs. 1 per kg to 0.50 paisa per kg. With the same income, the consumer can now afford OC (40 kg) of wheat, leading to a shift in the budget line from AB to AC. As a result, the consumer moves to a higher indifference curve, IC2. The new budget line AC is now tangent to IC2 at point P2, which becomes the new equilibrium. At this point, the consumer purchases OM2 quantity of wheat instead of OM.

By connecting points P and P2, we derive the Price Consumption Curve (PCC), which illustrates the impact of price changes on the consumer's purchase decisions. This curve shows how variations in the price of wheat influence the quantity demanded while keeping the price of rice, income, and consumer preferences constant. In Figure 10.2, the demand for wheat increases from OM to OM2, where MM2 represents the price effect, reflecting the increase in quantity demanded due to the price reduction.

Self-Check Exercise-3

Q.1. Discuss Effect of the Changes in the Consumer's Income and Prices of Goods

10.7 SEPARATION OF INCOME AND SUBSTITUTION EFFECTS

A change in the price of a commodity results from the interaction of two distinct forces, which can be analyzed separately as the **income effect** and the **substitution effect**.

10.7.1 *Income Effect:*

When the price of a commodity decreases, while the price of other goods and the consumer's monetary income remain unchanged, the consumer experiences an increase in purchasing power. This improvement in financial well-being is roughly equivalent to the amount saved if the consumer continues to buy the same quantity of both goods.

For example, if the price of wheat drops from ₹1 per kg to 75 paise per kg, while the price of rice remains at ₹2 per kg, a consumer who previously purchased 6 kg of rice and 8 kg of wheat will now spend less on wheat. If they continue buying 8 kg of wheat at the new price, their total expenditure on wheat reduces from ₹8 to ₹6, resulting in a saving of ₹2. This surplus amount acts similarly to an increase in income, allowing the consumer to allocate it to either or both goods.

Thus, the **income effect** refers to the change in the quantity of a good demanded due to a change in its price, assuming the consumer's income remains constant. Conversely, when the price of a good rises, the consumer's purchasing power diminishes, leading to the opposite effect.

10.7.2 Substitution Effect:

The **substitution effect** occurs when a decrease in the price of one good makes it relatively cheaper compared to another good whose price has either remained constant or not decreased as significantly. As a result, consumers tend to replace the relatively more expensive good with the cheaper alternative, increasing the demand for the lower-priced good.

A shift in relative prices alters the slope of the price line while keeping the consumer on the same indifference curve, indicating the same level of overall satisfaction. However, due to the price change, the consumer adjusts their consumption pattern, preferring the now cheaper good over the relatively expensive one. This shift leads to a change in the quantities purchased and moves the consumer's equilibrium position along the same indifference curve.

Price Effect: A Combination of Income and Substitution Effects

The overall impact of a price change on demand, known as the **price effect**, results from the combined influence of the **income effect** and the **substitution effect**. The net change in demand for a commodity due to a price fluctuation is the sum of these two forces. This relationship can be illustrated graphically, as shown in Diagram 10.10.

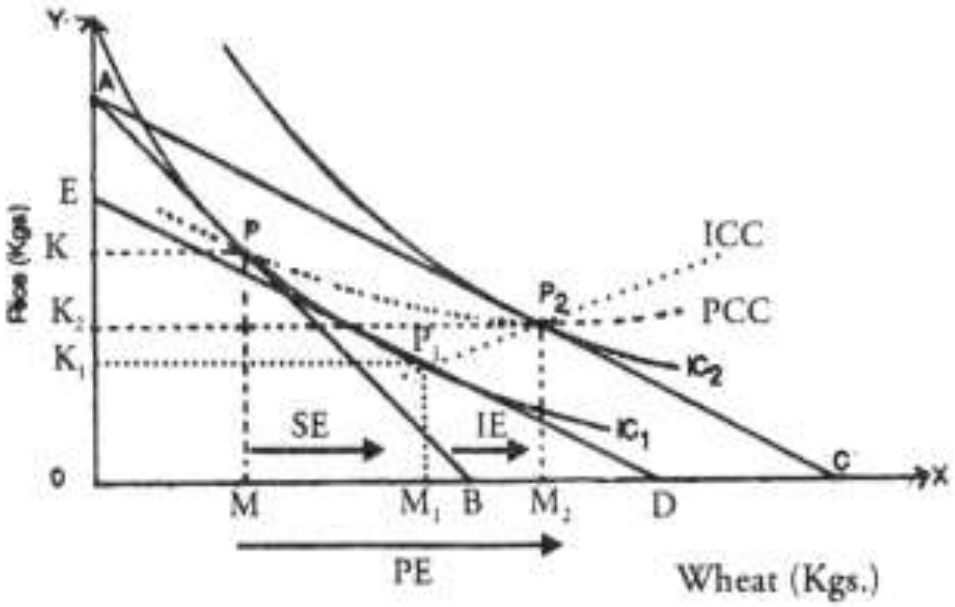


Fig 10.10

In Diagram 10.10, wheat is represented along the X-axis, while rice is measured along the Y-axis. Initially, at the original price line AB, the consumer achieves equilibrium at point P, purchasing OM units of wheat and OK units of rice. However, when the price of wheat drops (from ₹1 per kg to ₹0.50 per kg), the consumer, with the same income, can now buy OC units of wheat if they allocate all their income to purchasing wheat. Since the price of rice remains unchanged, if the consumer spends their entire income on rice, they will continue to purchase OA units. Consequently, AC becomes the new price line. At the revised price level, the consumer's equilibrium shifts to point P2, leading to an increased consumption of wheat (OM2, which is greater than OM) and a reduced consumption of rice (OK2, which is less than OK). By connecting points P and P2, a curve known as the Price Consumption Curve (PCC) is formed.

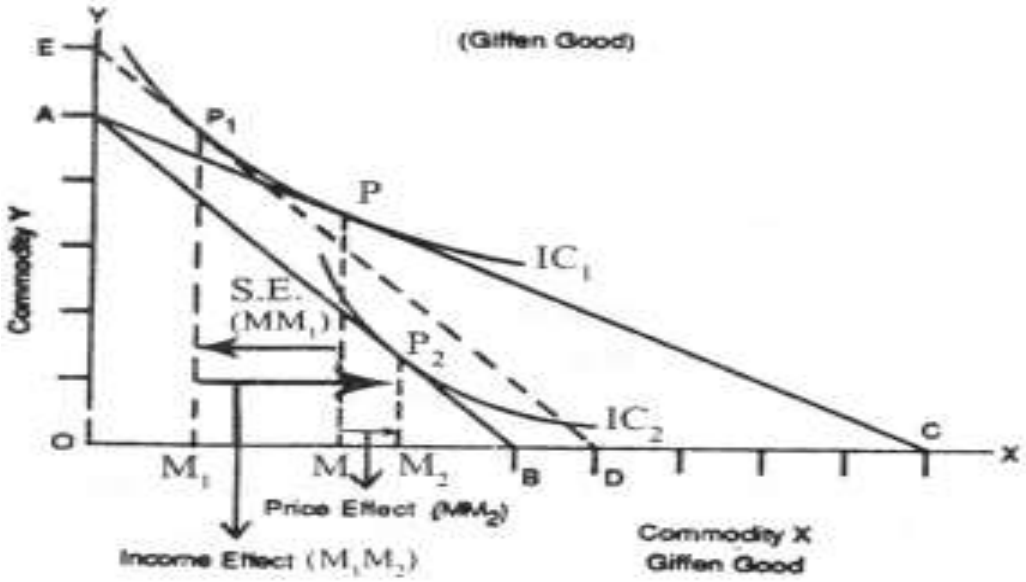
The rise in wheat demand due to its price decline is known as the price effect, which results from two key factors: the income effect and the substitution effect. To distinguish between these effects, a price line ED is drawn parallel to the initial price line AB and touches the indifference curve IC2 at P1. Since ED is parallel to AB, it maintains the original price ratio between wheat and rice. This line indicates that, had the consumer's income increased while prices remained unchanged, equilibrium would have been at P1. However, because the price of wheat has actually fallen, the consumer moves from P1 to P2, where the new price line AC is tangent to IC2.

In Diagram 10.10, the shift from P to P1 represents the substitution effect, while the movement from P1 to P2 illustrates the income effect. The substitution effect encourages greater consumption of wheat and reduced consumption of rice, leading to an increase in wheat consumption by MM1 and a decline in rice consumption from OK to OK1. Meanwhile, the income effect promotes higher consumption of both goods, resulting in an additional increase in wheat consumption (M1M2) and rice consumption (K1K2). In summary, the overall increase in wheat demand (MM2) is a result of the price effect, with MM1 attributed to the substitution effect and M1M2 to the income effect.

Thus, a change in the price of a good consists of two distinct effects: the income effect and the substitution effect, whose combined influence determines the overall price effect on demand. The substitution effect is always negative, meaning it leads to an increase in demand for the relatively cheaper good. Generally, the income effect is positive, increasing the demand for a product. However, in the case of inferior goods, the income effect can be negative. If an inferior good constitutes only a minor share of the consumer's total expenditure, the negative income effect remains weak, allowing the stronger positive substitution effect to increase its demand. On the other hand, if the good accounts for a significant portion of the consumer's budget, the negative income effect may outweigh the substitution effect, resulting in a decline in demand despite the price drop. Goods exhibiting this behavior are called Giffen goods, named after Sir Robert Giffen.

It is important to differentiate between inferior goods and Giffen goods. While all Giffen goods are inferior, not all inferior goods qualify as Giffen goods. A Giffen good is a specific type of inferior good on which a consumer spends a large proportion of their income, causing the negative income effect to overpower the positive substitution effect. As a result, the price effect becomes negative, meaning a price drop reduces demand, whereas a price increase leads to higher demand.

Diagram 10.11 further illustrates this concept. Suppose commodity X is a Giffen good, shown on the X-axis. Given a fixed income and initial price conditions (represented by line AC), the consumer attains equilibrium at point P on indifference curve IC1, purchasing OM units of X. When the price of X rises, the budget constraint shifts to AB, and the new equilibrium moves to P2 on indifference curve IC2. At this point, the consumer purchases OM2 units of X. Thus, despite the price increase, the consumer buys more of X, resulting in an increase in demand by MM2. This is the price effect. Breaking it down, the price effect comprises both income and substitution effects. To distinguish them, an imaginary price line ED is drawn parallel to AB, touching indifference curve IC1 at P1. The substitution effect, represented by MM1, suggests that the consumer would reduce X consumption due to its higher price. However, the income effect works in the opposite direction and exceeds the substitution effect. Here, the income effect is M1M2. Consequently, the overall price effect is MM2, meaning the demand for X increases as its price rises—demonstrating the unique nature of Giffen goods.



If a good is classified as a Giffen good, a decrease in its price leads to a reduction in the quantity demanded, while an increase in price results in higher demand. In other words, Giffen goods exhibit a direct relationship between price and demand, meaning both move in the same direction. This contradicts the conventional law of demand. The demand curve for a Giffen good slopes upward from left to right, a phenomenon known as the **Giffen Paradox**. However, such goods are extremely rare.

To summarize, the impact of price changes on demand can be explained through the following three key points:

(i) When the price of a good decreases, its demand generally rises—except when the good is classified as **inferior**—because both the **income effect** and **substitution effect** work together to boost demand.

(ii) For **inferior goods**, if they constitute a small portion of the consumer's total income, the **negative income effect** remains weak. Consequently, the **positive substitution effect** dominates, leading to an increase in demand even when the price falls.

(iii) In the case of **Giffen goods**, which are a specific type of inferior good that makes up a significant part of consumers' budgets, the **negative income effect** outweighs the **positive substitution effect**. As a result, a decrease in price reduces the quantity demanded.

Self-Check Exercise-4

Q.1. How would you Separate Income and Substitution Effects?

10.8 Limitation of Indifference Curve Analysis

Indifference curve analysis, while widely used in economics, has certain limitations.

One key limitation stems from the assumption that consumers have complete knowledge of their preferences. This implies that individuals are fully aware of all possible combinations of goods, such as apples and oranges or coffee and cigarettes. While consumers may easily compare familiar combinations—such as recognizing that 8 cups of coffee with 16 cigarettes provide the same satisfaction as 10 cups of coffee with 14 cigarettes—they may struggle with unfamiliar combinations, like assessing whether 10 cups of coffee with 5 cigarettes offer the same satisfaction as 6 cups of coffee with 8 cigarettes. Consequently, the assumption that consumers possess perfect knowledge of all possible choices is a major shortcoming of this approach.

Another limitation is that indifference curve analysis primarily examines consumer choices between only two goods and how they allocate their spending on these goods. However, in reality, consumers purchase a variety of goods, making this approach less practical. When multiple goods are involved, representing preferences graphically becomes challenging.

Furthermore, this method is most effective when analyzing goods that can be substituted at varying rates. It does not adequately account for complementary goods, where substitution is not possible.

Despite these constraints, indifference curve analysis continues to play a crucial role in economic theory, particularly in areas such as demand analysis, production theory, and international trade.

10.9 SUMMARY

The ordinal approach to consumer behavior, as explained through indifference curve theory, illustrates that indifference curves generally slope downward and are strictly convex to the origin. Consumer equilibrium in this approach can be determined both graphically and algebraically. Two key conditions must be met for equilibrium:

(i) The slope of the indifference curve must be equal to the slope of the budget line, ensuring that at equilibrium, the rate at which the consumer is willing to substitute one good for another matches the market rate.

(ii) The budget constraint must hold with equality, meaning that the consumer allocates their entire income to consumption, a condition based on the assumption of non-satiation.

The concepts of income effect and substitution effect were also explored. The income effect refers to changes in consumer demand due to variations in income while keeping other factors constant. In contrast, the substitution effect captures changes in demand resulting from price fluctuations of a specific good, assuming utility remains unchanged.

Additionally, Slutsky's theorem, which explains the relationship between the price effect, income effect, and substitution effect, was discussed. The theorem establishes that the overall price effect is the sum of both the income and substitution effects.

10.10 GLOSSARY

- **Income Effect**: The rise in consumption resulting from an increase in income while keeping the prices of goods unchanged.
- **Substitution Effect**: The change in consumption patterns due to a change in the price of a good, while maintaining the same level of satisfaction.
- **Inferior Goods**: Products that consumers tend to purchase when their income is low. As income increases, consumers typically shift from inferior goods to higher-quality alternatives.
- **Budget Line**: A graphical representation that illustrates the combination of goods a consumer can afford based on their available income and prevailing market prices.

10.11 Answers to Self-Check Exercises

Self-Check Exercise-1

Ans.1. Please refer to section 10.4

Self-Check Exercise-2

Ans.1. Please refer to section10.5

Self-Check Exercise-3

Ans.1. Please refer to section 10.6, 10.6.1,10.6.2 and 10.6.3

Self-Check Exercise-4

Ans.1. Please refer to section 10.7,10.7.1 and 10.7.2

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10.13 TERMINAL QUESTIONS

Q1. Explain separation of income and substitution effect?

Q2. Explain the consumer equilibrium with the help of indifference curve.

Unit-11

PRODUCTION FUNCTION

STRUCTURE

11.1 INTRODUCTION

Firms are economic entities that acquire inputs and sell outputs. Production refers to the process of converting inputs into outputs, such as transforming raw materials into finished goods. This concept of production encompasses not only goods but also services. It is the foundation for generating supply that meets our needs and desires. Production is a key focus in economics, with production theories emerging long before Adam Smith but gaining refinement in the late 19th century. The theory of production seeks to explain the principles that guide a business firm in determining how much of each product or service (its outputs) it will produce, and how much of each type of labor, raw material, fixed capital, and other factors of production (its inputs) it will utilize. This theory touches on fundamental economic

principles, including the relationship between commodity prices and the costs of the productive factors used to produce them, as well as the connection between the prices of goods and productive factors, and the quantities produced or used of both.

11.2 LEARNING OBJECTIVES

After going through this unit, you will be able to:

- Discuss Production Function.
- Describe Short and Long run Production Function.
- describe of Cob Douglass Production Function.

11.3 Production

Production is an activity that generates or enhances current and future utility. It involves the creation of three main types of utility:

Form Utility: This occurs when the shape or structure of inputs is altered to create a useful product. In this process, raw materials are transformed into finished goods. Examples include shaping clay into pottery, converting wood into furniture, and refining iron into usable metal products.

Place Utility: This type of utility arises when resources are relocated from areas of limited utility to locations where they are more valuable. For instance, transporting gold ore from a mine to a processing factory and eventually to markets, or moving apples from Shimla (a production hub) to other regions of the country, increases their usefulness. The act of transportation itself plays a role in creating utility by making resources available in locations where they are in greater demand.

Time Utility: This refers to making goods available at times when they are not naturally or readily accessible. A relevant example is the production of dried fruits, which ensures their availability even during off-seasons.

To illustrate these types of utility, consider the production of woolen goods. The transformation of raw wool into woolen fabric demonstrates form utility, transporting woolen garments to retail markets creates place utility, and selling these garments in winter when they are most needed represents time utility.

Factors of Production

The production process relies on several factors of production:

- **Land**: In economic terms, land encompasses all natural resources, including soil, water, air, and minerals. It is a fundamental element of production since all economic activities involve some interaction with nature. Classical economist John Stuart Mill observed that "man can only move matter, not create it," emphasizing the indispensable role of natural resources. While some theoretical models may overlook this aspect for simplicity, it does not diminish the importance of land in production.
- **Labour**: Labour refers to human effort—both mental and physical—used in the production of goods and services. However, not all activities qualify as labour in economic terms. For example, a person performing music for personal enjoyment or among friends is not considered to be engaging in labour, as it is not directed toward economic production.

- **Capital**: Capital represents assets used to generate further production. It is a **stock** concept, meaning it exists as a resource that contributes to economic activity over time. The return generated from capital, known as income, is a **flow** concept. Capital includes man-made production tools such as factories, bridges, and machinery. The process of increasing a country's capital stock over time is known as capital formation, which essentially refers to investment growth.
- **Entrepreneurship**: An entrepreneur organizes and coordinates the factors of production—land, labour, and capital—combining them in appropriate proportions to drive production. Entrepreneurs assume the risks involved and make crucial decisions, such as:
    - Whether to engage in production
    - The quantity of goods to produce
    - The selection of inputs and production methods
    - The choice of technology

One of the most critical challenges in production is achieving the right combination of the factors of production. This requires both entrepreneurial skills and an understanding of available technologies. While entrepreneurship ensures economic efficiency by optimizing resources, technology plays a key role in achieving technical efficiency.

11.3.1 Practical Applications of the Production Theory

The theory of production describes the technical and technological relationships between inputs and output. As additional factors of production—such as labor, capital, land, time, space, and raw materials—are utilized, total output tends to increase. For instance, a farmer's total agricultural yield rises as more land, labor, machinery, irrigation, and fertilizers are employed. Even when one factor, like land, remains constant while others increase, production continues to grow until the land's maximum capacity is reached. This demonstrates a clear relationship between input usage and output generation, which is analyzed by production theory.

In essence, production theory examines and formalizes the connection between inputs and the resulting output. It seeks to address questions such as: What happens to total production when additional units of a variable factor, like labor, are combined with a fixed factor, such as capital? If all inputs are increased proportionally, does output rise in the same proportion, or at a different rate? Understanding these dynamics is crucial for producers when making decisions regarding resource allocation.

A business enterprise's production-related decisions can be categorized into three levels. The first involves selecting the most efficient method to produce a given quantity of output within a plant of a fixed size and equipment, focusing on short-run cost minimization. The second level pertains to determining the most profitable production quantity within an existing plant, aligning with short-run profit maximization. The third level concerns selecting the optimal plant size and equipment for maximum profitability in the long run. These aspects are systematically analyzed through the study of the production function.

11.4 PRODUCTION FUNCTION

Before delving into the discussion on the production function, let's first explore its historical background.

11.4.1 History of Production Function

Throughout history, numerous Roman and Greek scholars have explored various economic concepts, including aspects of production and distribution. The Scholastic thinkers, notably Saints Augustine and Thomas Aquinas, engaged deeply with economic discussions, including production-related inquiries. Later, scholars from the Mercantilist and Physiocratic schools provided more systematic insights into production processes. Among them, Anne Robert Jacques Turgot, a key figure of the Physiocrats, is credited with identifying the principle of diminishing returns in a single-input production function around 1767. Adam Smith further expanded on production and income distribution in his influential 1776 work, *The Wealth of Nations.*

Following Smith, Classical economists built upon his theories. In 1815, Thomas Malthus and Sir Edward West independently discovered that simultaneous increases in labor and capital led to agricultural output growth, but at a diminishing rate. This reinforced the principle of diminishing returns. David Ricardo later incorporated this concept into his theory of income distribution, presented in *Principles of Political Economy.* The Marginalists also contributed to production theory. In the late 19th century, W. Stanley Jevons, Carl Menger, and Léon Walras integrated factor valuation into their economic models. These early post-Smith economists typically assumed fixed proportions in production, meaning the capital-to-labor ratio remained unchanged regardless of output variations. However, in reality, production often operates with variable input proportions.

A significant breakthrough occurred in the 1840s when J. H. von Thünen introduced the first variable-proportions production function. He recognized that altering one input while keeping another constant led to diminishing returns, a concept he applied to a two-input production model. His work laid the foundation for modern marginal productivity theory, though it did not gain widespread recognition at the time. Instead, John Bates Clark, through his 1888 speech at the American Economic Association, was credited as the pioneer of marginal productivity theory.

By 1894, Philip Wicksteed demonstrated that if a production function exhibited constant returns to scale, distributing output according to marginal productivity would lead to complete absorption of total production without surplus or deficit. Around the early 20th century, Knut Wicksell formulated a production function similar to the later Cobb-Douglas model, which was formally developed by Paul Douglas and Charles W. Cobb.

Further advancements in production function theory came in 1961 when Kenneth Arrow, H.B. Chenery, B.S. Minhas, and Robert Solow introduced the Arrow-Chenery-Minhas-Solow (ACMS) production function, later known as the constant elasticity of substitution (CES) function. This model allowed substitution elasticity to range between zero and infinity, remaining constant at all output and input levels. Several well-known production functions, such as the Cobb-Douglas, Leontief, and Linear models, are special cases of the CES function. In 1968, Y. Lu and L.B. Fletcher extended this framework by introducing a generalized CES production function, which allowed elasticity to vary under different output levels.

More recently, economists have explored flexible production functions, with the transcendental logarithmic (translog) function gaining popularity due to its fewer constraints on elasticity of scale, homogeneity, and substitution elasticity. However, despite its flexibility, the translog function still faces limitations, particularly in terms of separability restrictions, which impose constraints on parameter flexibility. Research continues in pursuit of more adaptable and practical production function models.

In microeconomics, a production function defines the relationship between inputs and outputs within an organization. It mathematically or graphically represents the maximum possible output derived from varying combinations of factor inputs, considering available technology and resources. Fundamentally, a production function is a technical relationship that maps input usage to output levels, independent of factor costs or prices. It encapsulates the fundamental laws governing the transformation of inputs into final products, with unique production functions existing for different technologies.

In general, a production function is represented as

Q = *f*(x1, x2, x3, ...,xn)

Where,

Q is the maximum quantity of output,

x1, x2, x3, ...,xn are the quantities of various inputs.

The mathematical representation of a production function offers more detailed insights compared to its general form. This is because it enables the quantification of key economic concepts such as marginal productivity of production factors, marginal rate of substitution, elasticity of substitution, factor intensity, production efficiency, technological influence, and returns to scale. The general mathematical form of the production function is

Q = *f*(L, K, R, S, *v*, *e*)

Where,

L is labour input,

K is capital input,

R is raw material,

S is land input,

v is returns to scale and

e is efficiency parameter

The efficiency parameter (e) is included to recognize that even when two firms have identical factor inputs and returns to scale, their output levels may still differ due to variations in managerial or entrepreneurial efficiency. In neoclassical economics, the production function serves as a key analytical tool. While Philip Wicksteed (1894) is often credited as the first economist to formally express the relationship between output and inputs using an algebraic equation, some evidence suggests that Johann Von Thünen had already introduced a similar concept in the 1840s.

There are multiple ways to define a production function. One approach is the additive production function, where input variables are combined through addition. For instance, it can be represented as $Q = a + bX_1 + cX_2 + dX_3$, where a, b, c, and d are empirically determined parameters.

Another type is the multiplicative production function, where variables are related through multiplication. A common example is the Cobb-Douglas production function, represented as $Q = AL\alpha K\beta$, which will be discussed in detail later. Other variations include the Constant Elasticity of Substitution (CES) production function, a generalized form of the Cobb-Douglas function, and the quadratic production function, which falls under the category of additive functions. The most suitable equation and parameter values (a, b, c, and d) differ across industries and companies. In a short-run production function, at least one input (X) remains fixed, whereas, in the long run, all inputs can be adjusted based on managerial decisions. While textbooks often reference two specific types of production functions, they are rarely encountered in practice.

11.4.2 Homogeneous Production Functions: The production function Q = f (X1,X2) is said to be homogeneous of degree n, if given any positive constant k, f(kX1,kX2)=knf(X1,X2). When n>1, the function exhibits increasing returns, and decreasing returns when n<1. When it is homogeneous of degree 1, it exhibits constant returns.

A production function, represented as Q=f(X1,X2), is considered homogeneous of degree n, if for any positive constant k, it satisfies the condition f(kX1,kX2) =knf(X1,X2). When n>1, the function demonstrates increasing returns to scale, whereas n<1 indicates decreasing returns. If the function is homogeneous of degree 1, it reflects constant returns to scale.

11.4.3 Homothetic Functions: These functions form a specific subset of homogeneous functions, where the marginal rate of technical substitution remains unchanged along the function.

11.4.4 Aggregate Production Functions: Typically, production functions are designed at the firm or industry level. However, in macroeconomic analysis, production functions are sometimes developed at the national level. Ideally, they should represent the sum of all individual production functions within an economy. However, due to the diversity of outputs, services, capital goods (such as factory machinery, office buildings, and transportation equipment), and labor categories (ranging from unskilled workers to highly specialized professionals), constructing such functions directly is impractical. To address this challenge, economists use a process called aggregation to derive a single output measure that accounts for all goods and services. The assigned weights in this process are linked to the relative prices of these goods—for example, a complex medical procedure carries more weight than an inexpensive office supply. The final aggregated measure of economic output is known as real Gross Domestic Product (real GDP).

11.4.5 Fixed Coefficients Production Function: A production function represents the highest possible output that can be achieved using specific amounts of inputs. When inputs must be combined in fixed ratios—similar to ingredients in a recipe—the function is known as a fixed-coefficients production function. This type is also referred to as a Leontief production function, named after economist and Nobel laureate Wassily Leontief. An example of this is call centers, where there is a one-to-

one requirement between workers and telecommunication equipment. The isoquants of such a production function have an L-shape, with the kink positioned along the 45-degree line.

Now, let's explore three key types of production functions in detail.

11.4.6 Linear Production function

The most basic form of a production function is the linear production function, which assumes a direct and proportional relationship between input factors and total output.

Example: Given a Linear Production Function Q = 20 K + 40 L. If this firm employed 8 units of capital and 17 workers then how much output would they produce?

20 x 8 + 40 x 17 = 840 units of output

11.4.7 Homogenous Production Function

A production function is said to be homogenous if it satisfies the following condition.

Consider a production function Q = f(X, Y). As you know, in the long run all the factors of production can be increased. Suppose we increase both the factors x and y by the same proportion, k. To effect this change we multiply each input factor is by a positive real constant k. The new level of output is Q* and can be represented as

A production function is considered homogeneous if it meets a specific condition. Let's take a production function Q=f(X,Y). In the long run, all factors of production can be scaled up. Suppose both input factors, X and Y, are increased by the same proportion, k. To implement this change, each input factor is multiplied by a positive real constant k. The resulting output level, denoted as Q∗, can be expressed as:

Q* = f (kX, kY).

Now, if we can take k out of the brackets as a common factor (if k can be completely factored out from Q*), then the new level of output Q* can be expressed as a product of k (to any power v) and the initial level of output.

That is Q* =$k^v f$ (X, Y) or Q* =k^vQ

In such cases, where k can be completely factored out is called a homogeneous production function. The formal definition is as follows.

A homogenous production function is a function such that if each of the inputs is multiplied by a real constant k, then k can be completely factored out of the function. If k cannot be completely factored out, the production function is non homogenous. The power v of k is called the degree of homogeneity of the function and is used to measure the return to scale of a function.

As you know returns to scale is the long run analysis of production. The Law of Returns to scale postulates that when all inputs are increased by 1 %: if output increases by 1% it is constant returns to scale; if output increases by less than 1% it is decreasing returns to scale; if output increases by more than 1% it is increasing returns to scale.

Using the power v of k, we can state:

If $v = 1$, it is constant returns to scale

If $v < 1$, it is decreasing returns to scale

If $v > 1$, it is increasing returns to scale

A production function with v=1, indicating constant returns to scale, is referred to as a linearly homogeneous production function. This means that if all inputs are increased proportionally, the output will increase by the same proportion. Consequently, these production functions are also known as Constant Returns to Scale (CRS) production functions. Mathematically, returns to scale are determined by the coefficients of the production function. For instance, in a production function X = b0Lb1Kb2, the returns to scale are represented by the sum b1+b2.

11.7.1 Cobb Douglas Production Function

Among the various production functions utilized in economics, the Cobb-Douglas production function, often abbreviated as the C-D function, is one of the most widely recognized. This function effectively models the relationship between output and input factors in production. Although similar concepts were initially explored by Knut Wicksell (1851–1926), it was Charles Cobb and Paul Douglas who formalized and tested the Cobb-Douglas function using statistical data.

In the 1920s, economist Paul Douglas sought to establish a quantitative relationship between inputs and national output. A study conducted by the National Bureau of Economic Research revealed that between 1909 and 1918, the proportion of output allocated to labor remained relatively stable at approximately 74%, despite fluctuations in the capital-to-labor ratio. Curious about whether a specific mathematical function could explain this phenomenon, Douglas consulted his friend Charles Cobb, a mathematician. This collaboration led to the development of the Cobb-Douglas production function, which was introduced in their 1928 paper, *A Theory of Production*.

The general form of the Cobb-Douglas function is represented as:

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

where:

- Q represents total production (the total monetary value of goods produced annually),
- L denotes labor input,
- K signifies capital input, and
- A represents total factor productivity or technology, assumed to be constant.

The parameters α and β reflect the output elasticities of labor and capital, respectively. These constants are determined by the prevailing technology and indicate how responsive output is to changes in input levels, assuming other factors remain unchanged (ceteris paribus). For instance, if α=0.15, a 1% increase in labor input would result in approximately a 0.15% increase in output.

A standard Cobb-Douglas function assumes constant returns to scale, implying that α+β=1. This assumption is based on the observation by Cobb and Douglas that labor and capital's share of total output appeared consistent over time in developed economies. However, modern economists debate the validity of this assumption, as evidence suggests that these shares may not remain constant.

Nonetheless, at a foundational level, it is generally accepted that for a Cobb-Douglas function, α+β=1.

11.7.2 Properties of a Cobb-Douglass function

1) The Cobb-Douglas production function exhibits constant returns to scale, meaning that if all inputs are scaled by a factor of λ, the output will also increase proportionally by λ.

2) The average products of capital and labour can be represented as ratios of inputs.

The average product of labour is determined by dividing total output by the quantity of labour employed.

$Q = A\ L^{\alpha}\ K^{\beta}$

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

$= \frac{AK^{\beta}}{L.L^{-\alpha}}$

$= \frac{AK^{\beta}}{L^{1-\alpha}}$

$= \frac{AK^{\beta}}{L^{\beta}}$ or $A\ [\frac{K}{L}]^{\beta}$

Since α + β = 1, 1- α = β

Thus we have shown that the AP_L can be expressed as the ratio of the two inputs K and L. Similarly

$AP_K = \frac{Q}{K} = \frac{AL^{\alpha}K^{\beta}}{K}$

$= \frac{AL^{\alpha}}{K.K^{-\beta}}$

$= \frac{AL^{\alpha}}{K^{1-\beta}}$

$= \frac{AL^{\alpha}}{K^{1-\beta}}$

$= \frac{AL^{\alpha}}{K^{\alpha}}$

$=A\ [\frac{L}{K}]^{\alpha}$

Since α + β = 1, 1- β = α

3). The marginal productivity of capital and labour can be represented using input ratios.

$MP_K = \beta\ A\ [\frac{L}{K}]^{\alpha}$

Thus the marginal product of capital (MP_K) can be expressed in terms of ratios of inputs L and K. It is also equal to β times AP_K. That is, $MP_K = \beta\ AP_K$

Similarly the marginal product of capital (MP_L) can be expressed in terms of ratios of inputs L and K.

Symbolically $MP_L = \alpha\ A\ [\frac{K}{L}]^{\beta}$

It is also equal to α times AP_L. That is, $MP_L = \alpha AP_L$

4. CD function satisfies Euler's theorem.

$$L \frac{\partial Q}{\partial L} + K \frac{\partial Q}{\partial K} = Q$$

5. In a Cobb-Douglas (CD) production function, the elasticity of substitution is always equal to one. This concept was independently introduced by John Hicks (1932) and Joan Robinson (1933) to quantify the degree to which one factor can be substituted for another. The elasticity of substitution refers to the responsiveness of the input ratio in a production function concerning changes in the ratio of their marginal products. It indicates the curvature of an isoquant, which reflects the ease of substituting one input with another.

6. Factor intensity: In the Cobb-Douglas production function, represented as $Q=AL^{\alpha}K^{\beta}$, factor intensity is determined by the ratio α/β. A higher ratio indicates a labour-intensive production process, while a lower ratio signifies a capital-intensive technique.

7. A standard Cobb-Douglas function demonstrates constant returns to scale when the sum of the exponents equals one, i.e., α+β=1.

Self-Check Exercise-1

Q.1 Give History of production Function.

Q.2 Discuss Various types of Production Function.

11.5 MATHEMATICAL CHARACTERISTICS OF PRODUCTION FUNCTIONS

The historical development of production functions has introduced several fundamental characteristics that define their structure and behavior. This section explores some of these essential aspects in detail. One key concept is the relationship between production functions and cost functions. In well-structured models, a cost function can be derived from a given production function, and vice versa. This interconnection is important because estimating production functions econometrically is often more complex than estimating cost functions. Cost functions depend on observable factors such as input prices and output levels, making them relatively easier to analyze.

Another significant feature of production functions is homogeneity and homotheticity. While all homogeneous functions are homothetic, the reverse is not always true. Homogeneity can exist at various degrees, with economic models frequently focusing on functions that are homogeneous of degree zero or one. When a production function is homogeneous of degree k, its first-order partial derivatives exhibit homogeneity of degree k−1. For instance, a production function with linear homogeneity (degree one) will have marginal product functions that are homogeneous of degree zero. This means that these functions depend on the relative proportions of inputs rather than their absolute amounts. Additionally, homogeneity ensures proportionality in isoquant curves, meaning that along any ray from the origin, the slopes of the isoquants remain consistent. Euler's Theorem is a direct consequence of the homogeneity assumption.

Homotheticity, a broader concept, plays a crucial role in economic analysis. Since all homogeneous functions are also homothetic, the properties of homogeneity

extend to homothetic functions as well. A homothetic production function ensures that the output elasticities of all inputs remain constant at any given point. This common elasticity value is determined by the ratio of marginal cost to average cost. Firms with increasing average costs will have output elasticities exceeding one, whereas firms with decreasing average costs will have output elasticities below one. Under the assumption of homotheticity, all inputs are considered normal goods.

Another essential characteristic of production functions is separability. Not all production processes exhibit separability, particularly those involving multiple inputs. Analyzing such complex multi-input functions can be challenging. However, if a production process can be structured into different stages where intermediate inputs are initially produced and then combined to generate the final output, the technology is classified as separable. This property is valuable in economic analysis as it simplifies the study of production and cost functions by reducing the number of parameters that need to be examined.

Self-Check Exercise-2

Q.1 Discuss Mathematical Characteristics of production functions.

11.6 USES OF A PRODUCTION FUNCTION

A production function plays a crucial role in various aspects of economic analysis:

(i) It helps determine the level of output based on the specified quantities of inputs.
(ii) When the output quantity (Q) is fixed, the production function identifies different input combinations that can achieve the same output level.
(iii) It aids in finding the most technically efficient combination of inputs and selecting the least-cost input mix within budget constraints.
(iv) The production function facilitates the assessment of returns to scale in the production process.
(v) It enables the calculation of the marginal productivity of different inputs.

A production function can be applied at the firm level, within an industry, or across an entire economy. Typically, it remains constant for a given technological level, but advancements in technology can lead to modifications. The specific characteristics of a production function depend on factors such as data availability, the duration of analysis, and the type of technology in use.

Self-Check Exercise-3

Q.1 What are the uses and types of Production Function?

11.7 SUMMARY

A production function represents the relationship between input combinations and the resulting output for a firm, an industry, or an economy. It is based on technological possibilities and engineering knowledge, reflecting the feasible ways in which inputs can be utilized to generate output. Production functions are generally categorized into two types. (i) Fixed Proportion Production Function: In a fixed proportion production function, a specific ratio of inputs, such as capital and labor, is required to produce a particular level of output. This means that inputs must be combined in a predetermined manner, and there is no possibility of substituting one factor for another.(ii) Variable Proportion Production Function: The variable proportion production function allows flexibility in the combination of inputs to

produce a given level of output. Unlike the fixed proportion production function, this type permits substitution between factors such as labor and capital. Various combinations of inputs can be used to achieve the same level of output, making it a more common and practical representation of real-world production processes.

11.8 GLOSSARY

- **Production Function**: A production function represents the relationship between the output of a firm, industry, or economy and the various combinations of inputs used. It reflects the technological constraints and the feasibility of substituting inputs based on the prevailing engineering and technical knowledge.
- **Fixed Proportion Production Function**: This type of production function requires a specific, unchanging ratio of inputs, such as labor and capital, to achieve a certain level of output. The inputs must be used in fixed proportions without substitution.
- **Variable Proportions Production Function**: Unlike the fixed proportion function, this production function allows multiple combinations of inputs, such as labor and capital, to produce a given level of output. It provides flexibility in the allocation of resources.
- **Linear Production Function**: This production function assumes a direct, proportional relationship between input levels and total output, meaning that increasing inputs will result in a corresponding linear increase in output.
- **Homothetic Functions**: These functions represent a specific type of homogeneous function in which the marginal rate of technical substitution remains constant along the function, maintaining a consistent input substitution pattern.
- **Homogeneous Production Function:** is a type of production function in which all inputs, when scaled by a common factor, result in output increasing by a proportional factor. Mathematically, if all input variables are multiplied by a constant k, the output also increases by k^n, where n represents the degree of homogeneity. If n=1, the function exhibits constant returns to scale; if n>1, it shows increasing returns to scale; and if n<1, it indicates decreasing returns to scale.

11.9 ANSWERS TO SELF-CHECK EXERCISES

Self-Check Exercise-1

Ans.1 Please refer to section 11.4.1

Ans.2 Please refer to section 11.4.2 to 11.4.7

Ans.3 Please refer to section 11.5

Self-Check Exercise-2

Ans.1 Please refer to section 11.5

Self-Check Exercise-3

Ans.1 Please refer to section 11.6

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11.11 TERMINAL QUESTIONS

Q1. What is production function? Discuss the fixed proportions and variable proportions production functions.

Q2. Discuss different types of production function?

Unit-12

SHORT RUN AND LONG RUN PRODUCTION FUNCTION

STRUCTURE

12.1 INTRODUCTION

After understanding the concept of a production function, we now turn our focus to its analysis. The study of production is typically categorized into two key areas: short-run and long-run analysis. This classification is essential because the relationship between inputs and outputs differs based on the time frame. For instance, certain production factors, such as labor, can be adjusted within a short period, whereas modifying factors like land requires a significantly longer duration. The distinction between the short run and the long run is further elaborated in the next unit.

12.2 LEARNING OBJECTIVES

After going through this unit, you will be able to:

- Describe Short and Long run Production Function
- Explain law of variable proportion.
- Explain TP, MP and AP.

12.3 SHORT RUN AND LONG RUN

Inputs in production can be categorized into two types: (i) fixed inputs and (ii) variable inputs. Fixed inputs are those whose quantity remains unchanged within a specific period, depending on the context. While it is theoretically possible to alter any input, some require significant investment, making rapid changes impractical. Such inputs, including plant and machinery, are considered fixed.

Conversely, variable inputs can be adjusted within the given timeframe. For instance, in the construction industry, the workforce can be increased or decreased as needed, with many firms hiring workers on a daily wage basis. Similarly, in butter production, the quantity of milk used can be easily modified, making it a variable input.

The classification of an input as fixed or variable depends on the duration under consideration. The longer the time horizon, the more likely it is that an input will be variable rather than fixed. Economists differentiate between the short run and the long run based on this principle. The short run refers to a period in which some inputs remain fixed, typically land and machinery, as they require substantial time and investment to change. On the other hand, the long run is a period where all inputs are variable, allowing firms to make necessary adjustments to their operations.

In most production processes, firms can alter the proportion of inputs used, particularly in the long run. For example, at Tata Motors Limited, automobile dyes can be produced using either conventional machine tools that require more labor and less expensive machinery or through advanced numerically controlled machines that reduce labor reliance but increase equipment costs. This flexibility allows firms to optimize input combinations. However, certain production processes require inputs in fixed proportions. For example, pharmaceutical companies like Ranbaxy or Smith-Kline-Beecham must use a precise amount of aspirin per 10 grams of a drug formulation. While slight variations may be allowed, if no flexibility exists in input ratios, the production technology is classified as a fixed-proportion type.

To summarize, in the short run, only variable inputs, such as labor, can be modified, while fixed inputs remain unchanged. In contrast, the long run allows for adjustments in both fixed and variable inputs, enabling firms to align supply with demand efficiently.

Basis	Short Period	Long Period
1. **Time Frame**	A period shorter than the time needed to alter fixed factors	A duration where all factors of production can be modified.
2. **Output Adjustment**	Output can be increased by changing only variable factors.	Output can be expanded by adjusting both variable and fixed factors.
3. **Nature of Factors**	Factors are divided into two types: (i) Fixed factors, (ii) Variable factors.	No distinction exists between fixed and variable factors.
4. **Impact on Price**	Price is primarily influenced by demand.	Both demand and supply influence price equally, as supply can adjust to demand shifts.

Let's now move on to the analysis of production, beginning with the short-run perspective, followed by the long-run analysis.

Self-Check Exercise-1

Q.1 What do you mean by Short run and Long Run?

12.4 The short run production function/ Law of returns to a factor.

In short-run production analysis, labor is considered the only variable factor of production. Suppose we examine a production function in the agricultural sector, where land is fixed at one acre. By adding more laborers to this fixed piece of land, we can analyze the impact on production.

Before delving into the example, it is essential to understand some key concepts related to production. The term "product" refers to the quantity of goods a firm produces within a specific time frame. Three fundamental concepts associated with production are:

(a) Total Product (TP)
(b) Marginal Product (MP)
(c) Average Product (AP)

12.4.1 Total Product (TP), also known as Total Physical Product (TPP), refers to the total quantity of goods a firm produces using a given set of inputs over a specific period. It represents the overall physical output generated at varying input levels. As the quantity of inputs increases, the total product also grows, but the rate of increase depends on the extent of factor utilization. In the short run, a firm can expand its total output only by increasing the use of variable inputs.

12.4.2 Average Product (AP) or Average Physical Product (APP) measures the output per unit of a variable input. It is calculated using the formula:

AP= $\frac{TP}{Q}$

For instance, if 20 units of a variable factor, such as labor, produce 100 units of output, the average product of labor (APL) would be:

APL= $\frac{100}{20}$ =5

This means that each unit of labor contributes an average of 5 units to total output.

12.4.3 Marginal Product (MP) or Marginal Physical Product (MPP): The marginal product refers to the increase in total output resulting from the addition of one extra unit of a variable input. For instance, consider a scenario where three workers cultivate an acre of land, producing 100 kg of wheat. In the next agricultural cycle, if a fourth worker is employed on the same land, and the total wheat output rises to 120 kg, the additional worker's contribution to production is 20 kg (120 - 100). This increase represents the Marginal Product of Labour (MPL), calculated as MPL = ΔTP/ΔL. Here, MPL and Average Product of Labour (APL) specifically measure labour's contribution, assuming that the land remains unchanged. Now, let's analyze how total product (TP), APL, and MPL change as additional units of labour are introduced while keeping the fixed input (land) constant.

Table 12.1: The law of variable proportions

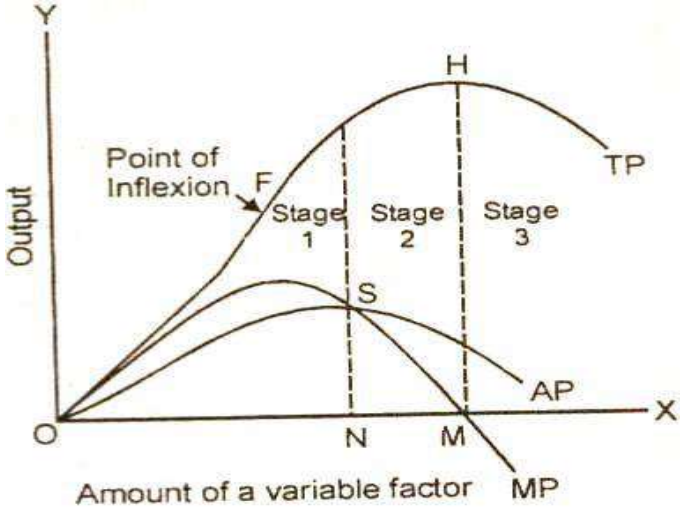
	Fixed Factor (Land)	**Variable Factor (Labour)**	**Total Product**	**Average Product of Labour AP_L= TP/Q**	**Marginal Product of Labour MP_L = ΔTP/ΔL**	**Stage of production**
A	1	0	0	0	0	I Stage
B		1	8	8	8	
C	1	2	18	9	10	
D	1	3	30	10	12	
E	1	4	48	12	18	
F	1	5	65	13	17	
G	1	6	78	13	13	
H	1	7	84	12	6	II Stage
I	1	8	88	11	4	
J	1	9	90	10	2	
K	1	10	90	9	0	
L	1	11	88	8	-2	III Stage
M	1	12	84	7	-4	

The table illustrates the impact of adding more laborers to a fixed plot of one acre of land.

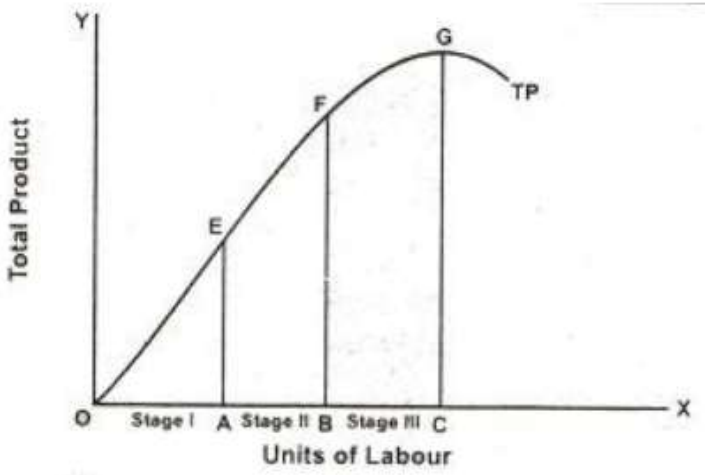
Initially, as a hypothetical case, there are no laborers on the land. When the first laborer is introduced, total production (TP) rises to 8 units, with both average

production (AP) and marginal production (MP) also at 8 units. The MP of 8 signifies that the first laborer's contribution to output is 8 units. Adding a second laborer increases TP to 18 units, with AP at 9 and MP at 10. Since land remains constant, all variations in output are solely attributed to labor. When a third laborer is introduced, TP rises to 30 units, and MP becomes 12. As additional laborers are employed, TP continues to grow, reaching 48 units with MP at 18. Eventually, TP peaks at 90 units, where MP drops to zero. Beyond this point, as TP declines (from 90 to 88, then to 84), MP turns negative. This demonstrates the relationship between TP and MP, with MP reflecting the rate at which TP changes.

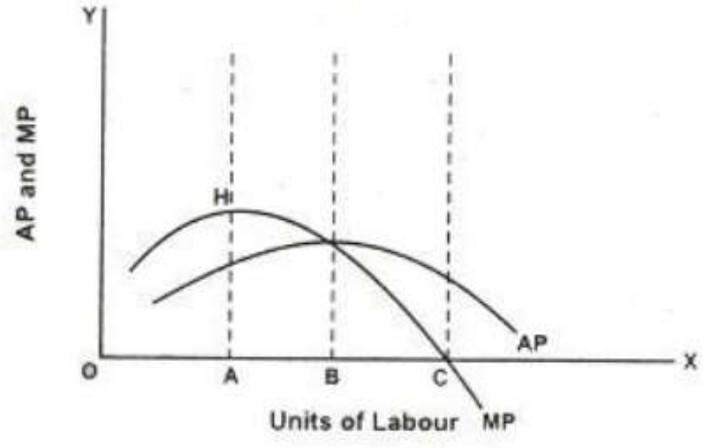
Observing the connection between TP and MP reveals a specific trend in total production. Initially, from points A to G, TP rises at an increasing rate, accompanied by a rise in MP. However, from H to K, although TP continues to grow, MP starts to decline, indicating that TP is increasing at a decreasing rate. In the final phase, from L to M, TP begins to fall, leading to a negative MP.



Before proceeding further, it is essential to recognize an important aspect of this table. As mentioned earlier, short-run production analysis is often referred to as the law of variable proportions. This law is evident in the table, as it shows how output responds to changes in the ratio of inputs. Initially, labor and land are combined in a 1:1 ratio, which then changes to 1:2, 1:3, and so forth. This shifting proportion of inputs significantly influences production outcomes.



For better analysis, these changes are categorized into three distinct stages, which can be visually represented through TP, AP, and MP curves in the following diagram



The shapes of the Average Product of Labor (APL) and Marginal Product of Labor (MPL) curves are influenced by the corresponding Total Product (TP) curve. The MPL curve reaches its peak before the APL curve. When the APL is increasing, the MPL remains higher than the APL; when the APL starts decreasing, the MPL falls below it. At the point where the APL is at its maximum, the MPL and APL are equal. This pattern occurs because, for the APL to increase, the MPL must exceed the previous APL. Conversely, for the APL to decline, the MPL must be lower than the previous average. If the APL remains constant, the MPL must be equal to the prior APL.

12.4.4 Stages of Production

Stage I

The first stage extends from the initial point of production to the level where Average Product (AP) reaches its highest value. This phase is further divided into two distinct sub-stages. In the first sub-stage, the Total Product (TP) curve rises at an increasing rate, while in the second, TP continues to increase but at a decreasing rate. The transition between these two sub-stages is marked by point F on the TP curve, which represents the inflection point. At this point, the curve changes from being concave to convex or vice versa. Stage I also includes the point where Marginal Product (MP) attains its peak value. Notably, at the conclusion of this stage—where AP is at its maximum—MP intersects AP, signifying that MP is equal to AP at this juncture. This relationship can be confirmed using Table 1. Although the diagram is not directly derived from the data in the table, it accurately represents the fundamental relationships outlined there. The highest MP is observed at point E, reaching 18 while AP stands at 12. From this point onward, MP begins to decline and eventually intersects AP at point G when its value is 13, which is the maximum AP value.

Stage II

Stage II starts at the point where AP is at its peak and extends to the level where TP reaches its maximum or MP becomes zero. In this stage, TP continues to grow but at a diminishing rate until it reaches its highest point. AP begins to decline, and MP continues to decrease until it reaches zero.

Stage III

Stage III encompasses the phase where TP starts to decline and MP becomes negative. During this stage, TP decreases, and AP keeps falling; however, AP never reaches zero or turns negative. Meanwhile, MP remains in the negative range.

Explanation of the Stages

Each of these stages occurs due to specific production dynamics. Stage I arises because, in this phase, the fixed factor is utilized more effectively as additional units of the variable factor are introduced. This aligns with the principle of diminishing returns, which takes effect when MP starts to decline. The decline in MP occurs because excessive labor is being applied to a fixed piece of land.

Stage II is considered the most desirable stage for production, as TP continues to increase while AP and MP, despite decreasing, remain positive.

Stage III, on the other hand, is characterized by a decline in TP and a negative MP. Referring back to Table 1, consider point M, where TP stands at 84 with one acre of land and 12 laborers. If the farmer decides to reduce the workforce by one laborer while keeping all other factors constant (such as working hours, inputs, and equipment), the table reveals that TP actually increases to 88. This suggests that the 12th laborer contributed negatively to production, with an MP of -4. A similar trend is observed for the 11th laborer. When the 10th laborer is removed, output remains constant at 90, indicating an MP of zero. Situations where a laborer's marginal contribution is either zero or negative are referred to as disguised unemployment.

Choosing the Optimal Stage for Production

A rational producer seeking to maximize profits would not operate in Stage I. This is because, in this stage, adding more labor enhances the average productivity of all workers, making it inefficient to halt production here. Similarly, Stage III is also undesirable, as reducing labor input in this phase would actually increase output and lower production costs. It is important to note that, for labor, Stage I is analogous to Stage III for land—where the MP of land becomes negative. Consequently, the most economically viable stage for production is Stage II.

Self-Check Exercise-2

Q.1 Discuss law of Variable Proportions.

12.5 THE LONG RUN PRODUCTION FUNCTION/ LAW OF RETURNS TO SCALE

In the long run, all factors of production are variable, eliminating the need to assume that one input remains fixed while another varies. This flexibility allows firms to adjust their scale of operation; for instance, a small-scale firm can expand into a medium-scale enterprise, and a medium-scale firm can grow into a large-scale business. The study of how output responds to changes in the scale of production is known as the **laws of returns to scale**.

Explanation of the Laws of Returns to Scale

When all inputs are increased by a certain percentage, three possible scenarios may arise:

- **Constant Returns to Scale**: If output increases in the same proportion as inputs (e.g., a 10% increase in inputs leads to a 10% increase in output).
- **Increasing Returns to Scale**: If output increases by a greater proportion than the inputs (e.g., a 10% increase in inputs results in more than a 10% increase in output).
- **Decreasing Returns to Scale**: If output increases by a smaller proportion than the inputs (e.g., a 10% increase in inputs leads to less than a 10% increase in output).

A NUMERICAL EXAMPLE OF LONG RUN RETURNS TO SCALE

Units of Capital	Units of Labour	Total Output	% Change in Inputs	% Change in Output	Returns to Scale
20	**150**	**3000**	**...**	**….**	**….**
40	300	7500	100	150	Increasing
60	450	12000	50	60	Increasing
80	600	16000	33	33	Constant
100	750	18000	25	13	Decreasing

In the given example, capital and labor inputs are increased proportionally each time. The percentage change in output is then compared to the percentage change in inputs. For instance, when the factor inputs are doubled from (150L + 20K) to (300L + 40K), the output increases by 150%, indicating increasing returns to scale.

Conversely, when production scales up from (600L + 80K) to (750L + 100K), the output rises by only 13%, while the inputs increase by 25%. This suggests diminishing returns to scale. Returns to scale can also be illustrated using isoquants, a graphical representation that will be presented later in this book after discussing the producer's equilibrium.

Self-Check Exercise-3

Q.1 Discuss law of Returns to scale.

12.6 SUMMARY

Inputs in production are categorized into fixed inputs and variable inputs. Fixed inputs remain unchanged over a given period, as adjusting them quickly is either costly or impractical. Examples include machinery and infrastructure. In contrast, variable inputs can be modified within the relevant timeframe. For instance, in construction, labor can be increased or decreased based on demand, and in butter production, the quantity of milk used can be easily adjusted.

The short run is a period where only variable factors, such as labor, can be changed, whereas the long run allows for adjustments in both fixed and variable inputs, enabling firms to scale production based on demand.

Total Product (TP) or Total Physical Product (TPP) represents the total output produced with given inputs over a specific period. As input usage increases, total output rises, though at varying rates. In the short run, output expansion is achieved by increasing variable inputs.

Average Product (AP) measures the output per unit of a variable factor and is calculated as TP/Q. For instance, if 20 laborers produce 100 units, the average product of labor (APL) is 100/20 = 5 units per worker.

Marginal Product (MP) refers to the additional output gained by employing one more unit of a variable factor. If an additional worker increases wheat production from 100 kg to 120 kg, the Marginal Product of Labor (MPL) is 20 kg. It is calculated as $\Delta TP/\Delta L$, where only labor is considered variable while other factors remain constant.

12.7 GLOSSARY

- **The short run** is a period in which only variable inputs, such as labor, can be adjusted, while fixed inputs remain unchanged.
- **The long run** is a phase where all production factors, both fixed and variable, can be modified. Firms can adjust their input levels to align supply with demand.
- **Total Product (TP) or Total Physical Product (TPP)** represents the overall quantity of output produced by a firm using given inputs within a specific timeframe.
- **Average Product (AP) or Average Physical Product (APP)** refers to the output per unit of the variable input and is calculated as TP/Q.
- **Marginal Product (MP) or Marginal Physical Product (MPP)** measures the change in total output resulting from the addition of one more unit of a variable input.

12.8 Answers to Self-Check Exercises

Self-Check Exercise-1

Ans.1 Please refer to section 12.3

Self-Check Exercise-2

Ans.1 Please refer to section 12.4, 12.4.1 to 12.4.4

Self-Check Exercise-3

Ans.1 Please refer to section 12.5

12.9 REFERENCES/SUGGESTED READINGS

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12.10 TERMINAL QUESTIONS

1. Discuss diagrammatically the laws of variable proportion?

Unit-13

RETURNS TO SCALE

STRUCTURE

13.1 INTRODUCTION

This chapter deals with the Return of Scale. The term ‘returns to scale’ refers to the degree by which output changes as a result of a given change in the quantity of all inputs used in production. We have three types of returns to scale: constant, increasing and decreasing. If output increases by the same proportion as the increase in inputs we have constant returns to scale. If output increases more than proportionally with the increase in inputs, we have increasing returns to scale. If output increases less than proportionally with the increase in inputs we have decreasing returns to scale. Thus, returns to scale may be constant, increasing or

decreasing depending upon whether output increases in the same, greater or lower rate in response to a proportionate increase in all inputs. In the Later section of this chapter we will deal with the Economies and Diseconomies of Scale. Economies of scale, refers to the cost advantages that a business obtains due to expansion. There are factors that cause a producer's average cost per unit to fall as the scale of output is increased. "Economies of scale" is a long run concept and refers to reductions in unit cost as the size of a facility and the usage levels of other inputs increase.

13.2 LEARNING OBJECTIVES

After going through this unit, you will be able to:

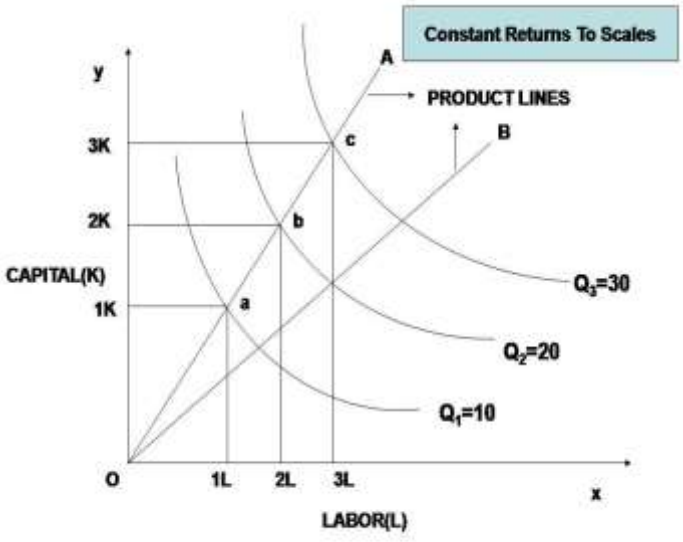
- Explain concepts of Economies and Diseconomies of scale
- Explain the returns to scale in detail.

13.3 LAWS OF RETURNS TO SCALE

Laws of returns to scale refer to the long-run analysis of the laws of production. In the long run, output can be increased by varying all factors. Thus, in this section we study the changes in output as a result of changes in all factors. In other words, we study the behaviour of output in response to changes in the scale. When all factors are increased in the same proportion an increase in scale occurs. Scale refers to quantity of all factors which are employed in optimal combinations for specified outputs. The term 'returns to scale' refers to the degree by which output changes as a result of a given change in the quantity of all inputs used in production. We have three types of returns to scale: constant, increasing and decreasing. If output increases by the same proportion as the increase in inputs we have constant returns to scale. If output increases more than proportionally with the increase in inputs, we have increasing returns to scale. If output increases less than proportionally with the increase in inputs we have decreasing returns to scale. Thus, returns to scale may be constant, increasing or decreasing depending upon whether output increases in the same, greater or lower rate in response to a proportionate increase in all inputs. The three types of returns to scale are explained below.

13.3.1 Constant Returns to Scale

At this stage, inputs and outputs change in direct proportion, either increasing or decreasing simultaneously. This relationship is illustrated in Figure 13.1. In the figure, product lines or expansion paths OA and OB represent two hypothetical production techniques, while isoquants Q1 (10 units), Q2 (20 units), and Q3 (30 units) depict different output levels.



The shift from point *a* to *b* reflects a doubling of inputs from 1K + 1L to 2K + 2L, resulting in a proportional increase in output from 10 to 20 units. Likewise, moving from *b* to *c* represents a 50% rise in inputs (from 2K + 2L to 3K + 3L), leading to a corresponding 50% increase in output (from 20 to 30 units). This proportional change between inputs and outputs demonstrates constant returns to scale.

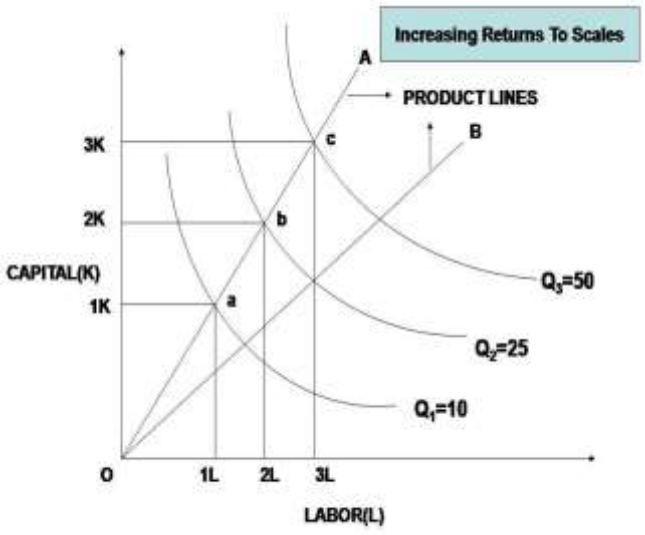
13.3.1.1 Reasons for constant returns to scale

Constant returns to scale occur when the advantages of economies of scale are exhausted, but diseconomies have not yet set in. As production expands, managing inputs efficiently becomes challenging for producers. At this stage, output increases proportionally with inputs, resulting in constant returns to scale. However, as input and output levels continue to rise, issues related to communication, coordination, and management—such as personnel, financial, and marketing complexities—lead to diseconomies. This phase serves as a transitional stage between increasing and decreasing returns to scale.

13.3.2 Increasing Returns to Scale

Increasing Returns to Scale occur when output grows at a faster rate than inputs, meaning the percentage increase in output surpasses the percentage increase in inputs. This implies that as inputs expand, output rises more than proportionately, with each additional input leading to a progressively higher output. For instance, if all inputs are increased by 100%, output may increase by 150% or more.

This concept is illustrated in the diagram, where Q1, Q2, and Q3 represent different output levels—10, 25, and 50 units, respectively. The product lines OA and OB depict the input-output relationship. Moving from point **a** to **b** reflects an increase in input combinations (labor and capital) from 1K+1L to 2K+2L, resulting in output growth from 10 to 25 units. Since doubling the inputs leads to more than double the output, this demonstrates increasing returns to scale. A similar pattern is observed in the transition from **b** to **c** as well.



13.3.2.2 Reasons for increasing return to scale:

Increasing returns to scale occur due to **economies of scale**. A detailed discussion on economies and diseconomies of scale is provided later in this chapter under the cost of production section. The key factors contributing to economies of scale include:

(i) **Higher Specialization** – As inputs like labor and machinery increase, specialization improves among both workers and management. This enhances efficiency, leading to higher productivity per unit of input, ultimately contributing to increasing returns to scale.

(ii) **Technical and Managerial Indivisibilities** – Certain production inputs, such as machinery and managerial expertise, cannot be divided into smaller units for small-scale operations. For instance, a turbine or a locomotive engine cannot be used in parts, and a manager cannot be employed in fractions. These indivisible inputs function optimally when used at a higher scale, leading to improved productivity as production expands.

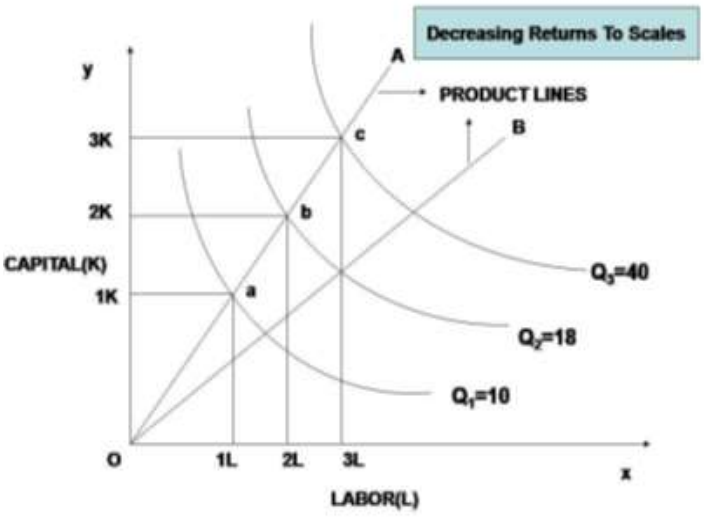
(iii) **Dimensional Advantages** – In some industries, increasing the size of inputs results in a disproportionately higher output. For example, a manufacturer using six metal sheets of 1 square foot each can produce a water tank with a capacity of 1 cubic foot. However, if the metal sheets are doubled in size to 2 square feet each, the tank's capacity increases to 8 cubic feet. This illustrates how output can rise faster than input, demonstrating increasing returns to scale.

(iv) **Marketing Economies** – Larger-scale production allows businesses to purchase raw materials in bulk at discounted rates, ensuring cost savings. Bulk buyers also receive preferential treatment from suppliers, including timely delivery and better-quality materials, ultimately enhancing production efficiency.

(v) **Risk-Bearing Economies** – Larger firms can absorb business risks more effectively than smaller ones. With increased production capacity, they can diversify products and markets, reducing vulnerability to market fluctuations and ensuring sustained growth in output.

13.3.3 Decreasing Returns to scale

Decreasing returns to scale occur when output increases at a slower rate than the increase in inputs. In other words, when inputs such as capital and labor are increased proportionally, but the resulting output grows by a smaller percentage, it signifies decreasing returns to scale.



This concept can be illustrated using a diagram where OA and OB represent different production techniques, and isoquants Q1 (10 units), Q2 (18 units), and Q3 (40 units) depict varying output levels. For instance, when inputs are doubled from 1K + 1L to 2K + 2L, the output rises from 10 to 18 units, reflecting an 80% increase—less than the proportional input increase. Likewise, moving from point b to c, inputs grow by 50%, but output increases by only 33.33%, demonstrating decreasing returns to scale.

13.3.3.1 Reasons for decreasing return to scale:

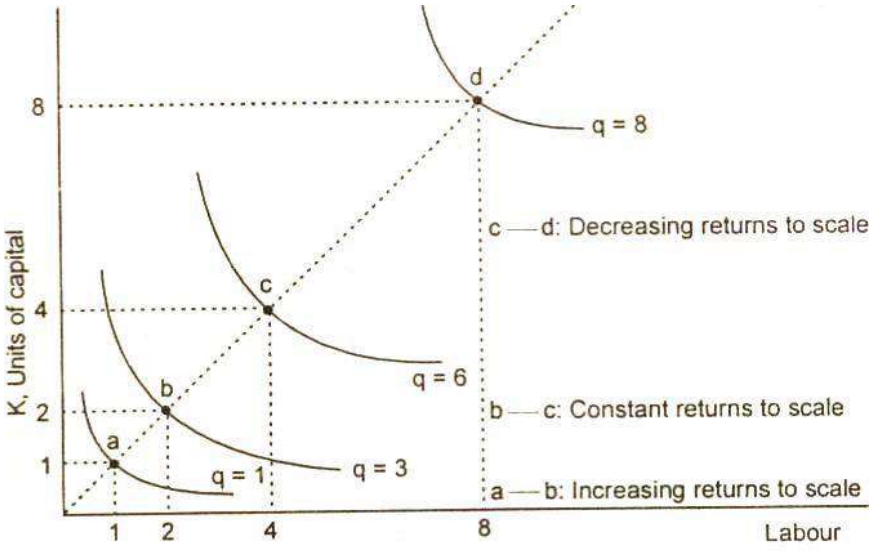
Diminishing returns to scale primarily occur due to diseconomies of scale. Several factors contribute to this phenomenon, including:

(a) **Managerial inefficiency**: As a business expands, inefficiencies in management often emerge first. The complexity of overseeing a larger operation can lead to decreased productivity, ultimately reducing output levels.

(b) **Limited natural resources**: The availability of natural resources can also contribute to diminishing returns to scale. For example, doubling the capacity of a coal mining plant does not necessarily double coal production due to constraints such as finite coal deposits or the challenges associated with extraction.

(c) **Reduced control efficiency**: In smaller firms, owners can effectively oversee and manage all operations. However, as the business grows and more departments are established, maintaining control becomes more difficult. This decline in oversight efficiency can create obstacles in the production process.

The diagram below illustrates the three key concepts of increasing, constant, and decreasing returns to scale within a single framework.



The figure illustrates that when a firm employs one unit of labor and one unit of capital (point A), it generates one unit of output, as indicated by the q = 1 isoquant. When the firm doubles its input to two units of labor and two units of capital, the output increases more than proportionally from q = 1 to q = 3, demonstrating

increasing returns to scale. Similarly, the output rises from 3 to 6 units with another doubling of input. However, at the final doubling stage, from point C to point D, the production function exhibits decreasing returns to scale, as increasing input from four to eight units results in output rising from 6 to only 8 units, reflecting a smaller gain of just two additional units.

Self-Check Exercise-1

Q.1 Discuss Laws of Returns to scale.

13.4 ECONOMIES OF SCALE

13.4.1 Concept of Economies of Scale

Economies of scale refer to the cost benefits a business experiences as it expands. This concept applies in the long run and involves a decrease in unit costs as the facility size and input usage grow. Conversely, diseconomies of scale represent the disadvantages of expansion. Various factors contribute to economies of scale, including labor (enhanced division of labor), purchasing (bulk procurement through long-term agreements), managerial (greater specialization among managers), financial (access to low-interest loans and diverse financial instruments), marketing (spreading advertising costs over a larger output), and technological (leveraging production efficiencies). These factors collectively lower long-run average costs (LAC) by shifting the short-run average total cost (SATC) curve downward and outward. Additionally, economies of scale can arise from the process of learning by doing.

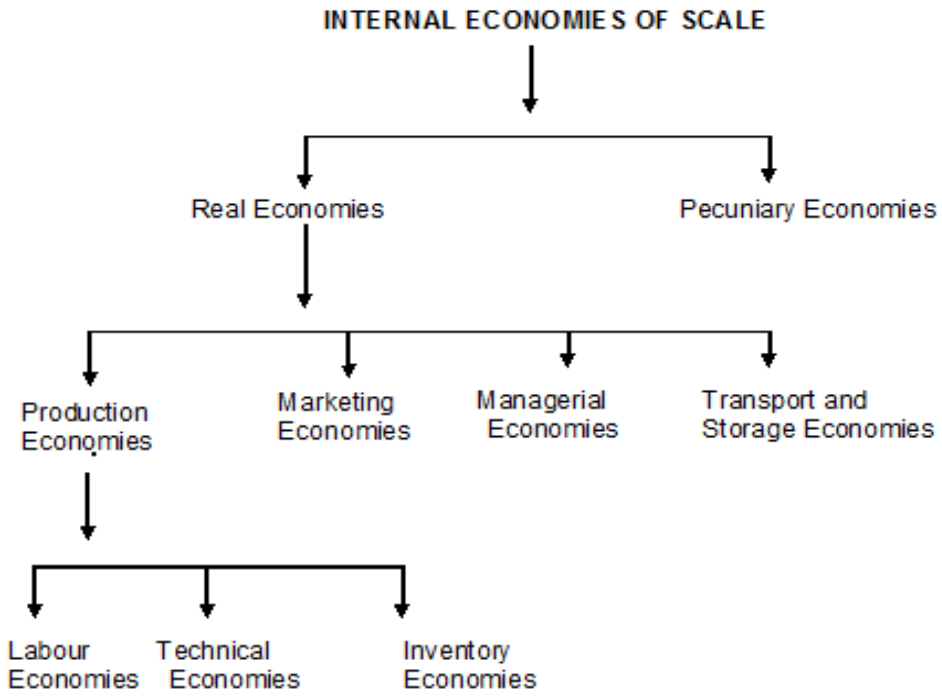
13.4.2 Economies and Diseconomies of Scale

Economies and diseconomies of scale can be categorized into two types: internal and external. Internal economies and diseconomies arise due to a firm's own expansion, whereas external economies and diseconomies result from the overall growth of the industry. They are termed external because they originate from factors outside the firm.

Internal economies and diseconomies influence the shape of the long-run average cost curve. While internal economies lead to a decline in long-run average costs as output increases, internal diseconomies cause these costs to rise. Conversely, external economies and diseconomies impact the positioning of both short-run and long-run average cost curves. External economies shift the cost curve downward, whereas external diseconomies push it upward.

13.5 INTERNAL ECONOMIES OF SCALE

Internal economies of scale refer to the benefits a firm gains from expanding its production. These advantages arise when a company increases its scale of operations, leading to cost reductions and efficiency improvements. They result from the firm's own initiatives and play a crucial role in shaping the long-run average cost curve. Internal economies of scale contribute to increasing returns to scale, as larger production volumes allow for more efficient utilization of indivisible factors. Many economists attribute these economies to the indivisibility of certain resources, which become more effective as output grows. Internal economies of scale are generally categorized into two main types, as illustrated in the following chart.



13.5.1 Real Economies of Scale

Real economies refer to those that involve a decrease in the physical amount of inputs, including raw materials, different forms of labor, and various types of capital. These economies are often linked to the indivisibility or lumpiness of production factors. The key types of real economies include:

(i) Production Economies
(ii) Marketing Economies
(iii) Managerial Economies
(iv) Transport and Storage Economies

(i) Production Economies:

Production economies arise from the use of factors of production in the form of (a) labour economies (b) technical economies and (c) inventory economies

(a) Labour Economies:

As production expands, firms benefit from various labor economies, including specialization, time efficiency, automation, and cumulative volume effects. An increase in output allows for greater division and specialization of labor, which enhances the efficiency and productivity of workers. Adam Smith, in *The Wealth of Nations* (1776), highlighted the significance of labor division in improving productivity. It also minimizes the time lost in shifting between tasks and fosters innovation in tools and machinery, leading to the mechanization of production. This mechanization enables workers to perform tasks more efficiently, boosting overall labor productivity. Additionally, large-scale production provides technical personnel with valuable experience, contributing to improved efficiency through cumulative learning effects. As a result, increased production leads to a reduction in unit costs.

(b) Technical Economies:

Technical economies primarily stem from the utilization of specialized capital equipment, which becomes effective when production occurs on a large scale. These economies also emerge due to indivisibilities, a key feature of modern production techniques. In simpler terms, as production expands, firms benefit from mechanization and mass production methods, leading to a reduction in the cost per unit of output.

(c) Inventory Economies:

Inventories play a crucial role in enabling firms to manage unforeseen fluctuations in both input supply and output demand. Their primary function is to stabilize the availability of raw materials, spare parts, and finished goods. While the volume of inventories grows with production scale, it does not increase in direct proportion to output. Consequently, as a firm's output expands, it can maintain a relatively smaller percentage of inventories while still effectively handling unpredictable variations.

(ii) Marketing Economies:

These economies are associated with the selling process of a firm's products and are primarily derived from advertising efficiencies. As production increases, advertising expenditures grow at a slower rate, leading to a decline in per-unit advertising costs. Similarly, other promotional expenses, such as providing product samples or employing a sales force, also increase at a lower rate than output. Additionally, larger firms can establish exclusive partnerships with dealers to ensure high-quality after-sales service, further reducing average selling costs as the firm grows.

(iii) Managerial Economies:

Expanding production allows for a greater division of managerial responsibilities. In large firms, distinct managerial roles exist, including production, sales, finance, and personnel management, whereas, in smaller firms, a single manager may oversee multiple functions. This specialization enhances efficiency and effectiveness. Moreover, decentralizing decision-making further improves managerial efficiency. Large-scale enterprises can also integrate technology, such as computers and telex systems, to streamline managerial tasks. As a result, per-unit managerial costs tend to decline with increased output.

(iv) Transport and Storage Economies:

As production scales up, transportation costs per unit of raw materials, semi-finished, and finished products decrease. Larger firms can achieve cost savings by investing in their own transport systems or utilizing larger vehicles. Similarly, as firms grow, storage costs also reduce due to improved efficiency in warehousing and logistics.

13.5.2 Pecuniary Economies

Pecuniary economies, also known as monetary economies, refer to the cost advantages a firm gains by acquiring production and distribution resources at lower prices due to bulk purchasing. These economies arise from the firm's ability to secure discounts as a result of large-scale production, thereby reducing its overall expenditure on various inputs.

A firm can achieve pecuniary economies in several ways. Firstly, purchasing raw materials in bulk enables the firm to obtain them at reduced prices. Secondly, due to its strong reputation in financial markets, a large firm can secure funds at lower interest rates. Additionally, firms that invest heavily in advertising may receive discounted rates for promotional activities. Lastly, transportation costs can also be minimized when large quantities of goods are shipped, leading to lower freight charges.

13.6 INTERNAL DISECONOMIES OF SCALE

Internal economies of scale are achieved only up to a specific plant size, known as the optimum plant size. At this stage, all potential cost-saving advantages are fully utilized. However, exceeding this optimal size can lead to diseconomies of scale, particularly in the form of managerial inefficiencies. While technical inefficiencies can be mitigated by replicating the optimal technical plant size, managerial diseconomies become more pronounced as firms expand.

One of the primary reasons for diseconomies of scale is the diminishing efficiency of management. When production surpasses a certain threshold, top management faces an increased workload, reducing their effectiveness in coordination and decision-making. As a result, an excessively large plant size complicates managerial structures and lowers overall efficiency.

Another factor contributing to diseconomies of scale is the depletion of natural resources. For instance, expanding a fishing fleet may not necessarily lead to a higher fish catch due to resource limitations.

13.7 EXTERNAL ECONOMIES

External economies of scale arise from improvements in the overall industrial environment rather than within an individual firm. These benefits, while external to a single company, remain internal to the industry as a whole. They often stem from the actions of other firms and influence the prices of production factors, leading to shifts in both short-run and long-run cost curves.

Key types of external economies include:

(i) **Reduction in Material and Equipment Costs** – As an industry expands, the demand for raw materials and capital equipment rises, encouraging large-scale production. This increased production lowers costs, allowing firms to procure materials and equipment at more affordable prices.

(ii) **Advancement in Technical Knowledge** – Industry growth often fosters innovation and the discovery of new technologies. Firms benefit from improved machinery and techniques, enhancing productivity and reducing production costs.

(iii) **Development of Skilled Labor** – With industry expansion, training facilities for workers improve, leading to a more skilled workforce. Higher skill levels enhance productivity, benefiting firms in the industry.

(iv) **Growth of Ancillary and Subsidiary Industries** – The expansion of a primary industry supports the development of related industries that produce essential tools, machinery, and equipment. Additionally, industries may emerge to repurpose waste materials into useful products, further reducing production costs.

(v) **Improvement in Transportation and Marketing** – Industrial growth stimulates advancements in transportation and marketing infrastructure, thereby reducing logistical costs for firms.

(vi) **Expansion of Information Services** – External economies also result from knowledge sharing among firms. Industry expansion often leads to the dissemination of technical knowledge through trade publications and collaborative research initiatives, fostering innovation and efficiency.

These external economies collectively contribute to the overall efficiency and competitiveness of firms within a growing industry.

13.8 EXTERNAL DISECONOMIES

The growth of an industry can lead to external diseconomies, increasing production costs. As the industry expands, the demand for limited resources such as raw materials and capital goods may drive up their prices. Similarly, wages for skilled labour, which is often in short supply, may rise. Additionally, industrial expansion can cause transportation congestion, affecting efficiency. Environmental concerns also arise, as industries may pollute lakes, rivers, and seas, negatively impacting other sectors like fishing. Air pollution from factory emissions and vehicle fumes can pose health risks to nearby communities. Consequently, these external diseconomies contribute to higher operational costs for individual firms.

Self-Check Exercise-2

Q.1 What do you mean by Economies of scale. Discuss in detail.

13.9 SUMMARY

The concept of 'returns to scale' describes how output responds to a proportional change in all input factors used in production. There are three main types: constant, increasing, and decreasing returns to scale. When output grows at the same rate as input expansion, it indicates constant returns to scale. If output rises at a greater rate than inputs, it reflects increasing returns to scale, whereas if output grows at a slower pace, it signifies decreasing returns to scale. Therefore, returns to scale depend on whether output changes in direct proportion, at a higher rate, or at a lower rate in response to a proportional change in all inputs.

Increasing returns to scale contribute to economies of scale, which can be categorized as internal or external. Internal economies arise due to an increase in a firm's size, while external economies stem from industry-wide expansion. In both cases, the firm benefits, though external economies occur without direct action by the firm itself. A firm can boost production by increasing expenditure on production factors. This can be done by maintaining the same proportion of inputs—such as doubling or tripling each factor—or by adjusting the combination of inputs. When

input quantities change but their proportions remain constant, the relationship between input changes and output is described as 'returns to scale.'

If all input factors are increased by a certain proportion (α), and output changes by a factor of (β), returns to scale are classified as increasing if β > α, constant if β = α, and decreasing if β < α. A firm can also expand production by replicating identical plants, ensuring at least constant returns to scale. This process is referred to as ‘replication.’ Returns to scale may increase, decrease, or remain unchanged if the firm expands its plant size while keeping input proportions the same. However, firms may also find it advantageous to alter input combinations to improve efficiency and maximize output.

The advantages gained in some of these cases are known as ‘real economies,’ as they arise from technical efficiencies. On the other hand, ‘pecuniary economies’ result from cost savings due to reduced input prices when production scales up. Real economies are linked to a reduction in the physical quantity of resources needed per unit of output, while pecuniary economies stem from lower input costs per unit.

13.10 GLOSSARY

- **Constant Returns to Scale**: When the output grows in direct proportion to the increase in input levels, it is referred to as constant returns to scale.
- **Increasing Returns to Scale**: If the output expands at a higher rate than the input increase, the phenomenon is known as increasing returns to scale.
- **Decreasing Returns to Scale**: When the output rises at a lower rate compared to the proportional increase in all inputs, it is termed decreasing returns to scale.
- **Economies of Scale**: This concept describes the cost benefits a business experiences as it expands. Various factors contribute to lowering the average cost per unit when production scales up. Economies of scale are a long-term concept, emphasizing cost reductions as the facility size and input utilization grow.
- **Internal Economies and Diseconomies**: These are benefits or disadvantages that a firm experiences due to its own expansion and operational efficiencies.
- **External Economies and Diseconomies**: Unlike internal factors, external economies and diseconomies arise from the overall growth of the industry. These effects impact firms due to external developments rather than internal changes.

13.11 ANSWERS TO SELF-CHECK EXERCISES

Self-Check Exercise-1

Ans.1 Please refer to section 13.3

Self-Check Exercise-2

Ans.1 Please refer to section 13.4, 13.5, 13.6, 13.7 and 13.8

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13.13 TERMINAL QUESTIONS

Q1. Discuss diagrammatically the laws of returns to scale?

Q2. Write short notes on

(a) Internal Economies of Scale
(b) External Diseconomies of Scale

Unit-14

ISO-QUANT CURVE ANALYSIS

STRUCTURE

14.1 INTRODUCTION

The term "iso" originates from the Greek language and translates to "equal" or "same." An isoquant is a graphical representation in economics that depicts various combinations of input factors that yield an identical level of output. Because the output remains constant along the curve, an isoquant is also referred to as an "equal product curve." Essentially, it illustrates different ways in which a firm can combine resources, such as labor and capital, to maintain a consistent level of production efficiency.

14.2 LEARNING OBJECTIVES

After going through this unit, you will be able to:

- Define Iso Quant and list its different types
- Explain the Optimal Input Combination for Maximisation of Output
- Explain properties of isoquant

14.3 EQUILIBRIUM OF THE PRODUCER

The producer's equilibrium is examined using the concepts of isoquant and isocost. Let's first understand these fundamental tools.

14.4 ISO QUANT

An isoquant is similar to the indifference curve used in consumer equilibrium analysis. However, while an indifference curve represents the combination of two goods (X and Y) that provide the same level of satisfaction to a consumer, an isoquant represents different combinations of two inputs—labor and capital—that yield the same level of output for a producer.

Since production deals with tangible quantities, output can be measured numerically. For instance, if the output corresponding to isoquant I is K or 100 units, then isoquant II represents 2K or 200 units, and isoquant III corresponds to 3K or 300 units, and so on. Unlike indifference curves, this numerical representation of output is possible in isoquant analysis. To explore this further, consider a production function that relies on two key inputs: labour and capital.

Table 14.1 : A production function with two inputs

	Iso quant	
	Labour (L)	**Capital (K)**
A	2	12
B	1	10
C	2	5
D	3	3
E	4	2.3
F	5	1.7
G	6	1.2
H	7	0.8
I	8	1

Table 14.2 illustrates a production scenario where both labor and capital are adjusted simultaneously. For example, in situation A, 2 units of labor and 12 units of capital are utilized. As we transition to situation B, the quantities of both inputs change, with 1 unit of labor and 10 units of capital being employed. In situation C, labor increases to 2 units while capital decreases to 5 units, and this pattern continues. Since all factors are variable, this represents a long-run production analysis.

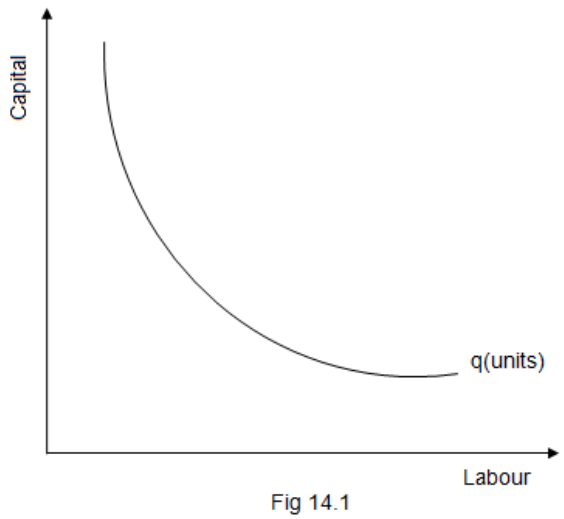

Fig 14.1

The assumption here is that each combination of labor and capital from A to I results in the same level of output. When these combinations are plotted on a graph, they form an isoquant. An isoquant represents the locus of all possible combinations of labor and capital that yield the same level of output. In other words, it depicts the different ways two inputs can be utilized to achieve a constant level of production. Because output remains unchanged along an isoquant, these curves are also referred to as equal product curves.

14.4.1 Types of Iso Quants

The iso quant may have various shapes depending on the degree of substitutability of factors:

14.4.1.1 Linear Iso Quant:

A linear isoquant appears as a straight line, assuming perfect substitutability between factors of production, as shown in Figure 14.2. In this scenario, labor and capital can replace each other at a constant rate. This implies that a particular output level can be achieved using only capital, only labor, or any proportional combination of both. For instance, at point A on the isoquant, production occurs solely with capital, without labor, whereas at point B, the same output is produced using only labor, without capital. However, in reality, labor and capital are not perfect substitutes, making this assumption impractical.

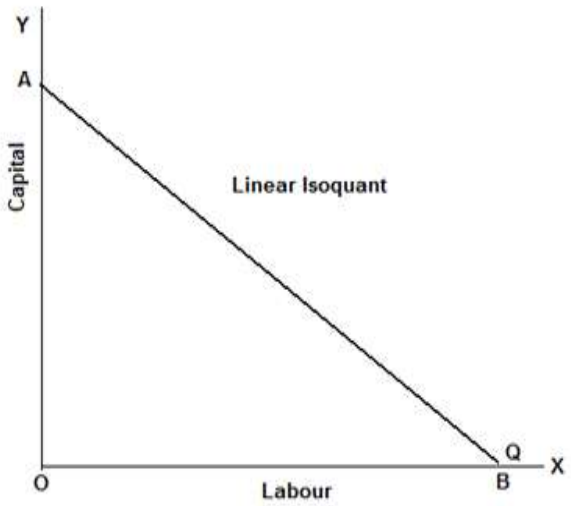

Fig. 14.2

14.4.1.2 Right Angled Iso Quant:

This scenario assumes that the factors of production cannot be substituted for one another. Each commodity can only be produced using a specific method. As a result, the isoquant takes the shape of a right angle, as illustrated in Fig. 14.3. In this case, labour and capital are perfect complements, that is, labour and capital must be used in fixed proportion shown by point C. The output can be increased only by increasing both the quantity of labour and capital in the same proportion depicted at the point C. This iso quant is called input-output iso quant or Leontief iso quant after Leontief, who invented the input-output analysis.

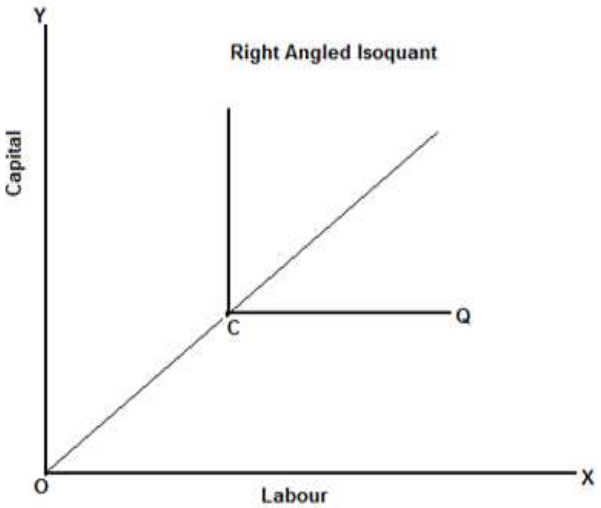

Fig 14.3

14.4.1.3. Kinked Iso Quant:

This iso quant assumes only limited substitutability of capital and labour. There are only a few processes for producing any one commodity. This is shown in Fig. 14.4 where A1, A2, A3 and A4 show the production process and Q is the kinked iso quant. In this case, the O substitutability of factors is possible only at the kinks. This is more realistic type of iso quant because engineers, managers and production executives consider the production process as a discrete rather than continuous process.

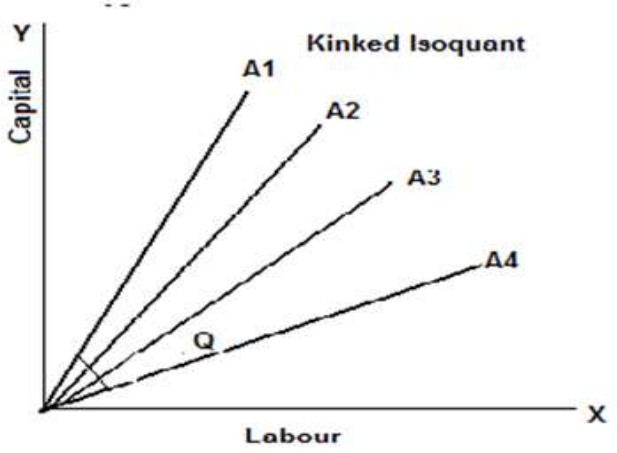

Fig. 14.4

14.4.1.4. Smooth Convex Iso Quant:

This type of isoquant suggests that capital and labour can be continuously substituted within a specific range, but beyond that, they are not interchangeable. This concept is illustrated in Figure 14.5. Traditional economic theory commonly employs this isoquant for analysis due to its simplicity. Additionally, it serves as an approximation of the more realistic kinked isoquant. As the number of production processes increases indefinitely, the isoquant gradually transforms into a smooth curve.

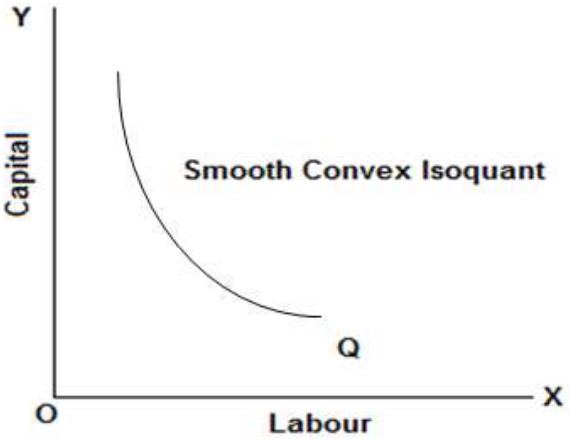

Fig 14.5

14.4.2 Iso Quant Map :

Isoquants can be labeled in terms of physical output units without any difficulty. Since each isoquant corresponds to a specific level of output, it allows for a clear comparison of how much one isoquant's output exceeds or falls short of another. This concept is illustrated through an isoquant map, as shown in Figure 14.6. The map indicates that the output levels for isoquants Q1, Q2, and Q3 are 20, 40, and 60 units, respectively.

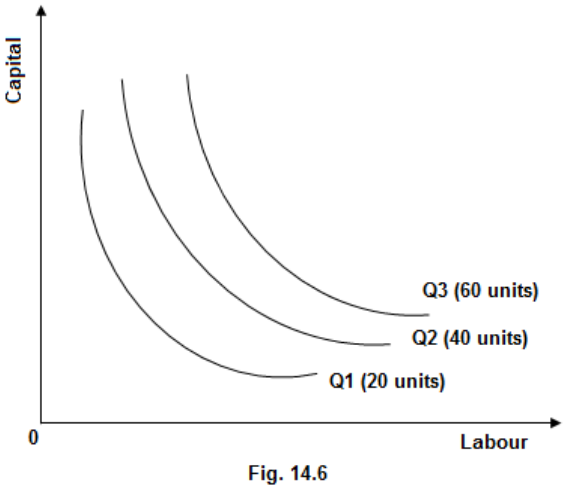

Fig. 14.6

This means that Q2 produces 20 units more than Q1, while Q3 yields 40 units more than Q1. Thus, an isoquant map not only represents the physical quantity of output but also enables a comparison of output levels across different isoquants. In theory, such a map consists of an infinite number of isoquants, as output is assumed to change continuously in response to variations in input factors.

14.3.4 Properties of Iso Quants

The important properties of iso quants are the following:

1. Iso quants slope downwards to the right: This implies that, to maintain a constant output, if the quantity of one factor is increased, the quantity of the other factor must be decreased. An isoquant that slopes upward indicates that a specific product can be produced with reduced amounts of both factors of production. An entrepreneur seeking to maximize profits would avoid using any factor combinations represented by the upward-sloping section of the isoquant.

Therefore, the points on the upward sloping portion of an iso quant cannot represent an equilibrium position. Similarly, a horizontal or vertical range of an iso quant cannot also represent a possible position of equilibrium. In this case, the same output could be obtained at a reduced cost by reducing the amount of one of the factors. Thus, iso quants slope downwards to the right as in fig 14.7.

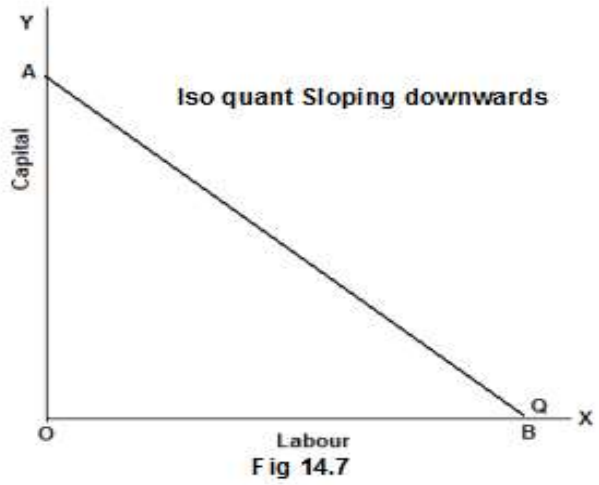

Fig 14.7

2. Iso quants are convex to the origin: The slope, at any point of an iso quant, is negative. Its numerical value measures the marginal rate of technical substitution between labour and capital. It equals the ratio of the marginal product of labour to the marginal product of capital. Thus, the slope of an iso quant is

$$\frac{\Delta K}{\Delta L} = \text{MRTS}_{LK} = \frac{MP_L}{MP_K}$$

Where ΔK is the change in capital, ΔL is the change in labour, $MRTS_{LK}$ is the marginal rate of technical substitution of labour for capital, MP_L is the marginal product of labour and MP_K is the marginal product of capital. The convexity of iso quant means that as we move down the curve less and less of capital is given up for an additional unit of labour so as to keep constant the level of output. This can be observed from the Fig. 14.8.

The figure shows that as we increase labour at a constant rate the amount of capital given up (ΔK) for an additional unit of labour goes on falling. Thus, the convexity of the iso quant shows that the marginal rate of technical substitution of labour for capital is diminishing.

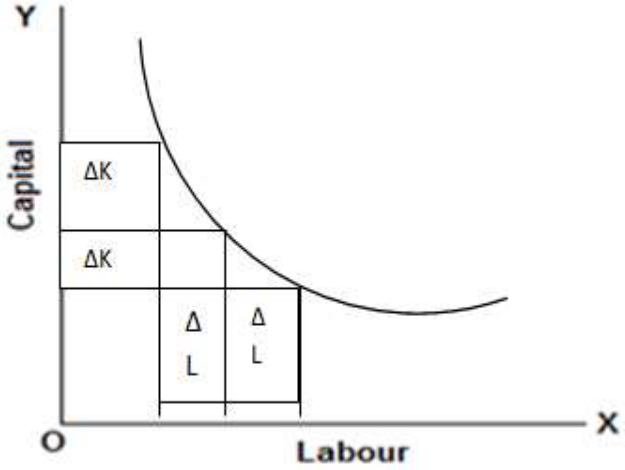

Fig 14.8

If the iso quant is concave to the origin it would mean that the marginal rate of technical substitution is increasing. This behaviour is elucidated in Fig. 14.9. It is apparent from the Fig. that as the labour is increased at a constant rate the amount of capital given up (ΔK) goes on increasing. Such behaviour is irrational and therefore, iso quants are not concave to the origin.

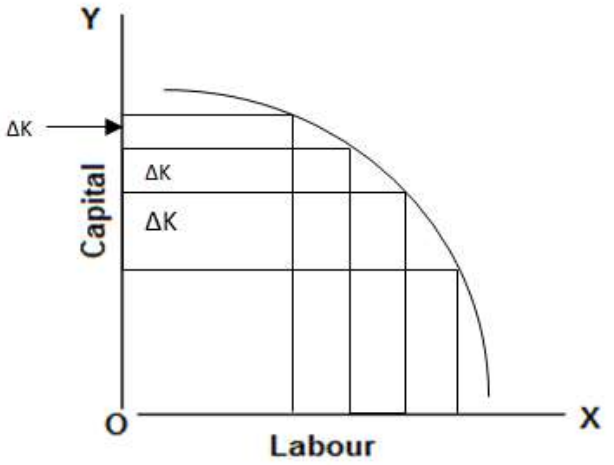

Fig. 14.9

3. Iso quants do not intersect: By definition iso quants, like indifference curves, can never cut each other. If they cut each other it would be a logical contradiction.

4. Iso quants cannot touch either axis: If an iso quant touches any axis, as in Fig. 14.10. it would mean that the output can be produced with the help of one factor. It is unrealistic because output cannot be produced only by labour or capital alone.

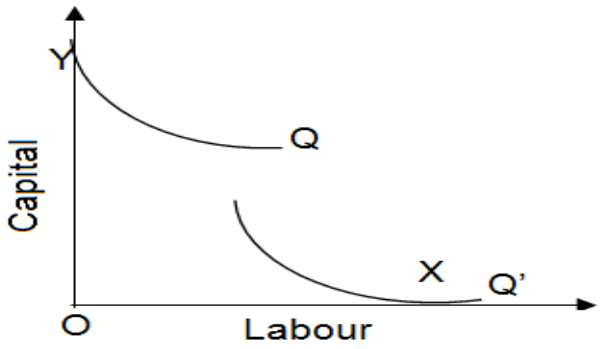

Fig. 14.10

5. Higher the iso quant, higher is the level of production: Refer to Table 14.2, where data for two additional sets of isoquants has been included. In Isoquant I, point A corresponds to 2 units of labor (L) and 12 units of capital (K). In Isoquant II, the same point corresponds to 4L and 11K, indicating a higher input level and, consequently, a greater output. Likewise, in Isoquant III, point A represents 6L and 13K, signifying an even higher input level and output. This demonstrates that as the isoquant level increases, production also rises. For this reason, two isoquants cannot intersect; if they did, it would imply the same output level at that point, which contradicts the principle of isoquants. When the data from Table 14.2 is plotted on a graph, it forms a series of isoquants, commonly known as an isoquant map, representing different output levels.

Table14.2

	Iso quant I		Iso quant II		Iso quant III	
	Labour (L)	**Capital (K)**	**Labour (L)**	**Capital (K)**	**Labour (L)**	**Capital (K)**
A	2	12	4	11	6	13
B	1	10	3	10	5	12
C	2	5	4	7	6	9
D	3	3	5	5	7	7
E	4	2.3	6	4.2	8	6.2
F	5	1.7	7	3.5	9	5.5
G	6	1.2	8	3.2	10	5.2
H	7	0.8	9	3	11	5
I	8	1	10	3.7	12	5.9

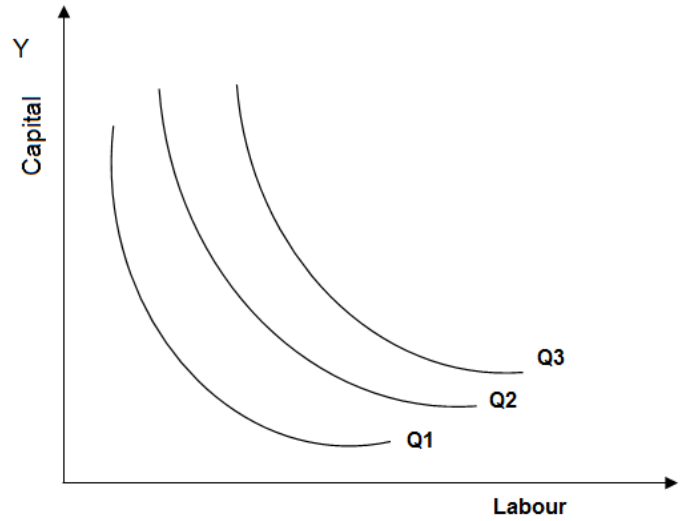

Fig. 14.11

(Note: The figure above is not precisely based on the data presented in Table 14.2.)

The firm achieves cost minimization at point ‘e,’ where the isoquant Q is tangent to the isocost line AB. At this point, the optimal combination of inputs consists of OK units of capital and OL units of labor. This ensures that the given level of output is produced at the lowest possible cost. Any point below ‘e’ would be preferable but is unattainable for producing output Q, while points above ‘e’ lie on higher isocost lines, indicating greater expenses.

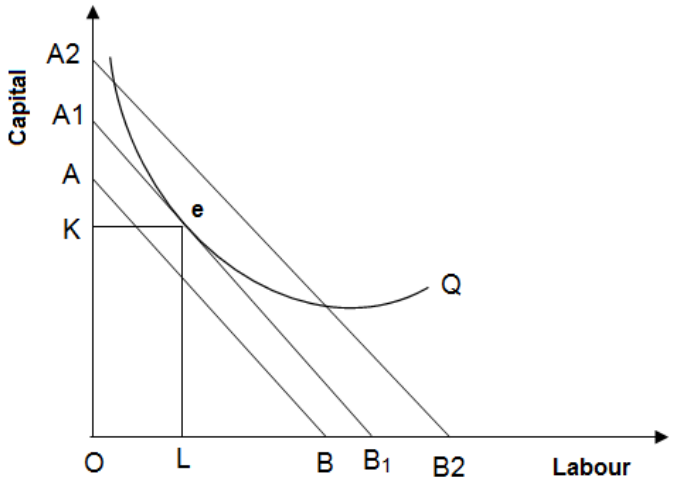

Fig. 14.12

Therefore, point ‘e’ represents the most cost-effective combination of inputs for producing output Q. It is achieved using OK units of capital and OL units of labor. At this tangency point, the slope of the isocost line matches the slope of the isoquant, which satisfies the first condition for equilibrium. The second condition requires that the isoquant be convex to the origin at equilibrium. Consequently, at point ‘e,’ the ratio of the marginal products of the two inputs equals the ratio of their respective factor prices.

Self-Check Exercise-1

Q.1 What is Iso Quant Curve? Discuss its types. Also discuss various properties of Isoquants.

14.5 OPTIMAL INPUT COMBINATION FOR MAXIMISATION OF OUTPUT

The firm's equilibrium conditions are similar to the previously discussed scenario, where the iso-cost line must be tangent to the highest attainable isoquant, and the isoquant should exhibit convexity. However, the current situation differs conceptually, as the firm aims to maximize output while operating within a fixed cost constraint. This concept is illustrated in Figure 14.13.

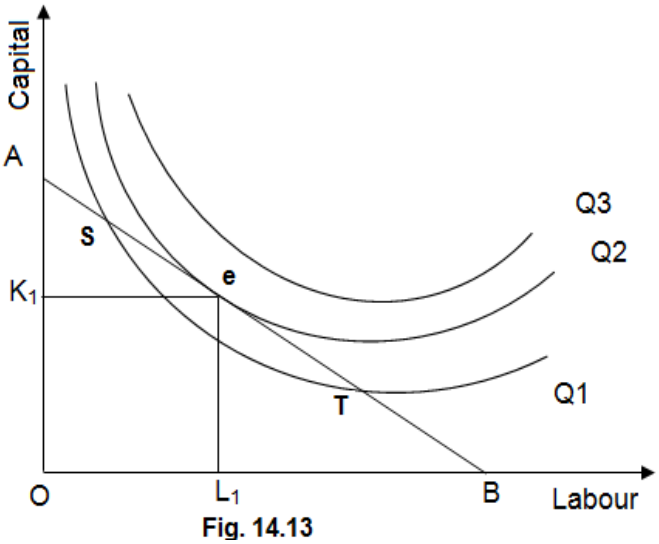

Fig. 14.13

The firm's cost limitation is depicted by the iso-cost line AB. The highest achievable output level is Q2 since point ‘e’ lies on the iso-quant Q2. This point serves as the equilibrium position, where the iso-cost line AB is tangent to the iso-quant Q2. Other points on the iso-cost line, such as S and T, correspond to a lower iso-quant Q1. Although points beyond ‘e’ represent higher output levels that would be desirable, they remain unattainable due to cost constraints. Thus, Q2 signifies the maximum possible output within the given budget, with the optimal combination of inputs being OK1 and OL1.

This analysis underscores that the most efficient input combination—whether to minimize production costs for a specific output level or to maximize output within a fixed budget—is determined by the tangency between an iso-quant and an iso-cost line. However, this conclusion relies on the assumption of constant factor prices. Any changes in factor prices will prompt the firm to adjust its input mix to either reduce costs for the same level of output or maximize production within the existing budget.

Self-Check Exercise-2

Q.1 Discuss Optimal Input Combination for Maximisation of Output.

14.6 SUMMARY

An isoquant represents a curve that illustrates various combinations of inputs that can be used to produce a specific level of output. It demonstrates the degree to which a firm can substitute one input for another while maintaining the same production level. The main types of isoquants include linear isoquant, right-angled isoquant, kinked isoquant, and smooth convex isoquant.

14.7 GLOSSARY

- **Iso quants:** An iso quant is the locus of points showing how a given output can be produced with different combinations of inputs.
- **Iso quant Map** represents a set of isoquants which represents different levels of output. In an. isoquant map each isoquant shows various combinations of labour and capital which are. capable to produce a given level of output.

14.8 ANSWERS TO SELF-CHECK EXERCISES

Self-Check Exercise-1

Ans.1 Please refer to section 14.4, 14.4.1 to 14.4.3

Self-Check Exercise-2

Ans.1 Please refer to section 14.5

14.9 REFERENCES/REFERENCES/SUGGESTED READINGS

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14.10 TERMINAL QUESTIONS

Q1. Explain the Optimal Input Combination for Maximisation of Output.

Q2. Explain properties of iso quant curves.

Unit-15

PRODUCER'S EQUILIBRIUM

STRUCTURE

15.1 INTRODUCTION

In the last unit we have dealt with the Iso- quant and its different types of Iso-quant. Now I this unit we will take up marginal rate of technical substitution, iso-cost line and elasticity of factor substitution.

15.2 LEARNING OBJECTIVE

After going through this unit, you will be able to:

- Explain Marginal Rate of Technical substitution
- Explain Elasticity of factor substitution
- Explain Optimal Input Combination for Minimising Cost and for Maximisation of Output.

15.3 MARGINAL RATE OF TECHNICAL SUBSTITUTION

The Marginal Rate of Technical Substitution (MRTS) represents the quantity of one input that a producer is willing to forgo in exchange for an additional unit of another input while maintaining the same level of output. It is conceptually similar to the Marginal Rate of Substitution (MRS) studied in consumer equilibrium analysis.

When considering two inputs—labor (L) and capital (K)—MRTS can be defined as the amount of capital that a firm can reduce when increasing labor by one unit while keeping output constant, thus remaining on the same isoquant. As movement occurs along an isoquant, the MRTS decreases due to its diminishing nature. This characteristic results in isoquants being convex to the origin.

The MRTS of labour for capital ($MRTS_{LK}$) can be determined using the Marginal Physical Product (MPP) or Marginal Product (MP), following the formula:

$$MRTS_{LK} = \frac{MP_L}{MP_K}$$

This ratio corresponds to the slope of the isoquant. For example, in a given table (Table 4), when moving from point B to point C along isoquant I, acquiring one additional unit of labor required giving up five units of capital. That is, as labor increased from 1 to 2, capital was reduced from 6 to 5 units. Similarly, when labor increased from 2 to 3, capital decreased from 5 to 3 units. This trend continues for other points and for isoquant II as well, demonstrating the diminishing MRTS as one moves downward along an isoquant.

Table 15.1: Marginal Rate of Technical Substitution

	Iso quant I			Iso quant II		
	Labour (L)	**Capital (K)**	**$MRTS_{LK}$**	**Labour (L)**	**Capital (K)**	**$MRTS_{LK}$**
A	**2**	**12**	**-**	**4**	**11**	**-**
B	**1**	**10**	**-**	**3**	**10**	**-**
C	**2**	**5**	**5**	**4**	**7**	**3**
D	**3**	**3**	**2**	**5**	**5**	**2**
E	**4**	**2.3**	**0.7**	**6**	**4.2**	**0.8**
F	**5**	**1.7**	**0.6**	**7**	**3.5**	**0.7**
G	**6**	**1.2**	**0.5**	**8**	**3.2**	**0.3**
H	**7**	**0.8**	**0.4**	**9**	**3**	**0.2**
I	**8**	**1**	**-**	**10**	**3.7**	**-**

The diminishing marginal rate of technical substitution (MRTS) between two factors can be illustrated graphically using an isoquant.

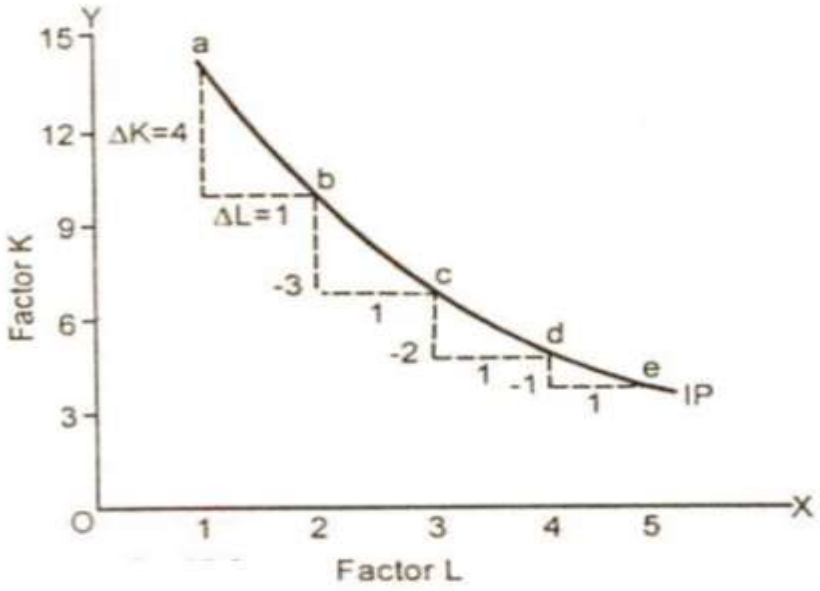

Fig. 15.1

As depicted in the figure, when the firm transitions from point (a) to point (b) by employing an additional unit of labor, it sacrifices 4 units of capital (K) while remaining on the same isoquant at point (b). This results in a Marginal Rate of Technical Substitution (MRTS) of 4. Similarly, when the firm moves from point (b) to point (c), it can reduce its capital usage by 3 units while staying on the same isoquant, giving an MRTS of 3. Further, shifting from point (c) to point (d) leads to an MRTS of 2, and from point (d) to point (e), the MRTS becomes 1. This progressive decline in MRTS along an isoquant, as labor increases in place of capital, is known as the Diminishing Marginal Rate of Technical Substitution.

It is important to note a common mistake students make when illustrating this concept. The length of the line representing the change in labor (ΔL) should remain constant, while the length of the line representing the change in capital (ΔK) should gradually decrease. This indicates that as we move downward along an isoquant, the amount of capital given up for an additional unit of labor steadily decreases. A frequent error is reducing the length of both lines, which misrepresents the principle of MRTS.

Self-Check Exercise-1

Q.1 What do you mean by Marginal rate of Technical substitution

15.4 ELASTICITY OF FACTOR SUBSTITUTION

The marginal rate of technical substitution is commonly used to assess the substitutability of factors; however, it has a significant drawback—it is influenced by the units in which the two factors are measured. A more effective approach to evaluating factor substitutability is through the concept of elasticity of substitution. This metric is defined as the percentage change in the capital-labor ratio relative to the percentage change in the rate of technical substitution.

Elasticity of factor substitution = $\frac{PErcentage\ change\ in \frac{K}{L}}{Percentage\ change\ in\ MRS}$

Elasticity of factor substitution $= \frac{\frac{\Delta \frac{K}{L}}{\frac{K}{L}}}{\frac{\Delta MRS}{MRS}}$

The elasticity of substitution is a unit-free measure, as it remains unaffected by the units used for K and L, given that both the numerator and denominator share the same units. This characteristic makes it a more effective metric for assessing the degree of factor substitutability.

Self-Check Exercise-2

Q.1 What do you mean by Elasticity of factor substitution?

15.5 ISO COST

In economics, an iso-cost line illustrates various combinations of inputs that result in the same total cost. While it resembles the budget constraint in consumer theory, the iso-cost line is specifically used in production to minimize costs rather than to maximize utility. For the two production inputs, labour and capital, with fixed unit costs of the inputs, the equation of the iso cost line is

$rK + wL = C$

Where w represents the wage rate of labour, r represents the interest rate of capital, K is the amount or units of capital used, L is the amount of labour used and C is the total cost of acquiring these inputs.

The absolute value of the slope of the iso-cost line, where capital is represented on the vertical axis and labor on the horizontal axis, corresponds to the ratio of the input prices of labor and capital. The iso-cost line is analyzed alongside the isoquant map to determine the optimal production point. This occurs where the isoquant and iso-cost curves are tangent to each other, ensuring that the firm achieves the highest possible output given the constraints of the iso-cost line. As a result, production takes place at the minimum possible cost, maximizing efficiency. The tangency condition signifies that the slopes of the isoquant and iso-cost line are equal, meaning that the marginal productivity of each input is proportional to the ratio of their respective prices. Essentially, the tangency point represents the most cost-effective combination of inputs required to produce a given level of output.

15.6 LEAST COST FACTOR COMBINATION

The concept of producer's equilibrium revolves around selecting the most efficient combination of inputs to minimize production costs while maintaining a specific level of output. The production function analysis highlights that multiple technically efficient input combinations can achieve the same output level. However, a firm must opt for the most cost-effective combination to maximize its profits.

The selection of a particular production method from several technically viable options is an economic decision influenced by prevailing input prices. A firm can enhance its profitability either by maximizing output within a given cost constraint or by minimizing costs for a predetermined output level. In both scenarios, achieving an optimal input combination is essential to ensuring minimal production costs.

There are two primary approaches to identifying the least-cost combination of inputs:

15.6.1. Finding the Total cost of Factor Combinations

In this analysis, we determine the total cost for each factor combination and select the one with the lowest cost. The total cost is calculated by multiplying the quantity of each factor by its respective price and then summing these values across all inputs. This process is demonstrated in Table 15.2.

Table 15.2: Choosing the Lowest Cost of Production Technique

Technique	Capital (units)	Labour (units)	Capital Cost Rs.	Labour Cost Rs.	Total Cost Rs.
1	2	3	4	5	6
A	6	10	500*6=3000	400*10=4000	7000
B	2	14	500*2=1000	400*14=5600	6600

It is assumed that 100 pairs of shoes are produced each week, with the cost of capital and labor wages set at Rs. 500 and Rs. 400 per week, respectively. To simplify the analysis, we consider only two technically efficient methods of production, referred to as Technique A and Technique B.

As shown in Table 15.2, the total cost of producing 100 pairs of shoes amounts to Rs. 7,000 per week using Technique A and Rs. 6,600 per week using Technique B. Given these costs, the firm will opt for Technique B, as it represents the most economically efficient (i.e., lowest-cost) production method under the given factor prices.

If the cost of any production factor changes, the equilibrium proportion of inputs will also adjust to minimize the use of the more expensive factor. In such cases, the new optimal combination of inputs can be determined by recalculating costs for different factor combinations and selecting the most cost-effective option.

15.6.2. Geometrical Method

The second and a more general way to determine the least cost combination of factors is geometrical in essence. It is done with the help of iso quant map and iso cost line. In order to determine the least cost factor combination or the maximum output for a given cost, we have to superimpose the iso quant map on the iso cost line. This is explained below.

15.6.3 Iso Quant Map

An iso quant map shows all the possible combinations of labour and capital that can produce different levels of output. The iso quant closer to the origin denotes a lower level of output. The slope of an iso quant is:

$$\frac{\Delta K}{\Delta L} = \text{MRTS}_{LK} = \frac{MP_L}{MP_K}$$

The iso-cost line represents different combinations of labor and capital that a firm can afford within a specified budget at prevailing factor prices. This concept is illustrated in Figure 15.2.

In the given figure, the line AB represents the iso-cost line, illustrating the possible combinations of capital (OB) and labor that can be purchased within a fixed budget. This line serves as the locus of all such combinations, considering the given prices of labor and capital. The slope of the iso-cost line corresponds to the ratio of factor prices, determining the trade-off between labor and capital.

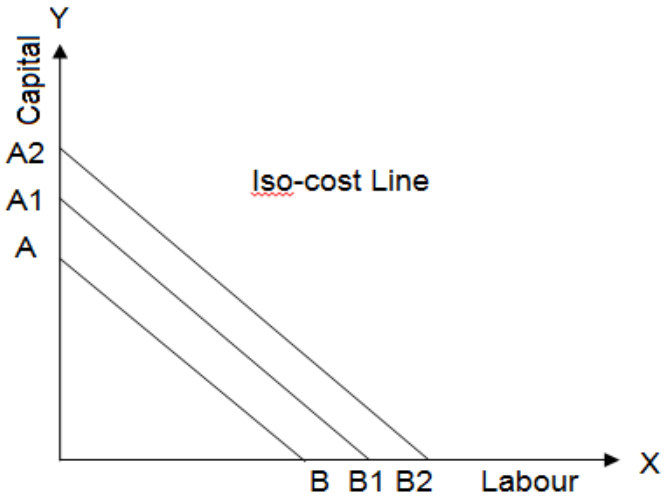

Fig 15.2

Iso-cost lines can be drawn for varying levels of expenditure. When the budget allocated for factors increases, the iso-cost line shifts to the right, indicating that the firm can afford more inputs at the given factor prices. As a result, a series of iso-cost lines, such as AB, A1B1, and A2B2 (as illustrated in Fig 15.2), can be observed. These lines remain parallel to each other since factor prices are assumed to be constant in all cases. Iso-cost lines positioned closer to the origin represent a lower total cost expenditure.

15.6.4 Slope of Iso Cost Line

Given the monetary resources, if the factor prices change the slope of iscocost line will change. This is shown in Fig 15.3.

Assume that a firm has a fixed budget and faces given prices for labor and capital, resulting in the iso-cost line AC in Figure 15.3. If the price of labor decreases, the firm can afford to employ more than OC units of labor with the same budget. However, if the firm chooses to hire only OC units, the iso-cost line's slope shifts to AC_2. Conversely, if the price of labor increases, the firm can afford fewer than OC units of labor. If it decides to hire only OC_2 units, the iso-cost line's slope adjusts accordingly to AC_2.

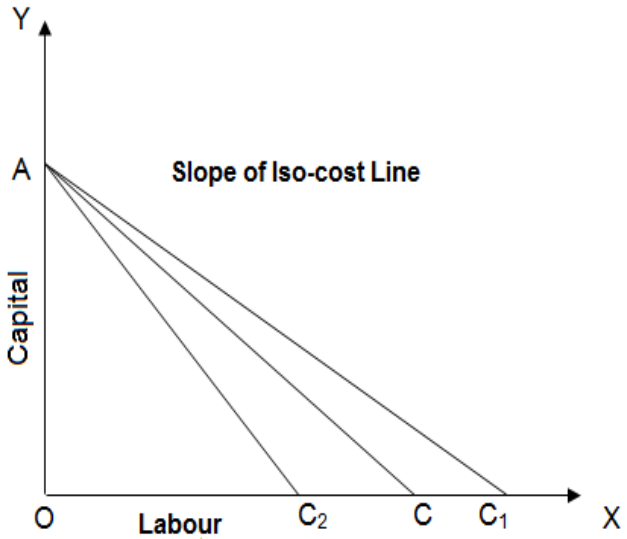

Fig 15.3

Thus, the iso-cost line depends upon 2 factors: (i) prices of factors of production (ii) the amount of money which the firm can spend on the factors. A change in the amount of money will shift the iso cost lines as in Fig.15.3 but the

slope of iso- cost lines remains constant. A change in factor prices, for example labour will change the slope of iso-cost lines as in Fig. 15.3.

A producer attains equilibrium either by minimizing the production cost for a specific output level or by maximizing output within a fixed cost constraint. Both scenarios are explained below.

Self-Check Exercise-3

Q.1 What is iso Cost Line? Also discuss least cost factor combination.

15.7 OPTIMAL INPUT COMBINATION FOR MINIMISING COST

In this scenario, the firm aims to produce a specified level of output at the lowest possible cost. This concept is illustrated in Figure 15.4. The isoquant labeled Q represents the required output level. A set of iso-cost lines, including AB, A1B1, and A2B2, is depicted. These iso-cost lines run parallel to each other, as they reflect constant factor prices, ensuring that all the lines maintain the same slope.

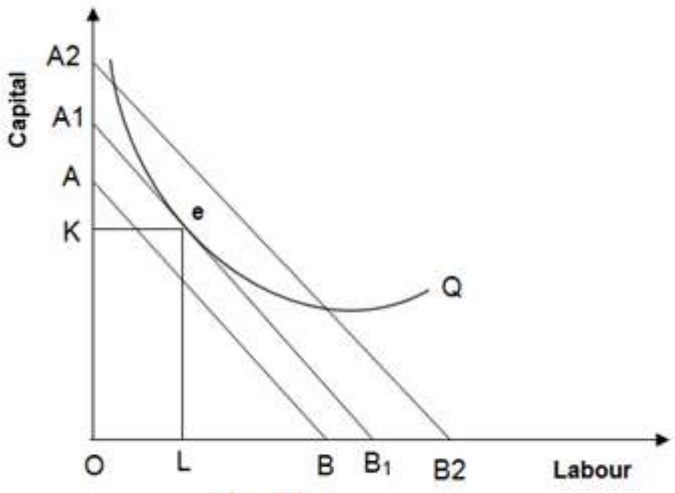

Fig. 15.4

The firm achieves cost minimization at point ‘e’, where the isoquant Q touches the iso-cost line AB. At this point, the most efficient combination of inputs is represented by OK units of capital and OL units of labour. This combination ensures that the given level of output is produced at the lowest possible cost. Any point below ‘e’ would be preferable but is unattainable for output Q, while points above ‘e’ correspond to higher iso-cost lines, indicating greater expenses. Therefore, point ‘e’ represents the least-cost input combination for producing output Q. At this point of tangency, the slope of the iso-cost line matches the slope of the isoquant, satisfying the first condition for equilibrium. The second condition requires the isoquant to be convex to the origin at equilibrium. Consequently, at point ‘e,’ the ratio of the marginal products of the two inputs equals the ratio of their respective factor prices.

Self-Check Exercise-4

Q.1 Diagramatically discuss Optimal Input Combination for Minimising Cost

15.8 OPTIMAL INPUT COMBINATION FOR MAXIMISATION OF OUTPUT

The firm's equilibrium conditions are similar to the previously discussed scenario, where the iso-cost line must be tangent to the highest attainable iso-quant, and the iso-quant should be convex. However, the current situation differs in its conceptual approach. Here, the firm's objective is to maximize output while operating within a fixed cost. This concept is illustrated in Figure 15.5.

The firm's cost limitation is represented by the iso-cost line AB. The highest level of output the firm can achieve is Q2 since point ‘e’ is located on the iso-quant Q2. This point ‘e’ serves as the equilibrium because, at this position, the iso-cost line AB touches the iso-quant Q2. Other points on the iso-cost line, such as S and T, fall on a lower iso-quant Q1. Although points beyond ‘e’ represent higher output levels, they remain unattainable due to cost constraints. Therefore, Q2 represents the maximum feasible output within the given cost. The optimal factor combination is OK1 and OL1.

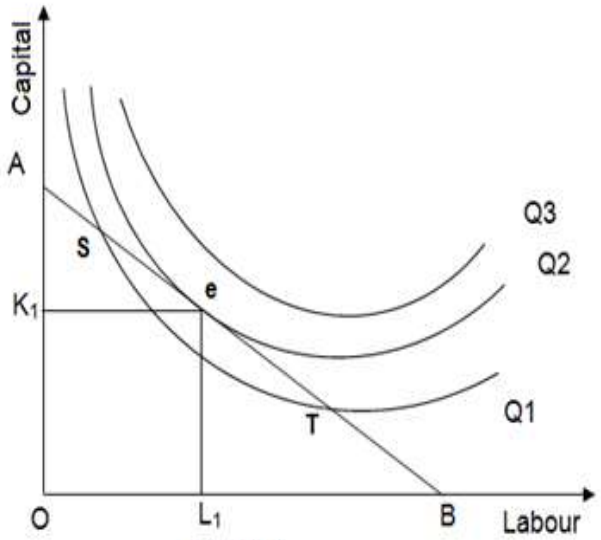

Fig. 15.4

The analysis indicates that a firm can achieve cost minimization for a specific level of output or maximize output within a fixed budget by selecting the optimal input combination. This occurs at the point where the isoquant and the isocost line intersect. However, this conclusion assumes constant factor prices. If factor prices fluctuate, the firm will adjust its input mix to either minimize production costs for a given output or maximize output within the available cost constraints.

Self-Check Exercise-5

Q.1 Diagrammatically discuss Optimal Input Combination for Maximising Cost

15.9 SUMMARY

This unit covers the Marginal Rate of Technical Substitution (MRTS), which represents the trade-off between two inputs while maintaining the same level of output. Similar to the Marginal Rate of Substitution (MRS) in consumer theory, MRTS has a limitation—it depends on the units of measurement for inputs. A more precise measure of input substitutability is the elasticity of substitution, which calculates the percentage change in the capital-labor ratio relative to the percentage change in the rate of technical substitution.

In production economics, an iso-cost line represents different input combinations that result in the same total cost, similar to a consumer’s budget constraint but focused on cost minimization rather than utility maximization. Production functions reveal multiple technically efficient input combinations, but firms must choose the most cost-effective option based on factor prices to maximize profits.

Profit maximization can be achieved by either increasing output for a given cost or reducing costs for a given level of output. Identifying the optimal factor combination ensures the lowest production cost, which can be determined through two main approaches: (i) calculating total costs for various input combinations and (ii) employing a geometrical method.

15.10 GLOSSARY

- **Marginal Rate of Technical Substitution (MRTS):** Indicates the amount of capital a firm can decrease when increasing labor by one unit, ensuring output remains constant along the same isoquant.
- **Elasticity of Substitution:** Captures how sensitive the capital-labor ratio is to variations in the MRTS, calculated as the percentage change in the capital-labor ratio divided by the percentage change in MRTS.
- **Iso-Cost Line:** Depicts all input combinations that lead to the same total production cost.
- **Iso-Quant Map:** Represents different combinations of labor and capital that yield varying output levels, with isoquants closer to the origin indicating lower output.

15.11 ANSWERS TO SELF-CHECK EXERCISES

Self-Check Exercise-1

Ans.1 Please refer to section 15.3

Self-Check Exercise-1

Ans.1 Please refer to section 15.4

Self-Check Exercise-1

Ans.1 Please refer to section 15.5 and 15.6

Self-Check Exercise-1

Ans.1 Please refer to section 15.7

Self-Check Exercise-1

Ans.1 Please refer to section 15.8

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15.13 TERMINAL QUESTIONS

Q1. What are the two methods for identifying the most cost-effective combination of factors to achieve a specific level of output?

Unit-16

COST ANALYSIS

STRUCTURE

16.1 INTRODUCTION

This unit explores various aspects of cost and revenue, with a particular focus on cost analysis in the current chapter. It examines different types of costs, as well as short-run and long-run cost curves. The cost of production represents the total financial expenditure, including both explicit and implicit costs, incurred by a producer while converting inputs into outputs. Simply put, it refers to the total monetary outlay required to produce a specific quantity of output. Understanding key cost concepts and the relationship between cost and output plays a crucial role in cost analysis.

16.2 LEARNING OBJECTIVES

After going through this unit, you will be able to:

- Outline Concepts of Cost Functions
- Compare Short and Long run Cost Function.

16.3 MEANING OF COST

Cost is examined from the producer's perspective and is assessed in monetary terms. Estimating costs is essential for making informed managerial decisions. During the production process, a producer utilizes various factor inputs, which must be compensated for their role in creating a product. This compensation represents the cost. The total cost of production is determined by the value of inputs required to manufacture a commodity. It encompasses all monetary expenses, both explicit and implicit, incurred in converting inputs into outputs. In essence, it refers to the total expenditure incurred to produce a specific quantity of goods. Understanding different cost concepts and the cost-output relationship plays a crucial role in cost analysis.

16.4 DIFFERENT KINDS OF COST CONCEPTS

16.4.1. Money Cost and Real Cost

When the cost of production is measured in monetary terms, it is referred to as money cost. It represents the financial expenditures incurred by a firm on various factor inputs to produce a commodity. In a monetary economy, all cost estimations and calculations are typically expressed in terms of money. Therefore,

understanding money cost holds significant importance in economics, as it allows for precise measurement.

On the other hand, when cost is assessed based on the physical or mental efforts involved in production, it is known as real cost. This includes the physical exertion, mental strain, sacrifices, discomfort, and inconveniences that individuals experience in the process of producing a good. Unlike money cost, real cost is a subjective and relative concept, making exact measurement difficult.

16.4.2. Implicit or Imputed Costs and Explicit Costs

Explicit costs refer to direct, contractual expenses incurred by an entrepreneur for acquiring factors of production, excluding self-owned resources. These costs include payments for rent, wages, interest, profits, utility bills, and raw materials. Since they involve actual financial transactions, they can be precisely measured, recorded, and accounted for in financial statements.

On the other hand, implicit or imputed costs represent the opportunity costs of self-owned resources used in the business. Unlike explicit costs, they do not involve direct monetary payments and are therefore not reflected in accounting records. These costs include the potential earnings from resources such as capital or assets that the entrepreneur could have rented out instead of using in the business.

It is essential to note that total cost comprises both explicit and implicit costs, representing the complete economic cost of production.

16.4.3. Actual Costs and Opportunity Costs

Actual costs, also referred to as outlay costs, absolute costs, or acquisition costs, involve direct financial expenditures and are recorded in a firm's accounting books. These are the real expenses incurred in the production or procurement of goods or services. Examples include wages paid to employees, costs of raw materials, electricity, fuel, and other essential inputs. Since these costs involve actual monetary transactions, they can be precisely calculated and documented without difficulty.

On the other hand, opportunity cost refers to the potential revenue or benefit that is forgone when a resource is allocated to one use instead of its next best alternative. It represents the cost of sacrificed opportunities or displaced alternatives. Since opportunity cost only reflects what has been given up, it cannot be precisely measured or recorded in financial statements. However, understanding opportunity cost is crucial for managerial decision-making. It helps in evaluating different options and selecting the one that provides the greatest benefit.

For instance, a company may consider purchasing a computer that can perform the tasks of ten workers. If the total cost of acquiring and maintaining the computer is significantly lower than the wages that would be paid to those workers over time, then investing in the computer would be a rational decision. Conversely, if the total wage cost is lower than the cost of purchasing the computer, retaining the workforce would be the better choice. Businesses face such decisions regularly and must carefully assess opportunity costs to make informed choices.

16.4.4. Direct Costs and Indirect Costs

Direct costs refer to expenses that can be directly linked to a specific product, department, or production process. Examples include costs related to raw materials,

fuel, worker wages, and the salary of a divisional manager. In contrast, indirect costs are not associated with a single unit of operation and cannot be directly assigned to a specific product, department, or process. These may include expenditures such as electricity and water bills, telephone charges, and administrative expenses.

16.4.5. Past and Future Costs

Past costs refer to expenses incurred in previous periods, whereas future costs are those that will be incurred at a later time. Analyzing past costs aids in making informed decisions for the future.

16.4.6. Marginal and Incremental Costs

Marginal cost represents the expense incurred when producing one additional unit of output. It strictly pertains to variable costs and does not include fixed costs.

In contrast, incremental cost refers to the additional expenses associated with producing a batch or group of outputs. These costs arise due to changes in business activity or production levels. For instance, expenses related to establishing a new sales depot in a different city or the cost of manufacturing an extra 100 units fall under incremental costs.

16.4.7. Fixed Costs and Variable Costs.

Fixed costs are expenses that remain unchanged regardless of fluctuations in production levels. Whether output increases or decreases, these costs stay constant and persist even when no production occurs. They are also referred to as supplementary or overhead costs. In contrast, variable costs fluctuate in direct proportion to the volume of output. As production rises or falls, these costs adjust accordingly. They are also known as prime costs or direct costs.

16.4.8. Accounting Costs and Economic Costs

Accounting costs refer to the expenses that have already been incurred in the production of a specific good. These costs include only the actual expenditures made for acquiring resources. In contrast, economic costs encompass not only these direct expenses but also the costs associated with alternative choices an entrepreneur could have pursued. Economic costs incorporate opportunity costs, making them a crucial factor in decision-making.

Self-Check Exercise-1

Q.1 What is the meaning of cost? Discuss different types of costs.

16.5 DETERMINANTS OF COSTS

Cost behavior is influenced by multiple factors, making it challenging to identify a universal set of determinants, as they vary across firms and industries. However, economists have identified several key factors that generally impact costs. These factors play a significant role in modern business operations and decision-making processes. The primary determinants include:

(i) **Technology**: Advanced technology facilitates optimal resource utilization, minimizes waste, saves time, lowers production costs, and enhances output. Conversely, outdated technology leads to inefficiencies and higher production expenses.

(ii) **Rate of Output (Utilization of Plant and Machinery)**: Maximizing the use of available plant and equipment helps lower production costs, whereas underutilization results in increased costs.

(iii) **Plant Size and Scale of Production**: Larger firms with extensive production facilities benefit from economies of scale, leading to reduced per-unit costs.

(iv) **Prices of Factor Inputs**: The cost of production is directly influenced by the prices of essential inputs—higher input costs result in increased production expenses, while lower prices reduce them.

(v) **Efficiency of Factors of Production**: Higher efficiency and productivity of labor, capital, and other production factors contribute to cost reduction, whereas inefficiencies drive costs up.

(vi) **Stability of Output**: A stable production process ensures optimal capacity utilization, minimizes hidden costs from disruptions, and enhances efficiency, ultimately reducing costs.

(vii) **Law of Returns**: The principle of increasing returns lowers production costs, whereas diminishing returns lead to higher expenses.

(viii) **Time Period**: In the short run, costs tend to be higher due to production constraints, whereas in the long run, adjustments and improvements can lead to cost reductions.

Self-Check Exercise-2

Q.1 What are the determinants of costs?

16.6 Types of Cost Function

Generally speaking there are two types of cost functions.

16.6.1. Short Run Cost Function.

16.6.2. Long Run Cost Function

16.6.1.1 Cost-Output Relationship and Cost Curves in the Short-Run

The relationship between cost and output varies across different time periods, namely the short run and the long run. Typically, production costs tend to be higher in the short run compared to the long run. This is because, over an extended period, producers have more opportunities to adjust various aspects of the production process, leading to cost efficiencies. When this relationship is illustrated graphically, it results in short-run and long-run cost curves for a firm. The following discussion provides a comprehensive analysis of cost-output relationships in both the short run and the long run.

16.6.1.2 Meaning of Short Run

In the short run, only variable factors can be adjusted, while fixed factors such as plant and machinery remain unchanged. As a result, the production capacity of a firm remains constant during this period. Additionally, the number of firms in an industry remains the same, as the short run does not allow enough time for new firms to enter or existing firms to exit. If a firm seeks to increase its output, it can only do so by utilizing additional variable factors, implementing extra work shifts, requiring overtime from the workforce, or making more intensive use of its existing capital

assets. Therefore, the short run is characterized as a period in which adjustments to changing conditions are limited.

The short-run cost function corresponds to the short-run production function and consists of two types of inputs: (a) fixed inputs and (b) variable inputs. Fixed inputs remain constant over time and cannot be modified, whereas variable inputs can be adjusted to alter production levels. Since certain inputs remain fixed in the short run, a firm can only expand or reduce its output by varying the quantity of variable inputs. The relationship between cost and output in the short run is determined by specific conditions, where production is constrained by the available plant and equipment. Consequently, a firm's costs in the short run are classified into fixed costs and variable costs. These two cost components will be examined in greater detail below.

16.6.1.3 Fixed Costs

Fixed costs are expenses associated with fixed factors such as land, buildings, equipment, plants, highly skilled labor, and top management. In the short run, these costs remain unchanged because the firm does not alter the scale of its plant or the quantity of fixed factors utilized. They do not fluctuate with changes in production levels, whether output increases or decreases. Even if a firm temporarily halts operations while staying in business, it must still bear these costs. Since they are unavoidable contractual obligations, they are independent of output.

According to Prof. Marshall, fixed costs are also known as supplementary costs. They include expenses such as contractual rent payments, interest on borrowed capital, insurance premiums, depreciation, maintenance allowances, and administrative costs, including salaries of permanent staff and management. Additionally, they cover business-related taxes, property taxes, and license fees. Since these costs must be paid regardless of production activity, they are referred to as overhead costs. As they are distributed across each unit of output, they are also categorized as indirect costs.

16.6.1.4. Variable Costs

Variable costs refer to expenses associated with factors of production that fluctuate with output levels. These costs include expenditures on raw materials, wages for regular labor, transportation, power, fuel, and water, all of which change in direct proportion to production in the short run. If a firm temporarily halts operations, it ceases to utilize variable inputs and, consequently, does not incur variable costs. These costs arise only when production occurs and increase or decrease in line with output levels.

According to Prof. Marshall, variable costs—also known as prime or direct costs—are essential as they directly determine a firm's production volume. Production expenses comprise both fixed and variable costs, but their distinction is relevant only in the short run. Over the long run, all costs become variable, as firms can adjust all factors of production. However, in the short run, this differentiation is crucial as it affects the firm's average cost behavior. Even if a firm decides to halt production temporarily while remaining in business, it must still bear fixed costs but must at least cover its variable costs to sustain operations.

16.6.1.5 Cost-output Relationship and Nature and Behaviour of Cost Curves in the Short Run

To analyze the connection between the output level and the associated production cost, it is essential to create a cost schedule for the firm. A cost schedule is a structured representation that illustrates how costs fluctuate with changes in output levels. It highlights the relationship between cost and production variations. The following table presents a hypothetical cost schedule of a firm.

Table 16.1: Cost Schedule of a firm

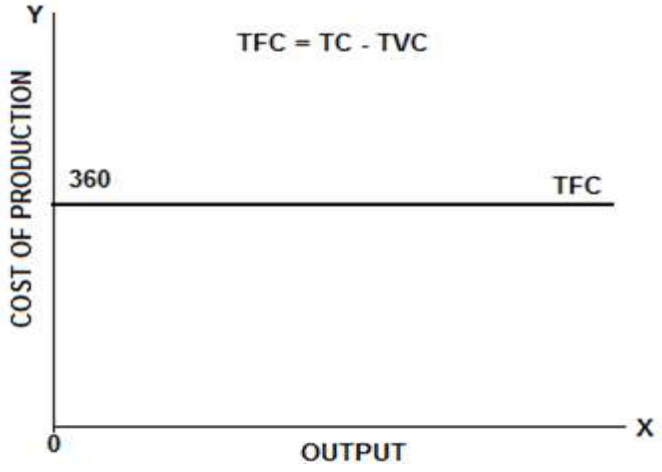
Output in Units	TFC	TVC	TC	AFC	AVC	AC	MC
0	360	-	360	-	-	-	-
1	360	180	540	360	180	540	180
2	360	240	600	180	120	300	60
3	360	270	630	120	90	210	30
4	360	315	675	90	78.75	168.75	45
5	360	420	780	72	84	156	105
6	360	630	990	60	105	165	210

Based on the given cost schedule, we can examine how variations in output levels influence production costs. When this relationship is depicted graphically, it results in different types of cost curves for the short run. Typically, in the short run, we analyze various cost concepts and their corresponding cost curves.

16.6.1.6 Total Fixed Cost (TFC)

Total Fixed Cost (TFC) represents the total expenditure on fixed inputs such as plant, machinery, tools, and equipment in the short run. It corresponds to the fixed inputs in the short-run production function and remains unchanged regardless of the level of output. Even when production is zero, TFC remains constant. This means that whether the output is 1 unit or 6 units, the total fixed cost does not vary.

The TFC curve appears as a horizontal line parallel to the OX-axis, signifying its invariability over time. It begins from a point on the Y-axis, indicating that fixed costs are incurred even when no output is produced. For instance, in this case, the TFC is Rs 360, calculated by summing up the quantities of fixed inputs multiplied by their respective unit prices.



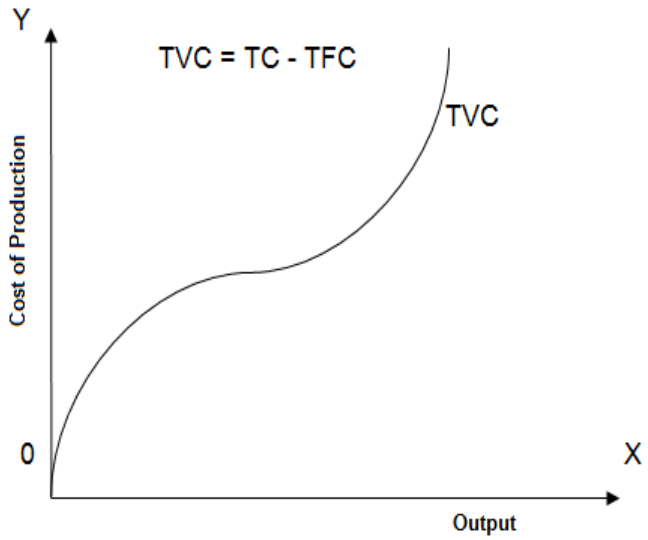
16.6.1.7 Total Variable Cost (TVC)

Total Variable Cost (TVC) represents the total expenditure on variable inputs such as raw materials, electricity, fuel, water, transportation, and communication in the short run. It corresponds to the variable factors used in the short-run production process and is determined by multiplying the quantity of variable inputs by their respective prices. The formula for calculating TVC is:

TVC = TC - TFC

Alternatively, TVC is a function of output: TVC = f(Q), indicating that it increases as production expands. If there is no production, TVC is zero. Therefore, it is a direct cost associated with output.

The TVC initially increases rapidly, then at a slower rate, and eventually rises sharply again, following the law of variable proportions. This law states that at first, a small increase in variable inputs leads to a higher output, but beyond a certain point, diminishing returns set in, requiring a larger quantity of variable inputs to achieve the same increase in output.

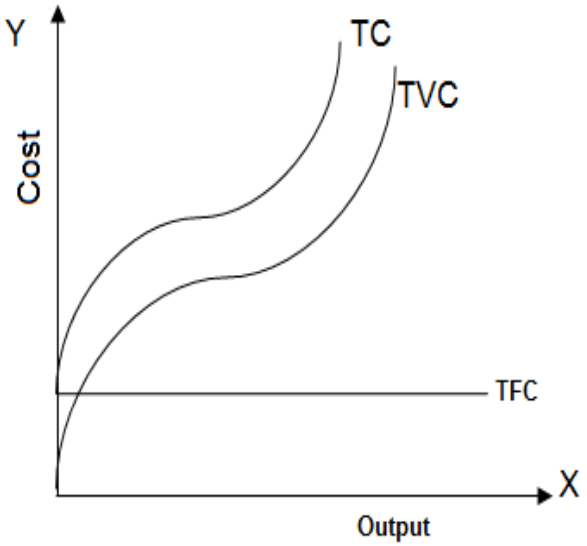


The TVC curve slopes upward from left to right, reflecting the rise in variable costs as production expands. Since TVC is zero when output is zero, the curve originates from the origin.

16.6.1.8 Total Cost (TC)

Total cost represents the total monetary expenditure a firm incurs to produce a specific quantity of output. It is determined based on the production function by multiplying factor prices with their respective quantities. Mathematically, total cost (TC) is a function of output (Q), expressed as TC = f(Q), indicating that total cost fluctuates with production levels. The concept of total cost encompasses both explicit and implicit costs, including normal profit, which is considered an implicit cost. Additionally, total cost consists of fixed costs (TFC) and variable costs (TVC), represented as TC = TFC + TVC. Since TFC remains constant in the short run, any change in total cost is solely attributed to variations in TVC.

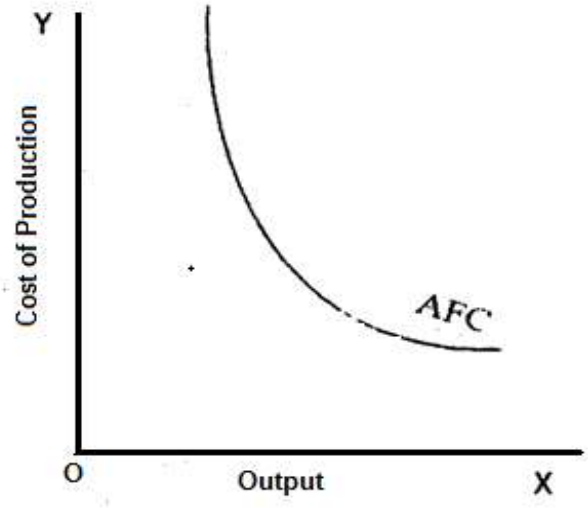
The total cost (TC) curve slopes upward from left to right. In this case, the TC curve begins at Rs. 360 because total fixed cost (TFC) remains a positive value even when output is zero. The shapes of the TC and total variable cost (TVC) curves are similar since both increase proportionally with output, given that TFC remains unchanged. The TC curve is obtained by vertically summing the TVC and TFC curves. The vertical gap between the TVC and TC curves represents the TFC, which remains constant throughout as TFC does not vary.



16.6.1.9. Average fixed cost (AFC)

Average fixed cost is the fixed cost per unit of output. When TFC is divided by total units of output AFC is obtained**,** Thus, AFC = TFC/Q .

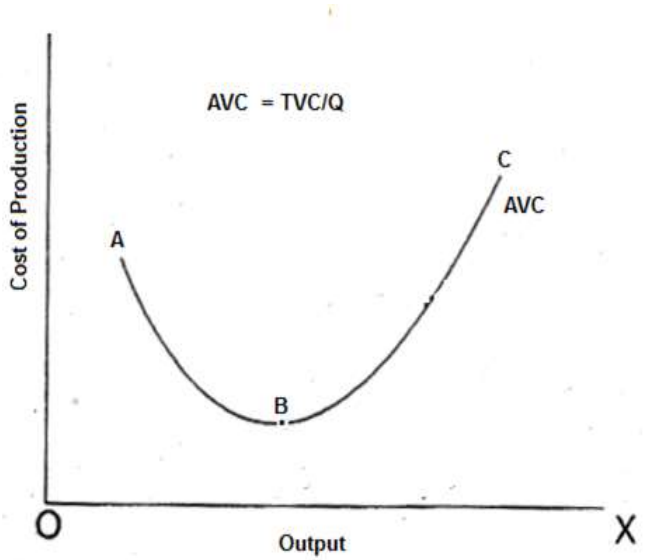
Average Fixed Cost (AFC) and output share an inverse relationship. At lower levels of output, AFC is relatively high, whereas it decreases as output expands within a given plant. This occurs due to a fundamental mathematical principle: since AFC is calculated as Total Fixed Cost (TFC) divided by output (Q), the numerator remains constant while the denominator increases, leading to a reduction in AFC. As output grows, TFC is distributed across a larger number of units, causing AFC to decline continuously. This inverse relationship between output and fixed cost applies universally across all types of businesses.



The Average Fixed Cost (AFC) curve exhibits a downward slope throughout its course. Initially, it declines sharply, then gradually, and eventually approaches the X-axis without ever touching it. Mathematically, AFC decreases as output expands; however, it never reaches zero since Total Fixed Cost (TFC) remains a positive value. Additionally, AFC cannot drop below a certain minimum level because, in the short run, plant capacity is fixed, restricting the extent to which output can be increased.

16.6.1.10 Average Variable Cost (AVC)

The average variable cost (AVC) refers to the variable cost incurred per unit of output. It is calculated by dividing the total variable cost (TVC) by the total quantity of output, represented by the formula: AVC = TVC/Q. Initially, as production increases, AVC decreases, but after a certain point, it begins to rise. This occurs because, in a fixed production setup, adding more variable inputs initially enhances efficiency, but beyond a certain level, their effectiveness diminishes.



The AVC curve is a U-shaped cost curve. It has three phases.

a) Decreasing Phase

During the initial phase (A to B), the Average Variable Cost (AVC) declines as output increases. This occurs because adding more variable inputs to a fixed factor leads to a more efficient and proportionately higher output, benefiting from increasing returns.

b) Constant Phase

At point B, AVC reaches its lowest level. This happens when the combination of fixed and variable inputs is optimal, allowing the firm to achieve maximum efficiency. When the firm operates at full capacity, output reaches its peak, resulting in the minimum AVC.

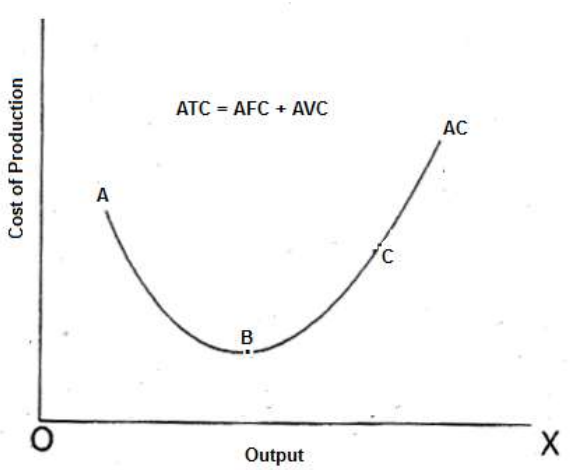
c) Increasing Phase

Beyond point B, in the third phase (B to C), AVC begins to rise as the firm surpasses its normal capacity. At this stage, adding more variable inputs does not lead to a proportionate increase in output. Instead, the cost per unit rises significantly. This phase illustrates the principle that excessive input utilization leads to inefficiencies—commonly expressed in the saying, *"Too many cooks spoil the broth."* In essence, AVC decreases during increasing returns and rises once diminishing returns take effect.

16.6.1.11 Average Total Cost (ATC) or Average Cost (AC)

Average cost (AC) represents the cost incurred per unit of output. It is also referred to as the unit cost since it reflects the expenditure required to produce each unit. AC is derived by adding the average fixed cost (AFC) and average variable cost (AVC). Mathematically, it is calculated by dividing the total cost (TC) by the total quantity of output (Q), expressed as AC = TC/Q. In the short run, the AC curve typically exhibits a U-shape due to the combined effects of the AFC and AVC curves, which influence its overall structure.

As output increases, the average fixed cost (AFC) declines, while the average variable cost (AVC) initially decreases before starting to rise. As long as the reduction in AFC outweighs the increase in AVC, the average cost (AC) continues to fall. During this phase, increasing returns and economies of scale are in effect, leading to efficient resource utilization and a decline in AC. When the firm reaches its optimal output level, AC reaches its minimum, known as the least-cost output level.



At the point where the increase in AVC exactly offsets the decrease in AFC, AC remains constant due to the balancing effect.

In the third stage, when the increase in Average Variable Cost (AVC) surpasses the reduction in Average Fixed Cost (AFC), the Average Cost (AC) starts to rise. Beyond the optimal production level, diminishing returns set in, leading to diseconomies of scale. During this phase, the inefficient use of indivisible factors contributes to the rise in AC. The short-run AC curve, often referred to as the "Plant Curve," illustrates the most efficient utilization of a specific plant or its capacity.

16.6.1.12. Marginal Cost (MC)

Marginal Cost (MC) refers to the additional cost incurred when producing one extra unit of output. In other words, it represents the increase in total cost resulting from an increase in production. For instance, if the total cost of producing 50 units of a product is Rs. 100 and the cost rises to Rs. 105 for 51 units, the marginal cost would be Rs. 5. It is calculated by determining the change in total cost due to a variation in output. Mathematically, MC is expressed as:

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

Where, ΔTC stands for change in total cost and Δ TQ stands for change in total output. Also $\mathbf{MC_n = TC_n - TC_{n-1}}$

It is important to note that marginal cost is independent of total fixed cost (TFC) and is directly linked to total variable cost (TVC), as it only considers the cost of producing one additional unit. In the short run, the MC curve generally follows a U-shape, influenced by the laws of returns. When MC declines, production benefits from increasing returns, whereas a rising MC indicates diminishing returns to production.

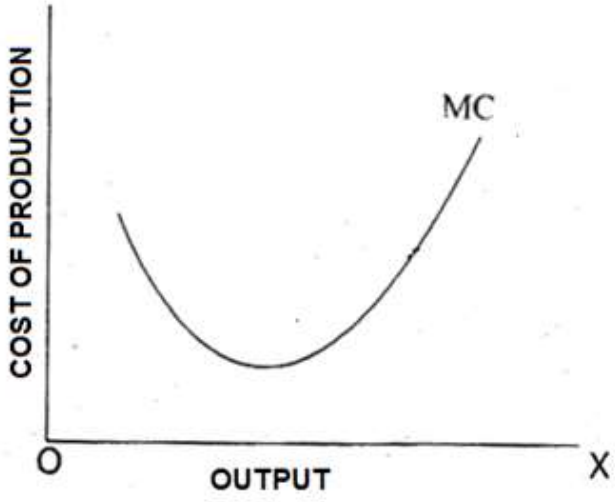


Table 16.2: Relationship between AC & MC

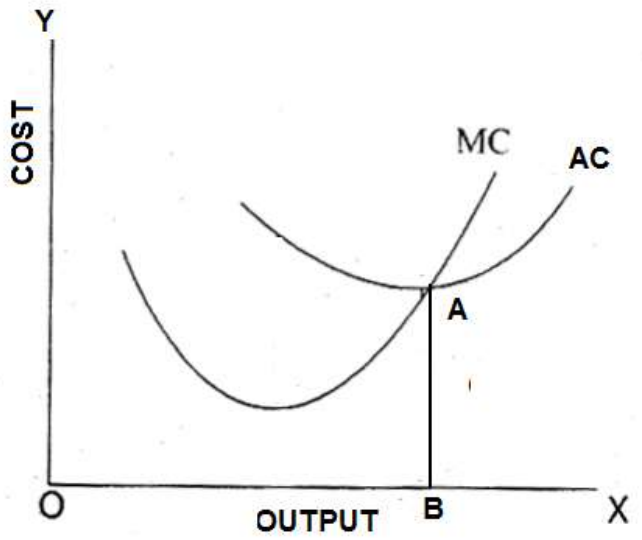
Output in Units	TC in Rs.	AC in Rs.	Difference in Rs. (MC)
1	150	150	-
2	190	95	40
3	220	73.3	30
4	236	59	16
5	270	54	34
6	324	54	54
7	415	59.3	91
8	580	72.2	165

16.6.1.13 Relation between AC and MC

The relationship between AC and MC can be understood through the following points:

(i) Both AC and MC decrease initially as output increases but begin to rise after reaching a certain level of production.

(ii) When AC declines, MC also falls. However, at a certain output level, MC starts rising even while AC continues to decrease. Despite this, MC remains lower than AC. This occurs because MC is calculated for a single additional unit, whereas AC considers the cost spread over all units produced.



(iii) As long as AC is decreasing, MC remains lower than AC. Therefore, the MC curve lies below the AC curve, indicating that the decline in MC is more pronounced than the decline in AC. Additionally, MC reaches its lowest point before AC does.

(iv) When AC begins to rise beyond the point where the curves intersect, MC surpasses AC. This happens because the increase in MC applies to a single unit, whereas the rise in AC is averaged over all units.

(v) As long as AC is rising, MC remains greater than AC. Hence, the MC curve lies above the AC curve, indicating that the increase in MC is steeper than the increase in AC.

(vi) The MC curve intersects the AC curve at AC's minimum point. This is because when MC decreases, it pulls AC downward, and when MC rises, it pushes AC upward. At the minimum point of AC, there is no further upward or downward influence from MC, meaning MC equals AC at this point. This intersection represents the optimal cost combination for the firm, where it operates at its optimum capacity

with the lowest AC. Beyond this level of output, costs continue to rise, indicating the firm is moving towards maximum capacity with increasing costs.

16.6.2 LAC curve

Long-run average cost refers to the total cost incurred in the long run divided by the quantity of output produced. Essentially, it represents the cost per unit of production at various output levels, considering adjustments in plant size or production scale.

16.6.2.1 Cost Output Relationship in the Long Run

The long run refers to a timeframe in which all adjustments to changing conditions are fully implemented. During this period, both fixed and variable factors can be modified, meaning there are no fixed costs. Unlike the short run, where a firm operates within its existing plant capacity, the long run allows for flexibility in production. If product demand rises, the firm can increase output by expanding plant capacity, constructing or leasing new buildings, installing machinery, and hiring additional staff. It can optimize the use of both existing and new resources, making previously indivisible factors more adaptable. Conversely, if demand declines, the firm can permanently scale down production, reduce plant size, and minimize other costs, leading to lower production expenses over time.

Since all costs in the long run are variable, the total cost of production consists solely of these costs, eliminating the distinction between fixed and variable costs. Consequently, in long-term production decisions, only the average total cost is considered significant.

16.6.2.2 Derivation of Long Run Average Lost (LAC):

In the long run, all costs become variable, eliminating the need to differentiate between fixed and variable costs. The long-run average cost (LAC) curve is derived from short-run average cost (SAC) curves as a firm adjusts its plant size to minimize the average cost of production while increasing output. The LAC curve represents the lowest attainable SACs. Initially, it declines as output grows due to increasing returns to scale. However, as diminishing returns set in, the LAC curve begins to rise. At its lowest point, the LAC curve reflects constant returns to scale, giving it a characteristic ‘U’ shape as it envelopes the SAC curves (fig 16.8).

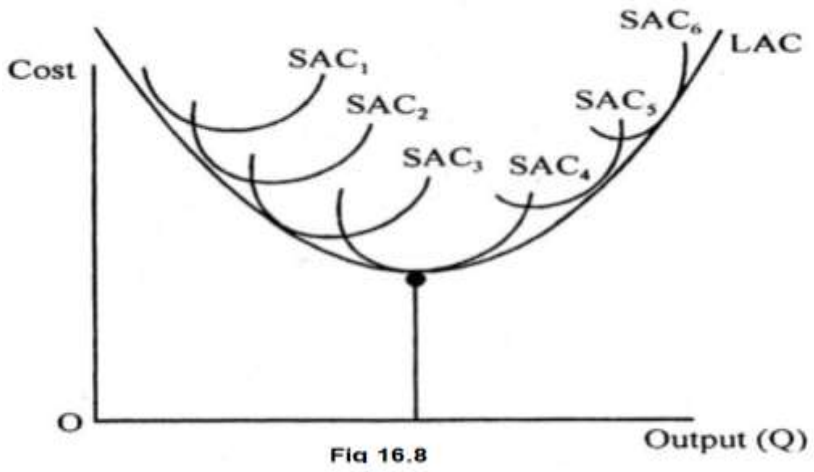


Fig 16.8

In the given diagram, the Long-Run Average Cost (LAC) curve is formed by connecting the lowest cost points on different Short-Run Average Cost (SAC) curves, such as SAC1, SAC2, SAC3, and so forth, corresponding to various levels of output. Since all factors of production are variable in the long run, firms adjust their plant size accordingly, leading to shifts in SAC curves from SAC1 to SAC2, SAC3, and beyond. Initially, as economies of scale result in increasing returns, the successive points on these shifting SAC curves lie below the previous ones, causing the LAC curve to slope downward until it reaches its lowest point, denoted as M. At point M, the firm operates at an optimal plant size, achieving constant returns to scale. Beyond this point, the LAC curve rises due to decreasing returns.

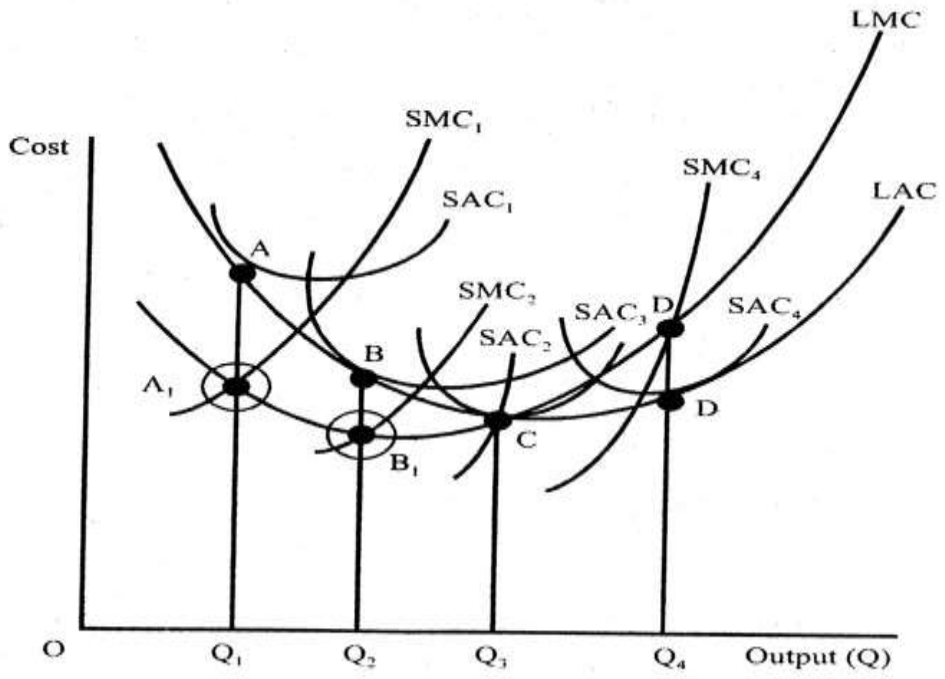
16.6.2.3 Long Run Marginal Cost (LMC):

The Long-Run Marginal Cost (LMC) curve is derived as follows (refer to Figure 16.9):

(i) Draw perpendiculars from the points on the Long-Run Average Cost (LAC) curve where it intersects with the corresponding Short-Run Average Cost (SAC) curves. In the diagram, these perpendiculars are represented as AQ_1, BQ_2, CQ_3, and DQ_4, among others.

(ii) Identify the points where these perpendiculars intersect with their respective Short-Run Marginal Cost (SMC) curves. These intersection points are labeled as A_1, B_1, C, and D_1 in the diagram.

(iii) Connect these points, passing through the minimum of the LAC curve, to obtain the LMC curve.



16.6.2.4 Important Features of Long Run AC Curves

1. Tangent Curve

Short-run average cost (SAC) curves represent the cost structures of different plants operating at varying capacities. The long-run average cost (LAC) curve serves as the locus of all these SAC curves at their points of tangency. While SAC curves touch the LAC curve, they never intersect it, signifying that for any level of

production, no SAC curve can fall below the LAC curve. This highlights that in the long run, SAC will always be equal to or higher than LAC. Therefore, the LAC curve remains tangential to multiple SAC curves.

2. Envelope Curve

The LAC curve is referred to as the envelope curve because it encloses various SAC curves, each corresponding to different levels of production.

3. Flatter U-shaped or Dish-shaped Curve

The LAC curve exhibits a U-shaped or dish-shaped structure, though it is flatter and less steep than the SAC curves. It declines initially and then rises due to the influence of economies and diseconomies of scale.

4. Planning Curve

The LAC curve is often called the planning curve because it illustrates the minimum cost required to produce each level of output. It assists in determining the optimal level of production that minimizes long-run costs. This is achieved when an entrepreneur selects the optimal plant size, where the lowest point of the SAC curve coincides with the lowest point of the LAC curve.

5. Minimum point of LAC curve should be always lower than the minimum point of SAC curve

The lowest point of the LAC curve must always be lower than that of the SAC curve, as the LAC curve never exceeds the SAC curve, nor can the SAC curve fall below the LAC curve. The LAC curve touches the SAC curve of the optimal plant at its lowest point. A rational entrepreneur would opt for the plant size where the SAC curve is tangent to the LAC curve at their respective minimum points. In this scenario, OM_2 represents the ideal output level with the lowest cost per unit, where LAC equals SAC. The LAC curve also touches SAC curves located to the left and right of the optimal scale; however, at these points, neither LAC nor SAC is at its minimum, leading to higher costs.

Self-Check Exercise-3

Q.1 Discuss various types of costs functions.

16.7 SUMMARY

Cost Function: The term cost function is a financial term used by economists to understand how costs behave. The cost function shows how a cost changes as the levels of an activity relating to that cost changes.

Cost function is a derived function. It is derived from the production function, which describes the efficient method of production at any one time. In other words, the production function specifies the technical relationships between inputs and the level of output. Thus, cost will vary with the changes in the level of output, nature of production function, or factor prices. Thus, symbolically, we may write the cost function as

$$C = f(X, T, Pf)$$

Where, C = Total cost, X = Output, T = Technology, Pf = Prices of factors.

The factors influencing cost include technology, the rate of output, plant size and scale of production, the prices of factor inputs, the efficiency of production

factors, output stability, the law of returns, and the time period. Broadly, cost functions are categorized into two types: short-run cost functions and long-run cost functions.

Average Cost (AC) represents the cost per unit of output and is also referred to as unit cost. It is calculated as the sum of Average Fixed Cost (AFC) and Average Variable Cost (AVC). Marginal Cost (MC) is the additional cost incurred when producing one more unit of output. In other words, it reflects the change in total cost due to the production of an extra unit.

The relationship between AC and MC follows a specific pattern. Both AC and MC initially decline within a certain range of output and subsequently begin to rise. When AC decreases, MC also falls; however, at a particular stage, MC starts to increase while AC continues to decline. Despite this, MC remains lower than AC because MC accounts for the cost of producing a single additional unit, whereas AC is distributed across all units of output. As long as AC is decreasing, MC remains below it, and the MC curve lies beneath the AC curve. This suggests that the decline in MC is greater than the decline in AC. Additionally, MC reaches its lowest point before AC does. Once AC begins to rise, MC surpasses AC, positioning the MC curve above and to the left of the AC curve.

16.8 GLOSSARY

- **Money Cost**: The cost of production when expressed in monetary terms is referred to as money cost.
- **Real Cost**: This represents the physical or mental effort involved in producing a good or service. It accounts for the sacrifices made by individuals during the production process.
- **Explicit Costs**: These are direct, contractual payments made by an entrepreneur to the factors of production, excluding their own contribution. They include expenses such as rent, wages, interest, profits, utility costs, and raw material purchases.
- **Implicit or Imputed Costs**: These costs are not directly paid out in cash and do not appear in financial records. They represent the earnings of self-owned or self-employed resources.
- **Actual Costs**: Also known as outlay costs, absolute costs, or acquisition costs, these are expenses that require financial outflows and are recorded in a company's accounts. They reflect the real expenditure incurred in acquiring or producing goods and services.
- **Opportunity Cost**: This refers to the potential earnings that could have been generated if a resource were utilized in its next best alternative use. Essentially, it is the cost of the sacrificed alternative and is often called an alternative cost.
- **Direct Costs**: These are expenses that can be specifically assigned to a particular product, department, or production process.
- **Indirect Costs**: These costs cannot be directly linked to a single product, department, or production activity. Instead, they are spread across multiple operations and are not easily attributable to a specific unit.

- **Short-Run Cost Function**: This function is associated with short-run production, where inputs are categorized as either fixed or variable. Fixed inputs remain unchanged over a given period, whereas variable inputs fluctuate to adjust the level of output. In the short run, some inputs remain constant, while output variations depend on changes in variable inputs.
- **Total Fixed Cost (TFC)**: TFC represents the total expenditure on fixed inputs such as machinery, tools, and equipment during the short run. This cost remains constant across different levels of output.
- **Total Variable Cost (TVC)**: TVC includes all expenditures on variable inputs like raw materials, fuel, power, transportation, and communication during the short run. It fluctuates with changes in production levels.
- **Total Cost (TC)**: This is the overall financial expenditure incurred by a firm to produce a specific quantity of output. It is the sum of fixed and variable costs.
- **Average Fixed Cost (AFC) & Average Variable Cost (AVC)**: AFC is the fixed cost per unit of output, calculated by dividing TFC by total output. AVC, on the other hand, represents the variable cost per unit, obtained by dividing TVC by the total output.
- **Marginal Cost (MC)**: Marginal cost is the additional expense incurred when producing one extra unit of output. It reflects the change in total cost due to a marginal increase in production.

16.9 ANSWERS TO SELF-CHECK EXERCISES

Self-Check Exercise-1

Ans.1 Please refer to section 16.3 and 16.4

Self-Check Exercise-2

Ans.1 Please refer to section 16.5

Self-Check Exercise-3

Ans.1 Please refer to section 16.6

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16.11 TERMINAL QUESTIONS

Q1. Discuss Relationship between AC, AFC, AVC and MC Curves.?

Unit-17

CONCEPT OF REVENUE

STRUCTURE

17.1 INTRODUCTION

In the last unit, we studied about the concept of cost and cost function. In this unit we will focus our attention to Revenue and its different functions.

17.2 LEARNING OBJECTIVES

After going through this unit, you will be able to

- Outline concepts of Revenue Functions
- State the relation between AC and MC

17.3 REVENUE FUNCTION

The revenue function represents the total income generated based on the price per unit of a product and the quantity sold. If 'x' units are sold at a price of 'p' per unit, the total revenue, denoted as R(x), is given by the equation R(x) = px, where both p and x are positive values.

For instance, an example of total revenue (TR) could be expressed as $TR = 200 – 6.5Q^2$.

In simple terms, a firm's revenue refers to the total earnings or receipts obtained from selling its output. Revenue can be categorized into different types, which will be explored under three main sections.

(i) Total Revenue,

(ii) Marginal Revenue and

(iii) Average Revenue.

17.3.1 Total Revenue (TR):

Total revenue refers to the overall income a firm earns from selling its goods or services. It represents the total sales proceeds or receipts generated by the firm.

Example: Suppose a company manufactures cloth and sells 100 meters in the market at a price of ₹8 per meter. The total earnings from this sale would be ₹800. If the firm sells 200 meters, its total revenue would increase accordingly. Thus, total revenue depends on the quantity of goods or services sold.

Formula: Total Revenue = Price × Quantity Sold

$TR = P \times Q$

TR = Rs. 8 × 200 = Rs. 1600

17.3.2 Marginal Revenue (MR):

Marginal Revenue (MR) refers to the increase in total revenue (TR) resulting from the sale of an additional unit of output. In simpler terms, it represents the extra revenue a firm earns by selling one more unit of its product in the market. It is also considered the net revenue generated from the sale of an additional unit.

Example: Suppose a company sells 200 meters of fabric at a price of Rs. 8 per meter, generating a total revenue of Rs. 1600. If the firm increases its sales from 200 meters to 201 meters, the total revenue rises to Rs. 1608. The Rs. 8 increase in total revenue due to the sale of one extra meter represents the marginal revenue.

MR can be mathematically expressed as follows:

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

MR can also be found using another formula

$$MR_n = TR_n – TR_{n–1}$$

Where, TR_n is total revenue of *n* units of output and TRn–1 is total revenue of *n–1* units of output. Suppose TR of 2 units is equal to Rs. 10 and TR of 3 units is Rs. 14. Then MR is 14 – 10 = 4.

17.3.3 Average Revenue (AR):

Average revenue refers to the income generated per unit of output sold. It is calculated by dividing the total revenue by the total quantity of goods sold in the market.

For instance, if a company sells 200 meters of fabric for ₹600, the average revenue would be ₹600 ÷ 200 = ₹3 per meter. This value indicates the average

selling price of the product per unit. The average revenue curve is also known as the demand curve.

$$\text{Average Revenue} = \frac{Total\ Revenue}{Quantity}$$

17.3.4 Relationship between TR, AR and MR

Table-17.1:The following table shows the relationship between TR, AR and MR.

Quantity Sold (Q)	Price Per unit (P)	TR = P × Q	AR = $\frac{TR}{Q}$	$MR_n = TR_n - TR_{n-1}$
1	10	10	10	10
2	9	18	9	8
3	8	24	8	6
4	7	28	7	4
5	6	30	6	2
6	5	30	5	0
7	4	28	4	-2

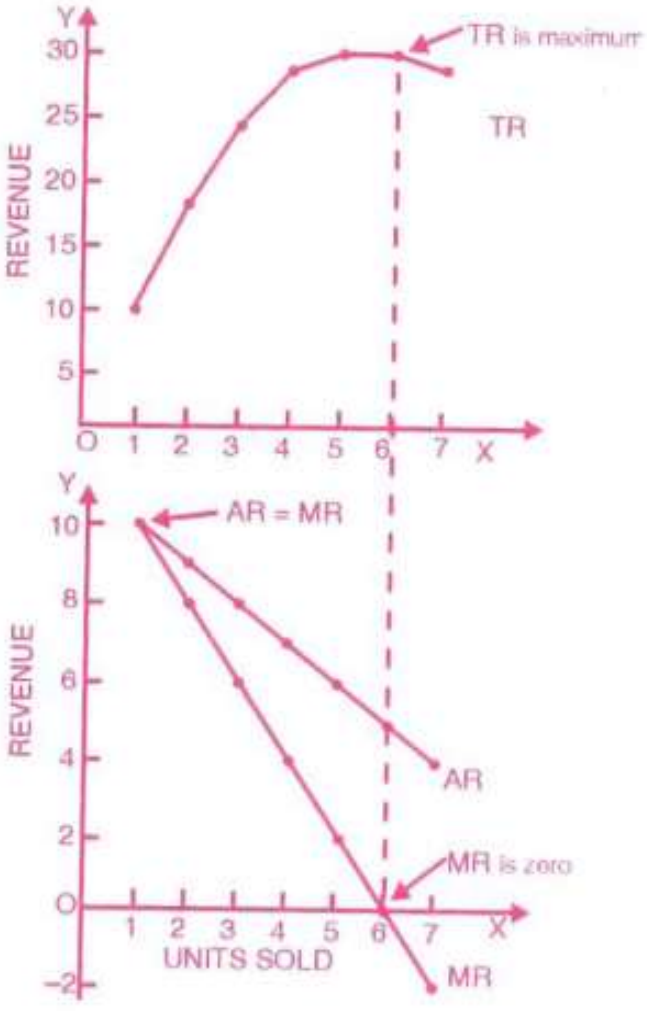
The graphical representation of the relationship between Total Revenue (TR), Average Revenue (AR), and Marginal Revenue (MR) is shown in the figure below.

(a) Total Revenue (TR) continues to rise as long as Marginal Revenue (MR) remains positive. In the provided table, this trend is observed up to an output level of six units.

(b) TR reaches its highest point when MR becomes zero. According to the table, when six units of the commodity are sold, MR is zero, and TR attains its maximum value.

(c) As both Average Revenue (AR) and MR decline, MR decreases at a faster rate than AR, meaning that MR always remains lower than AR.

Average Revenue represents the revenue earned per unit of output sold and is calculated by dividing TR by the quantity of goods sold. Marginal Revenue, on the other hand, measures the change in TR resulting from the sale of an additional unit and is derived by taking the first derivative of the TR function. Since both AR and MR originate from TR, they share a close interdependence.



The relationship between Average Revenue (AR) and Marginal Revenue (MR) follows a general economic principle that applies to various marginal and average concepts. The key points of this relationship are:

- When the marginal value is lower than the average, the average decreases. This means that when AR declines, MR is less than AR.
- When the marginal value is higher than the average, the average increases. In other words, when AR is rising, MR exceeds AR.
- When the marginal value equals the average, the average remains unchanged.

This fundamental principle is observed across different economic variables, including average and marginal cost, product, factor cost, and propensities to consume. Mathematically, the relationship between AR and MR indicates that changes in AR depend on the comparison between AR and MR. The nature of this relationship varies across different market structures.

In **perfect competition**, where the price remains constant for all units sold, AR is equal to price (or demand). Consequently, AR and MR are identical, forming a horizontal line. Since price does not change with output, MR coincides with AR at every level of production.

However, in **imperfect competition** (such as monopoly or monopolistic competition), firms must lower prices to increase sales. As a result, the AR curve slopes downward, reflecting the inverse relationship between price and quantity demanded. The MR curve also slopes downward but falls more steeply than the AR curve. This happens because, in imperfect markets, marginal revenue decreases at a faster rate than average revenue. Thus, the MR curve always lies below the AR curve in such market conditions.

The relationship between AR and MR varies depending on market structure. Below, we explore this relationship under competitive and non-competitive market conditions.

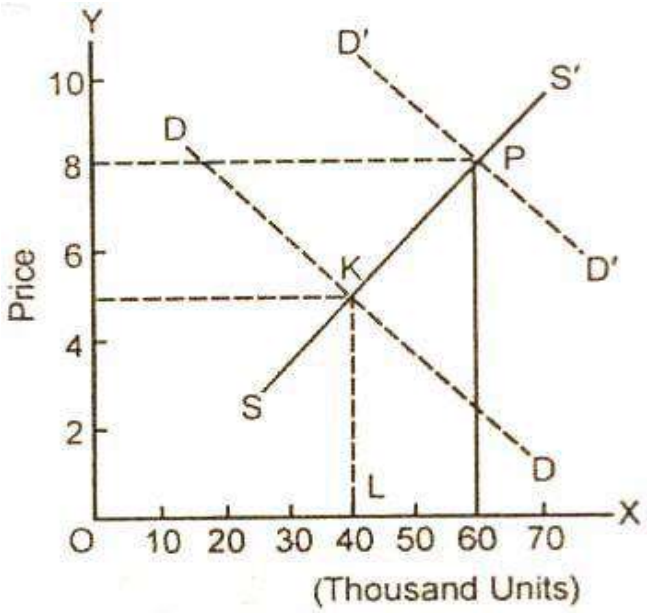
Self-Check Exercise-1

Q.1 What is Revenue Function? Discuss relationship between TR,AR and MR.

17.4 REVENUE CURVE OF AN INDIVIDUAL FIRM UNDER PERFECT COMPETITION: PERFECT COMPETITION

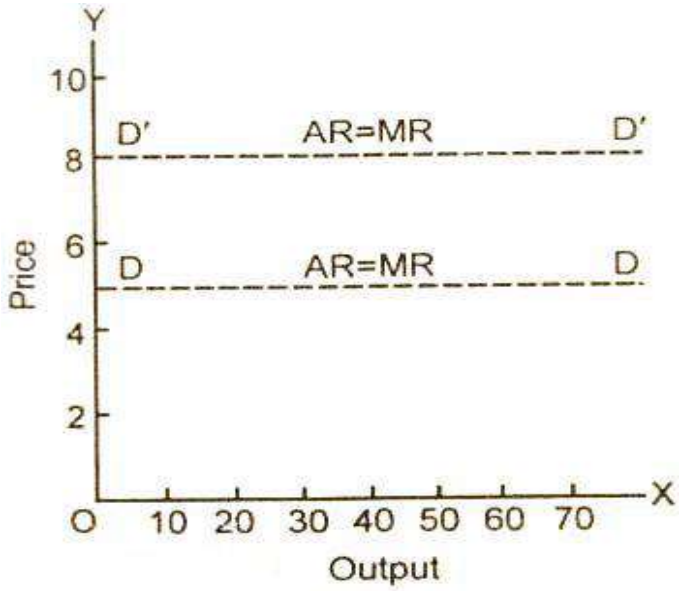
In a perfectly competitive market, there are numerous buyers and sellers, ensuring that no single participant can influence the market price. Firms must sell their products at the prevailing market rate, while buyers possess complete knowledge of product quality and pricing. Likewise, factors of production are aware of the compensation received by similar factors elsewhere. Additionally, resources are perfectly mobile, allowing free movement across locations and occupations without any artificial restrictions imposed by the state.

Sellers in such a market offer identical and homogeneous products. As a result, a uniform price prevails for these goods across all market segments. If a seller attempts to lower prices below the market rate, their products will be quickly sold due to buyers' perfect market awareness. Conversely, setting a higher price will result in no sales. To maximize profit, sellers must offer their entire output at the market-determined price, as illustrated in the figures below.



In the given figure, the market's demand and supply curves intersect at point K, where KL, or Rs. 5, represents the equilibrium market price.

The curve labeled DD represents the demand curve that an individual firm encounters. Regardless of whether a firm produces 5 units or 50 units, it must sell its product at the prevailing market price of Rs. 5. If, at any point, overall market demand increases and the price rises to PR (Rs. 8), an individual seller can sell its products at this new price, facing the adjusted demand curve D'D', as shown in the figure.



In a perfectly competitive market, any additional output is sold at the same price as the initial unit. Consequently, the average revenue (AR) and marginal revenue (MR) remain equal, causing both curves to coincide.

For example, if the market price of a product is Rs. 5 per unit and a firm sells 10 units, its total revenue amounts to Rs. 50. If the firm decides to sell an additional unit, it cannot influence the market price and must continue selling at Rs. 5 per unit. Thus, selling 11 units results in a total revenue of Rs. 55, with the marginal revenue from the additional unit being Rs. 5. Average revenue is determined by dividing total revenue by the quantity sold (e.g., Rs. 50/10 = 5, Rs. 55/11 = 5, Rs. 60/12 = 5). Therefore, under perfect competition, marginal revenue, average revenue, and price remain identical, as illustrated in the accompanying diagram and schedule.

Table 17.2

Units	Price Per Unit (Rs.)	Total Revenue (Rs.)	Marginal Revenue (Rs.)	Average Revenue (Rs)
10	5	50	5	5
11	5	55	5	5
12	5	60	5	5
13	5	65	5	5
14	5	70	5	5
15	5	75	5	5
16	5	80	5	5

In a perfectly competitive market, a firm's demand curve is represented by a horizontal line parallel to the quantity axis. Under these conditions, the Marginal Revenue (MR) and Average Revenue (AR) curves coincide with the price level, indicating that MR, AR, and Price are equal, as depicted in Figure 17.3.

Self-Check Exercise-2

Q.2 Diagrammatically show the revenue curve of an Individual firm under perfect competition.

17.5 REVENUE CURVE OF AN INDIVIDUAL FIRM UNDER IMPERFECT COMPETITION

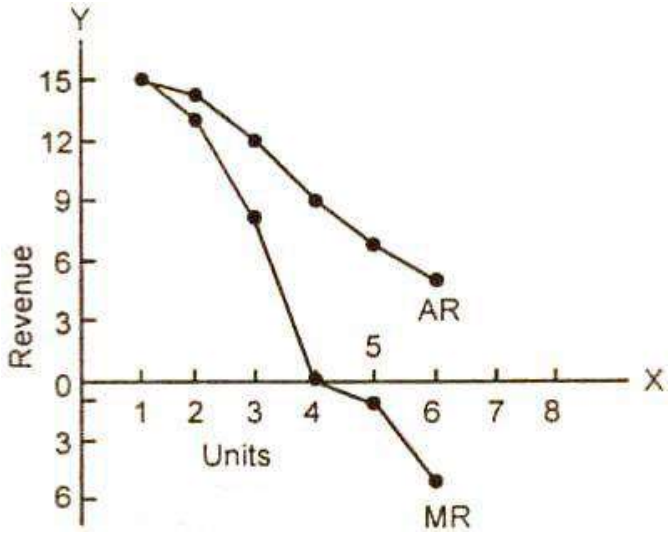
In imperfect competition, whether in the form of monopoly, duopoly, or oligopoly, a firm's demand curve has a downward slope from left to right. This indicates that the firm has some control over the market price, allowing it to sell a higher quantity at lower prices and a lower quantity at higher prices.

Regarding the marginal revenue (MR) curve in imperfect competition, it always lies below the average revenue (AR) curve. As production increases, the gap between these two curves widens. Additionally, the AR curve is identical to the price line, as illustrated in the following schedule.

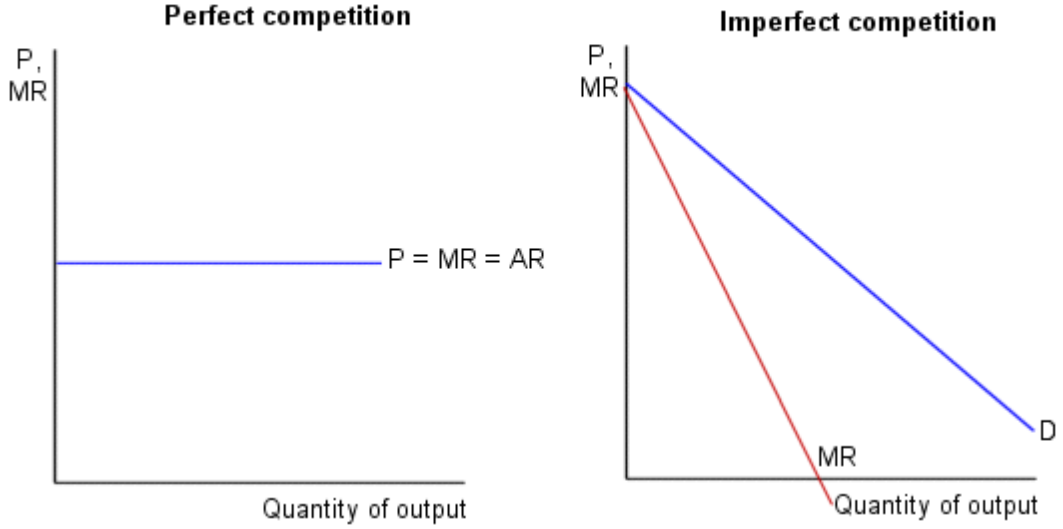
Table-17.3

Units sold	Price (Rs.)	Total Revenue (Rs.)	Marginal Revenue (Rs.)	Average Revenue (Rs)
1	15	15	15	15
2	14	28	13	14
3	12	36	8	12
4	9	36	0	9
5	7	35	-1	7
6	5	30	-5	5

The diagram clearly illustrates that both the average revenue (AR) curve and the marginal revenue (MR) curve have a downward slope. The MR curve is positioned below the AR curve because the output is sold at decreasing prices. Typically, this relationship is depicted in the following diagram.



The following figure gives a comparison of the AR and MR curves under the two situations.



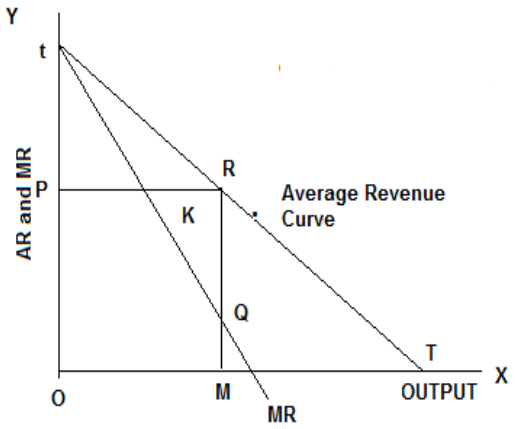
Self-Check Exercise-3

Q.1 Diagrammatically show the revenue curve of an Individual firm under Imperfect competition.

17.6 AVERAGE REVENUE, MARGINAL REVENUE AND ELASTICITY OF DEMAND

There is very useful relationship between elasticity of demand, average revenue and marginal revenue at any level of output. We have stressed above that the average revenue curve of a firm is really the same thing as the demand curve of a consumer's for the firm's product. Therefore, elasticity of demand at any point on a consumer's demand curve is the same thing as the elasticity of demand on the given point on the firm's average revenue curve.

We know that elasticity of demand at point R on the average revenue curve tT in fig is RT/Rt with this measure of point elasticity of demand we can study the relationship between average revenue, marginal revenue and price elasticity at any level of output.



In fig AR, and MR are respectively average revenue and marginal revenue curves. Elasticity of demand at point R on the average revenue curve:

$$=\frac{RT}{Tt}$$

Now in triangle PtR and MRT

<tPR = <RMT (right angles)

< tRP = <RTM (corresponding angles)

And <PtR = < MRT

Therefore, triangles PtR and MTR are equiangular

Hence, $\frac{RT}{Rt} = \frac{RM}{Pt}$……(i)

in the triangles PtK and KRQ are congruent (i.e. equal in all respect)

Hence

Pt = RQ .....(ii)

From I and ii we get

Elasticity at R $=\frac{RT}{Rt} = \frac{RM}{Pt} = \frac{RM}{RQ}$

Now it is obvious from the figure that

$$\frac{RM}{PQ} = \frac{RM}{RM - QM}$$

Hence, elasticity at

R = $\frac{RM}{RM-QM}$

It will also be clear from the figure that RM is the average revenue and QM is the marginal revenue at output OM which corresponds to the point R on the average revenue curve. Therefore Elasticity at

R = $\frac{Average\ Revenue}{Average\ Revenue - MArginal\ Revenue}$

If, A stands for average revenue

M stands for marginal revenue

e stands for elasticity on the average revenue curve.

Then

e = $\frac{A}{A-M}$

It follows from this that

e. A - e. M = A

e.A – A = e.M

A (e-1) = e.M

A = $\frac{e.M}{e-1}$

Hence,

A = $M(\frac{e}{e-1})$

And also,

M = A($\frac{e-1}{e}$)

Self-Check Exercise-4

Q.1 Discuss Average Revenue, Marginal Revenue and Elasticity of Demand under Imperfect Competition.

17.7 SUMMARY

The revenue function illustrates the connection between a firm's revenue, the price, and the quantity of goods sold. Total revenue represents the company's overall earnings from sales. Marginal revenue (MR) refers to the additional income generated by selling one extra unit of output. Average revenue (AR) is obtained by dividing total revenue by the total number of units sold. If MR is lower than AR, the average revenue declines, indicating that a decrease in AR corresponds to MR being less than AR. Conversely, when MR surpasses AR, average revenue increases, meaning that as AR rises, MR exceeds AR. When MR and AR are equal, the average revenue remains unchanged.

17.8 GLOSSARY

- **Total Revenue (TR):** Total revenue refers to the overall income generated by a firm from the sale of its goods or services. It represents the total earnings from all sales transactions.
- **Revenue Function:** The revenue function defines the relationship between revenue earned and key factors such as the price of a good and the quantity sold.
- **Marginal Revenue (MR):** Marginal revenue is the additional income a firm gains when it sells one more unit of output. It is calculated as the change in total revenue resulting from the sale of an extra unit of the product.
- **Average Revenue (AR):** Average revenue refers to the revenue earned per unit of output. It is derived by dividing the total revenue by the total number of units sold in the market.

17.9 Answers to Self-Check Exercises

Self-Check Exercise-1

Ans.1 Please refer to section 17.3, 17.3.1 to 17.3.4

Self-Check Exercise-2

Ans.1 Please refer to section 17.4

Self-Check Exercise-3

Ans.1 Please refer to section 17.5

Self-Check Exercise-4

Ans.1 Please refer to section 17.6

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17.11 TERMINAL QUESTIONS

Q 1. What is the relationship between AR, MR and elasticity of demand?

Q 2. Write short notes on

(i) Average Revenue
(ii) Marginal Revenue and
(iii) Total Revenue

Unit-18

MARKET STRUCTURE

Structure

18.1 INTRODUCTION

The word "market" is often linked to a physical location where goods are exchanged. However, in economics, a market extends beyond a specific place and represents a system or network that enables buyers and sellers to interact and engage in transactions at mutually accepted prices. These exchanges can take place across large geographical areas or even internationally, supported by various communication and trade channels. The fundamental purpose of a market is to enable the exchange of goods and services by creating a platform for buyer-seller interactions.

18.2 LEARNING OBJECTIVES

After going through the Unit you will be able to:

- Define the term 'Market Structure'.
- State the Elements of Market structure.
- Explain the Determinants of Market Structure.
- Classify various Forms of Market Structure.
- Define Perfect and Imperfect forms of market.
- Explain the features/Characteristics of Perfect, Monopoly, Monopolistic and Oligopoly forms of market.

18.3 DEFINITION OF MARKET

In the words of Augustine Cournot, a French economist "Economists understand by the term market not a particular market place in which things are bought and sold, but 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 Frederic Bentham, "A market is 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 prices paid in other parts." Thus it is not necessary that a market should be in a building or at a particular place; it is also not necessary that buyers and sellers should be physically close to each other.

According to Sidgwick, "A market is a body of persons in such commercial relations that each can easily acquaint himself with the rates at which certain kinds of exchanges of goods or services are from time to time made by the others."

In the words of Jevons, "The word market has been generalized so as to mean any body of persons who are in intimate business relations and carry on extensive transactions in any commodity."

To Ely, "Market means the general field within which the forces determining the price of particular product operate."

A market fundamentally requires that buyers and sellers remain in continuous communication, whether by being physically present in the same location or by having the ability to connect instantly through telephone or other means.

18.4 COMPONENTS OF MARKET

A market consists of the following fundamental components:

(i) Presence of Buyers – A market must have potential buyers for a product. In a country where the majority of the population has limited purchasing power, the demand for luxury items such as cars or high-end electronics remains minimal.

(ii) Availability of Goods for Sale – For a market to function, commodities must be available for purchase. Without sellers offering goods, there can be no transactions.

(iii) Interaction Between Buyers and Sellers – Effective communication and engagement between buyers and sellers are crucial for market operations.

(iv) Existence of a Price Mechanism – Every commodity in a market is exchanged at a specific price agreed upon by both buyers and sellers, ensuring smooth transactions.

18.5 CLASSIFICATION OF MARKET

Markets can be categorized based on various factors, including geography, time, nature of transactions, business volume, seller status, and competition levels.

i) **Classification Based on Area**: Markets can be classified into local, national, and international markets depending on their geographical reach. A local market consists of buyers and sellers within a specific locality, typically dealing in perishable goods such as fruits and vegetables, which cannot be stored for long or transported over long distances. A national market exists when a product is traded across an entire country, with demand and supply spanning nationwide. An international market involves buyers and sellers across different countries, making the commodity globally traded. The extent of a market—whether local, national, or international—depends on factors such as the nature of the commodity, consumer preferences, availability of storage, business practices, political stability, and ease of transportation.

ii) **Classification Based on Time**: Economist Alfred Marshall categorized markets based on time into four types: very short period, short period, long period, and very long period markets.

- Very Short Period Market: This type of market deals with perishable goods or commodities that have a fixed supply. Since supply cannot be adjusted, prices are influenced solely by demand fluctuations.
- Short Period Market: In these markets, supply can be increased but only to a limited extent, as adjustments in production take time.
- Long Period Market: Here, producers can modify the supply by altering fixed factors of production, such as investing in new machinery or expanding production facilities.
- Very Long Period or Secular Market: This type of market experiences changes in broader economic factors like population growth, capital supply, and availability of raw materials, influencing market trends over an extended period.

iii) **Classification Based on the Nature of Transactions**: Markets can also be categorized based on how transactions occur:

- Spot Market: Transactions take place immediately, with goods being physically exchanged at the point of sale.
- Future Market: In this market, transactions are based on agreements for the future exchange of goods, allowing buyers and sellers to hedge against price fluctuations.

iv) **Classification Based on Volume of Business**: Markets vary in size depending on the volume of goods traded:

- Wholesale Market: Goods are bought and sold in bulk, typically serving as a link between producers and retailers.

- Retail Market: In these markets, goods are sold in smaller quantities to end consumers, often through retailers who source products from wholesalers.

v) **Classification Based on the Status of Sellers**: Markets can be divided based on the position of sellers in the supply chain:

- Primary Market: The first point of sale where goods are initially traded, often involving direct transactions between producers and wholesalers.
- Secondary Market: Here, goods are resold, usually from wholesalers to retailers.
- Terminal Market: The final point in the distribution chain where goods reach consumers after passing through various intermediaries.

vi) **Classification Based on the Degree of Competition**: Markets are also categorized based on the number of buyers and sellers and the level of competition:

- Perfectly Competitive Market: A market with many buyers and sellers where no single entity can influence prices.
- Monopolistic Competition: A market where multiple sellers offer similar but slightly differentiated products, leading to some degree of price control.
- Monopoly Market: A single seller dominates the market, controlling supply and prices without competition.
- Oligopoly Market: A market where a few large sellers dominate, often engaging in strategic pricing and market control.

With the exception of perfect competition, all other markets fall under imperfect competition.

18.6 THE ESSENTIALS OF A MARKET

1. A commodity to deal with.
2. The existence of buyers and sellers.
3. A place, it may be a particular place, a region or the whole country or the entire world.
4. The facilities for free interaction between sellers and buyers.

Self-Check Exercise-1

Q.1 Define Market. Discuss its components.

Q.2 Give Classification of Market also discuss essentials of a market.

18.7 MARKET STRUCTURE

Market Structure is also known as the number of firms producing identical products. Firm sells goods and services under different market conditions which economists call Market Structures.

A Market Structure describes the key traits of a market, including the number of firms, the similarity of the products they sell, and the ease of entry into and exit from, the market examinations of the business sector of our economy reveals firms' operating in different Market Structure.

Market Structure is best defined as the organizational and other characteristics of a market. These characteristics affect the nature of competition and pricing.

18.7.1 Elements of Market Structure

1. Number and size, Distribution of Firms
2. Entry Conditions
3. Extent of Product Differentiation

Types of Market Structure influences how a firm behaves regarding the following:

1. Price
2. Supply
3. Barriers to Entry
4. Efficiency
5. Competition

18.7.2 Determinants of Market Structure

1. Freedom of Entry and Exit
2. Nature of the Product: Homogeneous or Differentiated
3. Control over Supply /Output
4. Control over Price
5. Control to Entry

Self-Check Exercise-2

Q.1 What is market structure? Discuss elements and determinants of market structure.

18.8 FORMS OF MARKET

18.8.1 Perfect Competition

Perfect Competition is a theoretical Market Structure that features unlimited contestability (No barriers to enter) and unlimited number of producers and consumers, and a Perfect Elastic Demand Curve. Perfect competition is a market structure where an infinitely large number of buyers and sellers operate freely and sell a homogeneous commodity at a uniform price.

Features of Perfect Competition

1. Infinitely Large number of Buyers and Sellers When there is very large number of buyers no individual buyer can influence the market price. Similarly when there are a very large number of sellers, each firm or seller in a perfectly competitive market forms an insignificant part of the market. Therefore, no single seller has the ability to determine the price at which the commodity is sold. So who determines the price in such a market? In a perfectly competitive market, it is the forces of Market Demand and Market Supply that determines the price of the commodity. Since each firm accepts the price that is determined by the market, it becomes a Price Taker. As the market determines the Price, it is the Price Maker.

2. Homogenous Product In a perfect competitive market, firms sell homogeneous products. Homogenous products are those that are identical in all respects i.e. there is no difference in packaging, quality colours etc. As the output of one firm is exactly the same as the output of all others in the market, the products of all firms are perfect substitute for each other.

3. Free Entry in to and Exit from the market Very easy entry into a market means that a new firm faces no barriers to entry. Barriers can be financial, technical or government imposed barriers such as Licenses, Permits and Patents. The implication of this feature of Perfect Competition is that while in the short run firms can make either supernormal profits or losses, in the long run all firms in market earn only normal profits.

4. Perfect Knowledge of Market Buyers and sellers have complete and perfect knowledge about the product and prices of other sellers. This feature ensures that the market achieves a uniform price level.

Self-Check Exercise-3

Q.1 What is Perfect Competition? Discuss its features.

18.8.2 Monopoly

Pure Monopoly is the form of market organization in which there is a single seller of a commodity for which there are no close substitutes. Thus, it is at the opposite extreme from perfect competition monopoly may be the result of: (1) Increasing returns to scale; (2) Control over the supply of raw materials; (3) Patents; (4) Government Franchise.

Features of Monopoly

1. **A Single Seller:** There is only one producer of a product. It may be due to some natural conditions prevailing in the market, or may be due to some legal restriction in the form of patents, copyright, sole dealership, state monopoly, etc. Since, there is only one seller; any change in supply plans of that seller can have substantial influence over the market price. That is why a Monopolist is called a Price Maker. (A Monopolist's influence on the market price is not total because the price is determined by the forces of Demand and Supply and the Monopolist controls only the supply).

2. **No Close substitute:** The commodity sold by the Monopolist has no close substitute available for it, Therefore, if a consumer does not want the commodity at a particular price, he is likely to get available closely similar to what he is giving up. For example, there are chapters you have studied that the availability of substitute goods impact. The elasticity of demand for a product since the product has no close substitutes; the demand for a product sold by a monopolist is relatively inelastic.

3. **Barriers to the entry of new firms:** There are barriers to entry into industry for the new firms. It may be due to following reasons: (i) Ownership of strategic raw material or exclusive knowledge of production (ii) Patent Rights (iii) Government Licensing (iv) Natural Monopolies.

   The implication of barriers to entry is that in the short run, monopolist may earn supernormal profit or losses. However, in the long run, barriers to entry ensure that a monopolistic firm earns only super normal profits.

4. **Price Discrimination**: Price Discrimination exists when the same product is sold at different price to different buyers. A monopolist practices price discrimination to maximize profits. For example Electricity Charges in Delhi are different for Domestic users and Commercial and Industrial users.

5. **Abnormal Profits in the Long run:** Being the single seller, monopolists enjoy the benefit of higher profits in the long run.

6. **Limited Consumer Choice:** As they are the single producer of the commodity, in the absence of any close substitute the choice for consumer is limited.

7. **Price in Excess of Marginal Cost:** Monopolists fix the price of a commodity (per unit) higher than the cost of producing one additional unit as they have absolute control over Price Determination.

Self-Check Exercise-4

Q.1 What is Monopoly? Discuss its features.

18.8.3 Monopolistic Competition

Monopolistic competition is a situation in which the market, basically, is a competitive market but has some elements of a monopoly. In this form of market there are many firms that sell closely differentiated products. The examples of this form of market are Mobiles, Cosmetics, Detergents, and Toothpastes etc.

Features of Monopolistic Competition

1. **Large number of buyers and sellers:** In this form of market, while the buyers are as large as it is under perfect competition or monopoly, the number of sellers is not as large as that under perfect competition. Therefore, each firm has the ability to alter or influence the price of the product it sells to some extent.

2. **Product Differentiation:** Under Monopolistic Competition products are differentiated. This means that the product is same, brands sold by different firms differ in terms of packaging, size, colour features etc. For example-soaps, toothpaste, mobile instruments etc. The importance of Product Differentiations is to create an image in the minds of the buyers that the product sold by one seller is different from that sold by another seller. Products are very similar to each other, but not identical. This allows substitution of the product of one firm with that of another. Due to a large number of substitutes being available Demand for a firm's product is relatively elastic.

3. **Selling Costs:** As the products are close substitutes of each other, they are needed to be differentiate for this firms incurs selling cost in making advertisements, sale promotions, warranties, customer services, packaging, colours are brand creation.

4. **Free Entry and Exit of firm**: Like perfect competition, free entry and exit of firms is possible under this market form. Since there are no barriers to entry and exit, firms operating under Monopolistic Competition, in the long run, earn only normal profits.

Self-Check Exercise-5

Q.1 What is Monopolistic Competition? Discuss its features.

18.8.4 Oligopoly

The term Oligopoly means ‘Few Sellers’. An Oligopoly is an industry composed of only few firms, or a small number of large firms producing bulk of its output. Since, the industry comprises only a few firms, or a few large firms, any change in Price and Output by an individual firm is likely to influence the profits and output of the rival firms. Major Soft Drink firms, Airlines and Milk firms can be cited as an example of Oligopoly.

Features of Oligopoly

1. **A Few Firms**: Oligopoly as an industry is composed of few firms, or a few large firms controlling bulk of its output.
2. **Firms are Mutually Dependent:** Each firm in oligopoly market carefully considers how its actions will affect its rivals and how its rivals are likely to react. This makes the firms mutually dependent on each other for taking price and output decisions.
3. **Barriers to the Entry of Firms:** The main cause of a limited number of firms in oligopoly is the barriers to the entry of firms. One barrier is that a new firm may require huge capital to enter the industry. Patent rights are another barrier.
4. **Non Price Competition:** When there are only a few firms, they are normally afraid of competing with each other by lowering the prices; it may start a Price War and the firm who starts the price war was may ultimately loose. To avoid price war, the firm uses other ways of competition like: Customer Care, Advertising, Free Gifts etc. Such a competition is called non-price competition.

Self-Check Exercise-6

Q.1 What is Oligopoly? Discuss its features.

18.9 SUMMARY

In this unit, we explored multiple definitions of the term "market" to understand its meaning from different perspectives. We also identified and discussed the essential components that make up a market, such as buyers, sellers, goods, services, and the mechanism of exchange. Additionally, we examined various classifications of markets based on factors like competition, geographical location, nature of transactions, and the number of participants. By analyzing these aspects, we gained a comprehensive understanding of how markets function and their role in economic activities. This unit provided valuable insights into the structure and dynamics of different market types.

18.10 GLOSSARY

- **Market:** A region or platform where buyers and sellers interact closely, either directly or through intermediaries, such that price changes in one part influence prices in other areas.
- **Perfect Competition:** A market structure where there is no competition among individual firms, ensuring uniform pricing and free market entry and exit.
- **Imperfect Competition:** A market scenario in which firms have some degree of control over pricing, varying based on the level of market imperfection.

- **Monopoly:** A market condition where a single producer or seller dominates, offering a product with no close substitutes.
- **Equilibrium:** A state in which a firm has no inclination to expand or reduce its output, maintaining stability in production.

18.11 ANSWERS TO SELF-CHECK EXERCISES

Self-Check Exercise-1

Ans.1. Please refer to section 18.3 and 18.4

Ans.2. Please refer to section 18.5 and 18.6

Self-Check Exercise-2

Ans.1. Please refer to section 18.7.1 and 18.7.2

Self-Check Exercise-3

Ans.1. Please refer to section 18.8 and 18.8.1

Self-Check Exercise-4

Ans.1. Please refer to section 18.8.2

Self-Check Exercise-5

Ans.1. Please refer to section 18.8.3

Self-Check Exercise-6

Ans.1. Please refer to section 18.8.4

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18.13 TERMINAL QUESTIONS

Q1. Define the term market? List the components of a market?

Q2. Classify the different types of market?

Unit-19

ROLE OF TIME ELEMENT

STRUCTURE

19.1 INTRODUCTION

Time period plays an important role in the determination of price in a competitive market. It was Alfred Marshall who brought into notice the role of time period in the theory of product pricing. Marshall classified, time period in to market period, short period and long period.

19.2 LEARNING OBJECTIVES

After going through this unit you will be able to:

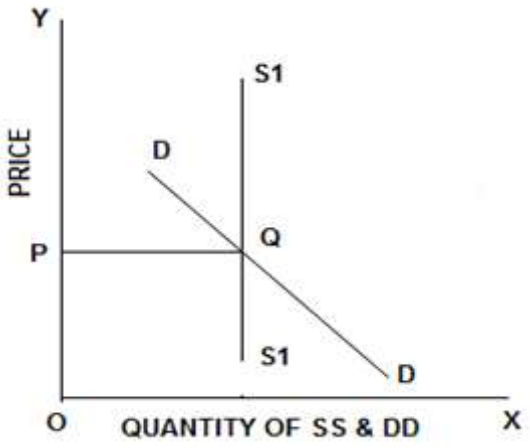
- Define market period
- Determine the price under market period
- Establish the price under short period
- Explain the price under long period
- Distinguish between market price and normal price
- Elucidate the determination of normal price

19.3 MARKET PERIOD (VERY SHORT PERIOD)

The market period refers to the period of time in which the supply of a commodity is perfectly fixed. Each firm has a fixed stock of commodity in hand and the total stock of the commodity in the market also is fixed. The time at the disposal

of firms is extremely short that there is no way to increase the supply of the commodity in the market.

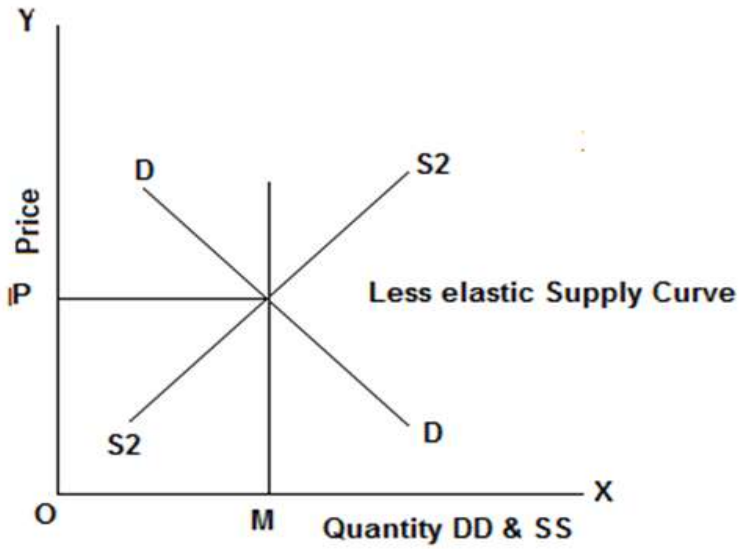
Therefore in the market period, the supply curve is supposed to be perfectly inelastic (vertical). This vertical supply curve interacts with the market demand curve to determine prices. The demand curve plays a more important role than the supply curve in the determination of price in the market period.



19.4 SHORT PERIOD

It refers to the time period in which the quantities of some factors of production (variable factors like labour, raw materials etc.) can be changed. Fixed factors of production like machinery, equipment, plant etc. remain constant. But using more and more quantities of variable factors, the fixed factors of production can be used more intensively and effectively to produce more output. Similarly, if required time is enough to reduce output by reducing the volume of variable factors of production used by firms. So in the short period the supply curve is slightly elastic. This elastic supply curve has a more powerful role in price determination than in the market period.

Price Determination in the Short Period



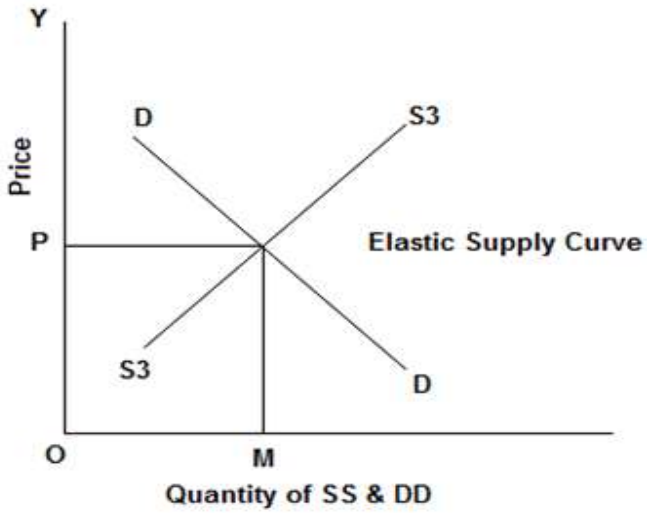
Self-Check Exercise-1

Q.1 What is Market Period? How price is determined under market Price?

19.5 LONG PERIOD

Long period refers to time period which is long enough to allow changes in all factors of production to change the volume of output by a firm. During this time period, a firm can increase output not only by using larger quantities' of variable factor (more intensive use of fixed factors) but also by enlarging the size of the plant itself. In the long period the supply curve is more elastic than the supply curve in the short period. This elastic supply curve plays a relatively more important role in the determination of market price than the demand curve.

Price Determination in the Long Period



Self-Check Exercise-2

Q.1 What is Long Period? How price is determined under Long period?

19.6 MARKET PRICE AND NORMAL PRICE

Marshall, who propounded the theory that price is determined by both demand and supply, also gave a great importance to the time element in the determination of price. Time element is of great relevance in the theory of value since one of the two determinants of price, namely supply depends on the time allowed to it for adjustment. The reason why supply takes time to adjust itself to a change in the demand condition is that the nature of technical conditions of production is such as to prohibit instantaneous adjustment of supply to changed demand conditions. Marshall divides time periods into four categories: market-period, short-period, long-period and secular-period.

19.6.1 Determination of Market Price

The market period is a brief timeframe during which the supply remains constant, meaning no adjustments can be made to production. In other words, the quantity of goods available in this period is restricted to the existing stock. As a result, an increase in demand cannot lead to an immediate rise in supply.

The price that prevails in the market period is known as the market price, which fluctuates depending on the nature of the commodity and may change multiple times within a day, week, or month. Essentially, the market price is determined by the interaction of demand and supply at a specific moment. The process of market price determination varies for perishable and durable goods.

(i) Perishable goods: The perishable goods like fish, milk cannot be stored or kept back; they will go waste if stored. Therefore, the whole of the given stock of a perishable good has to be supplied in the market, whatever the price of the good. As a result, the market period supply curve of a perishable commodity is perfectly inelastic or a vertical straight line.

Fig. 19.1 illustrates the determination of market price of perishable goods. OM is the given stock of goods and MPS is the market period supply curve. DD is the demand curve of the commodity. Demand and supply are in equilibrium at price OP. So OP is the equilibrium market price.

Now if demand increases from DD to D'D', the market price will rise from OP to OP', the supply of the goods remaining fixed at OM. On the contrary if the demand decreases from DD to D"D" the market price will fall from OP to OP", the supply again remaining constant at OM. We thus see that changes in demand produce changes in price in the market period, supply being constant during this period.

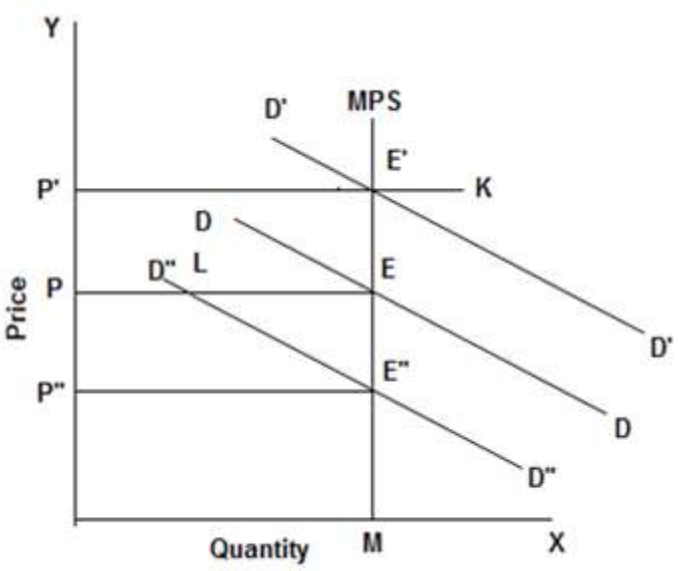


Fig. 19.1

(ii) Durable goods: Most commodities which are durable can be kept in stock. When the price of durable goods decreases with decrease in its demand, its supply can be decreased by keeping source quantity in the inventory. On the other hand, supply can be increased out of the given stock if its demand and price increases.

Fig. 19.2 illustrates the determination of market price of a durable non-perishable commodity. As pointed out above, the market oriented supply curve of a durable good is not a vertical straight line throughout its length. In this connection it is essential to note two important price levels.

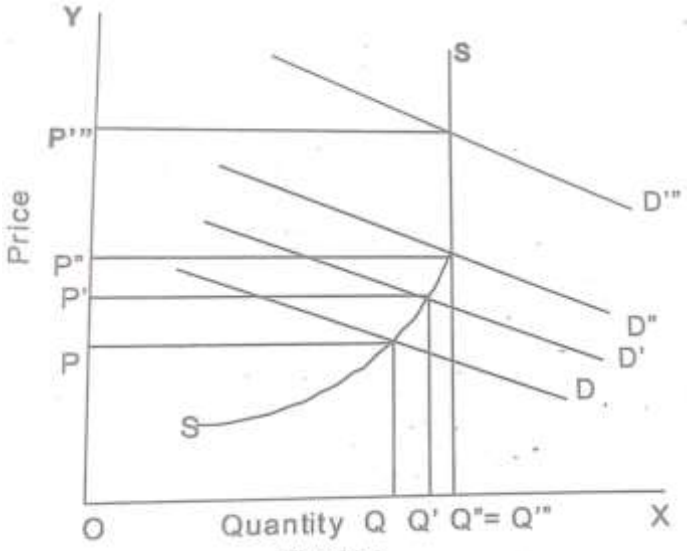


Fig. 19.2

Firstly, there is a price level which is sufficiently high so that the sellers will be prepared to supply the whole stock of the goods. Secondly, there is a minimum price at which the sellers will not be prepared to sell at all, instead they will hold back the whole stock of the goods. This minimum price at which the sellers refuse to supply the goods at all and store it with themselves is known as “reserve price”. At a reserve price the quantity supplied of the goods will be zero, and as the price rises the quantity supplied will increase till a price is reached at which the whole stock of the goods will be offered for sale. So, the supply curves of a durable commodity slopes upward to a point and then it becomes a vertical straight line. This is shown in Fig. 8.5 where SES is the supply curve of the seller whose reserve price is OS and the maximum price is OP”. The supply curve becomes vertical after E. Within lower part of the supply curve both the price and supply are increasing, but beyond E only demand is increasing, supply remaining fixed at OQ”.

19.6.2 Determination of Short-run Price

In the short run, the price is determined by the interaction of demand and supply forces. The equilibrium point is where the demand and supply curves intersect. During this period, firms may continue production even if they cannot cover their average total cost, as long as they can meet their average variable cost. Halting production would result in a loss of fixed costs. However, firms will cease production if the price is insufficient to cover their variable costs. The equilibrium price in the short run, known as the short-run normal price, is established at the intersection of the short-run normal supply and demand curves.

Figure 19.3 illustrates the process of the price determination in the short-run. In the Fig. DD represents the demand curve. MPS is the market period supply curve and SRS is the short-run supply curve of the industry. OP is both the market price as well as the short-run price since the given demand curve DD intersects both the market period supply curve MPS and the short-run supply curve SRS at point E. With shifts in the demand curves from DD to D’ D’ or D” D” both the price and the quantity supplied of the product change.

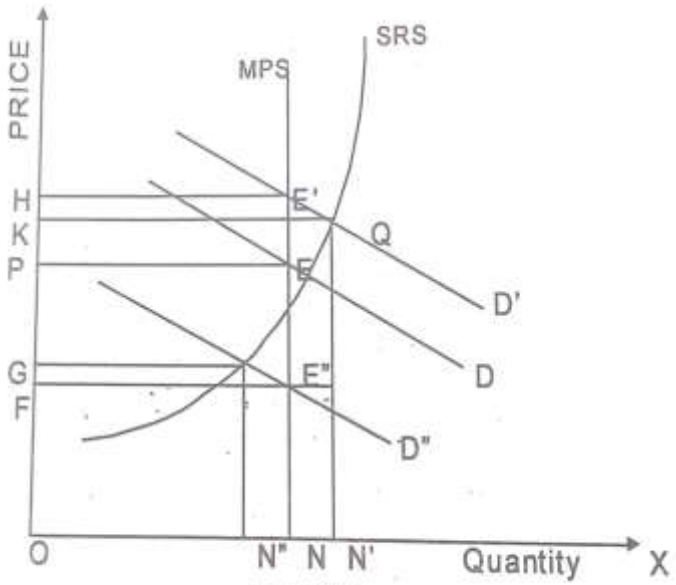


Fig. 19.3

19.6.3 Determination of Long-run Normal Price

The long-run price, also referred to as the normal price, is established when demand and supply reach equilibrium over an extended period. This occurs once supply has completely adapted to the prevailing demand conditions. In the long run, a stable price emerges as supply fully adjusts to meet demand, and this price is recognized as the long-run or normal price.

Long-run normal price is fixed by the long-run equilibrium between demand and supply. This long-run price under perfect competition cannot be above or below the long-run average cost. A firm under perfect competition is in long-run equilibrium at the output whose price is equal to both marginal cost and average cost. When price is either above or below the long-run average cost certain forces in the system operate as to bring the long-run normal price to the level of long-run average cost. It will be seen in Fig. 19.4 that long-run equilibrium is established at the minimum point of the long-run average cost and long-run price OP is established which is equal to minimum long-run average cost.

Long-run Price = SMC = SAC = LAC = LMC.

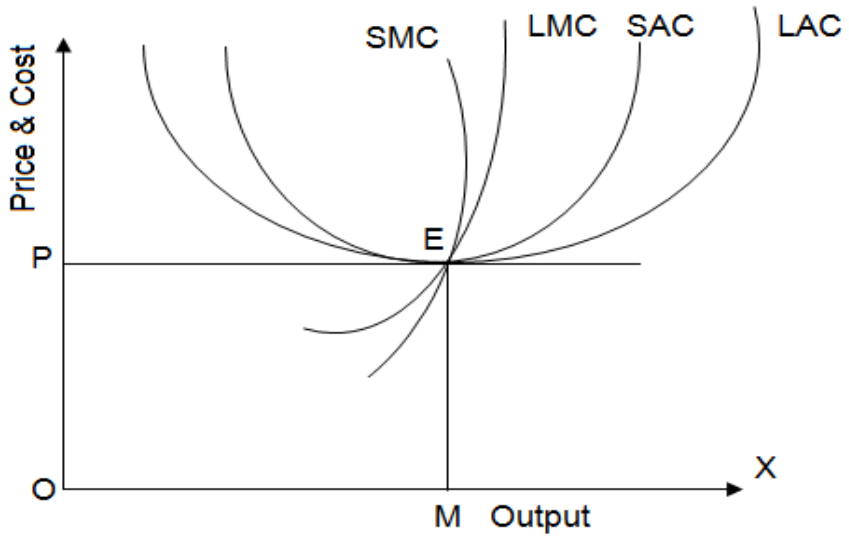


Fig. 19.4

Self-Check Exercise-3

Q.1 Differentiate between Market Price and Normal Price. How normal price is determined in short run and long run.

19.7 SUMMARY

In this chapter we have studied the role of time element in the determination of price. Time period plays an important role in the determination of price in a competitive market. It was Alfred Marshall who brought into notice the role of time period in the theory of product pricing. Marshall classified, time period in to market period, short period and long period. We have taken the entire time period one after the other.

19.8 GLOSSARY

- **The market period** refers to the period of time in which the supply of a commodity is perfectly fixed. Each firm has a fixed stock of commodity in hand and the total stock of the commodity in the market also is fixed.
- **Short Period:** It refers to the time period in which the quantities of some factors of production (variable factors like labour, raw materials etc.) can be changed. Fixed factors of production like machinery, equipment, plant etc. remain constant.
- **Long period** refers to time period which is long enough to allow changes in all factors of production to change the volume of output by a firm. During this

time period, a firm can increase output not only by using larger quantities' of variable factor (more intensive use of fixed factors) but also by enlarging the size of the plant itself.

19.9 ANSWERS TO SELF-CHECK EXERCISES

Self-Check Exercise-1

Ans.1 Please refer to section 19.3 and 19.4

Self-Check Exercise-2

Ans.1 Please refer to section 19.5

Self-Check Exercise-3

Ans.1 Please refer to section 19.6, 19.6.2 and 19.6.3

19.10 REFERENCES/SUGGESTED READINGS

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19.11 TERMINAL QUESTIONS

Q1. What is role of time element in the determination of the price?

Q2. How does market price differs from normal price?

Unit-20

PRICE AND OUTPUT DETERMINATION UNDER PERFECT COMPETITION

STRUCTURE

20.1 INTRODUCTION

Perfect competition exists when numerous firms produce an identical product. It is considered "perfect" because each firm believes it can sell any quantity of output at the existing market price, without influencing it, as its individual market share is minimal. Due to the presence of many firms and a standardized product, no single firm has control over pricing. As a result, the demand curve for each firm is perfectly elastic, represented by a horizontal line at the prevailing market price.

20.2 LEARNING OBJECTIVES

This unit is intended to discuss equilibrium condition and price-output determination under perfect competition. After studying this unit you will be able to:

- Describe meaning and features of perfect competition
- Understand equilibrium of a competitive firm in the short-run
- Describe price and output determination of a competitive firm in the long-run.

20.3 MEANING OF PERFECT COMPETITION

Perfect competition is a market structure in which individual firms do not compete against each other. Unlike the common usage of the term "competition," which implies rivalry among businesses, perfect competition in economic theory signifies a lack of such rivalry.

It is defined as a type of market organization that meets the following criteria: (1) a large number of buyers and sellers, none of whom can influence the market price; (2) a homogeneous product offered by all firms; (3) free and unrestricted movement of resources; and (4) complete information about market conditions available to all economic participants.

20.3.1 Features of Perfect Competition

Following are the main features of Perfect Competition:

1. **Numerous Buyers and Sellers**: A market or industry consists of a vast number of firms and buyers, ensuring that each firm, regardless of its size, contributes only a small fraction of the total market supply. Similarly, the presence of many buyers prevents any single entity from exerting monopolistic control over the market. As a result, no individual firm can influence the market price by altering its production levels.
2. **Uniformity of Products**: The product offered by all firms is identical in terms of its technical specifications and the services related to its sale and delivery. Buyers cannot distinguish between products from different firms.

If there were any differentiation, firms would have some control over pricing, which is not possible under perfect competition. The assumptions of numerous sellers and product homogeneity ensure that each firm in a purely competitive market acts as a price taker. This means the firm's demand curve is perfectly elastic, allowing it to sell any quantity of output at the prevailing market price (Figure 20.1).

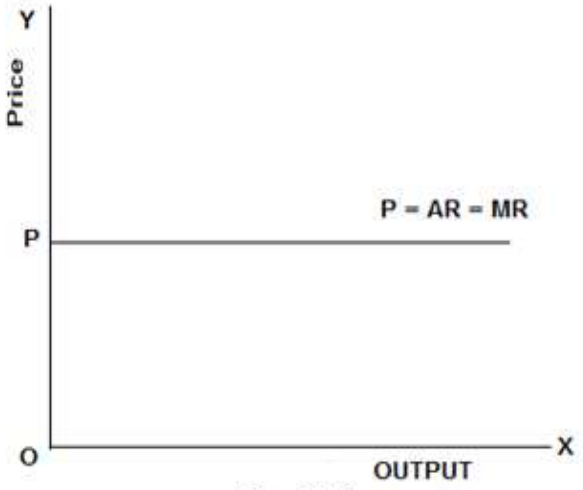


Fig. 20.1

3. **Unrestricted Market Entry and Exit:** Firms can enter or exit the industry without facing any significant barriers. While the process may take time, there are no restrictions on their movement. If obstacles to entry or exit exist, the number of firms in the market may decrease, potentially giving existing firms the ability to influence prices.
4. **Objective of Profit Maximization:** Every firm operates with the primary goal of maximizing its profits, without pursuing any other objectives.
5. **Absence of Government Intervention:** The market functions without any government interference, meaning there are no tariffs, subsidies, production controls, or demand restrictions. Under these conditions, firms become price-takers and face a perfectly elastic demand curve. A market structure that meets these criteria is known as pure competition, which differs from perfect competition due to additional assumptions.
6. **Complete Factor Mobility:** Resources, including labor and raw materials, can move freely between firms and industries. Workers have the flexibility to switch jobs, and essential production inputs are not monopolized or controlled by unions.
7. **Perfect Market Knowledge:** Buyers and sellers have full access to all market-related information, not only for the present but also for future conditions. This information is freely available without any cost.

20.4 DETERMINATION OF PRICE

The primary goal of a capitalist producer is to maximize profits while considering the cost and revenue conditions associated with their product. Selling an additional unit of output generates extra revenue but also incurs additional costs. The increase in total revenue (TR) resulting from the sale of one more unit is referred to as marginal revenue (MR), while the corresponding increase in total cost (TC) is known as marginal cost (MC). Regardless of the market structure or time frame, a rational producer will always compare MR and MC when deciding whether to produce an additional unit. If MR exceeds MC, producing that unit will enhance profits by the difference between the two. Conversely, if MC surpasses MR, production will lead to a decline in profits. Therefore, a producer will expand output when MR > MC to increase profits and reduce output when MC > MR to minimize losses. This implies that profit maximization occurs when the firm produces at the level where:

(i) MC = MR and

(ii) Beyond which MC>MR.

The equality of marginal cost (MC) and marginal revenue (MR) is a necessary condition for profit maximization, but it is not sufficient on its own. If, after the point where MR equals MC, marginal revenue remains higher than marginal cost (MR > MC), the firm will continue increasing its output to maximize profits. In such a case, equilibrium will not be stable at the point where MC and MR are equal. This concept can be illustrated using a simple diagram.

In Diagram 20.1, the marginal cost (MC) curve intersects the marginal revenue (MR) curve at points Q and R, meaning that MC equals MR at both points. However, profit maximization does not occur at point Q because, beyond this point, MR is greater than MC. This implies that the firm can increase its profits by expanding output. Consequently, the firm continues to increase production until MC equals MR again at point R. Beyond R, MC surpasses MR, leading to a decline in profits if the firm further increases output.

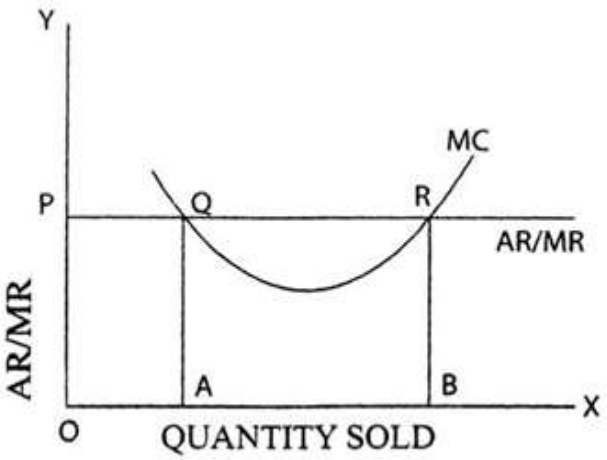


Figure 20.1

For a firm to achieve equilibrium, two essential conditions must be met simultaneously: (1) Marginal Cost (MC) must be equal to Marginal Revenue (MR), and (2) beyond the point where MC equals MR, MC should be rising. These conditions serve as the fundamental criteria for determining a firm's equilibrium, regardless of the market structure or time frame being considered. It is important to note that while the MC = MR condition helps identify the profit-maximizing level of output, it does not determine the product's price. The price is established based on the firm's demand curve corresponding to the output level determined by MC and MR equality. With this understanding of profit-maximization conditions, we can analyze a firm's equilibrium in different market structures over the short and long run.

20.5 PRICE DETERMINATION UNDER PERFECT COMPETITION

Firm's Supply Curve:

In a perfectly competitive market, an individual firm acts as a price taker rather than a price maker. This means it has no significant influence on the market price through changes in its own production level. The market price is determined by the overall interaction of supply and demand forces. A defining characteristic of perfect competition is the presence of a perfectly elastic demand curve for the firm's product. Consequently, the marginal revenue (MR) is always equal to the average revenue (AR), making the firm's AR curve identical to its MR curve.

Under perfect competition, a firm's equilibrium condition is met when marginal cost (MC) equals marginal revenue (MR), which also implies that MC equals AR (or price). Therefore, the firm adjusts its production level to ensure that its MC aligns with the prevailing market price. This results in price always being equal to MC.

As illustrated in the diagram, when the market price is OP_1, the firm produces OQ_1 units, aligning its MC with the given price at point A. Similarly, when the price changes to OP_2, the firm adjusts its output to OQ_2, ensuring MC equals the new price at point B. This pattern continues as the price rises to OP_3 and OP_4, leading the firm to produce OQ_3 and OQ_4, respectively. In this way, the firm continually modifies its output to match its MC with the market price.

A firm's supply curve is derived when its marginal cost (MC) equals the prevailing market price of the product. The quantity a firm decides to supply at a specific price is determined by the intersection of the given average revenue/marginal revenue (AR/MR) curve and the MC curve. Essentially, the upward-sloping segment of the MC curve indicates the various quantities the firm will supply at different price levels. Thus, in the short run, the firm's supply curve corresponds to the upward-sloping portion of its MC curve.

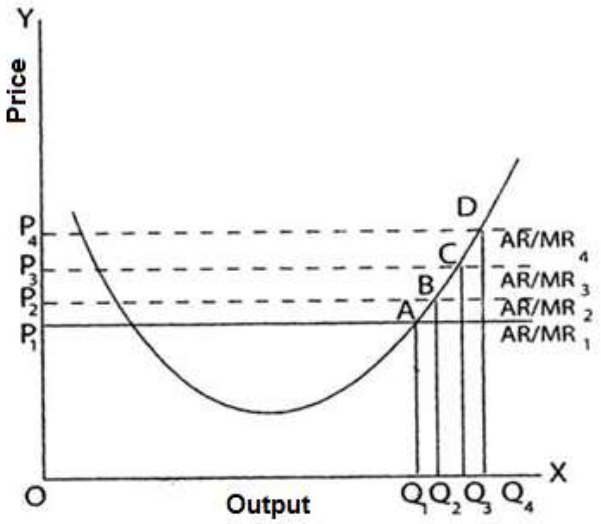


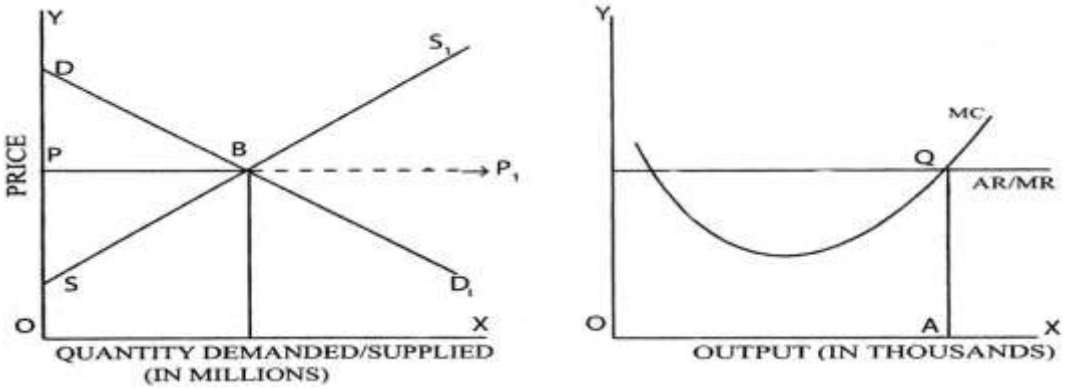
Figure 20.2

Market Supply Curve:

The market supply curve in the short run is derived by horizontally summing the individual supply curves (marginal cost curves) of all firms producing the product. Since each firm's marginal cost (MC) curve slopes upward, the overall market supply curve also exhibits an upward trend.

The equilibrium market price is determined by the intersection of the market supply and demand curves. As illustrated in Diagram 20.3 A, the supply curve (SS) represents the aggregate supply of all firms, while the demand curve (DD) reflects consumer demand for the product. The equilibrium price, OP, is established at point B, where supply and demand are equal, resulting in an equilibrium quantity of OA.

Once the market price is determined, individual firms take it as a given and cannot influence it through their own production decisions. Instead, each firm adjusts its output to equate its marginal cost with the prevailing market price. This is depicted in Figure B, where the firm produces an output level of OA, ensuring that marginal cost aligns with the set market price at point Q. Under the given cost and demand conditions, OA represents the firm's profit-maximizing output level.



(A) **Figure 20.3** **(B)**

Self-Check Exercise-1

Q.1 What is perfect Completion? Discuss its features.

Q.2 How Price is determined Under Perfect Competition.

20.6 EQUILIBRIUM OF THE FIRM UNDER PERFECT COMPETITION

20.6.1 Short-Run Equilibrium

In a situation where a firm has a horizontal Average Revenue (AR) and Marginal Revenue (MR) curve, along with the typical U-shaped Average Cost (AC) and Marginal Cost (MC) curves, equilibrium is achieved at the point where the horizontal AR/MR curve intersects the upward-sloping MC curve. However, this holds true only if the intersection does not occur below point E, known as the "shutdown point," as depicted in Figure 20.4B.

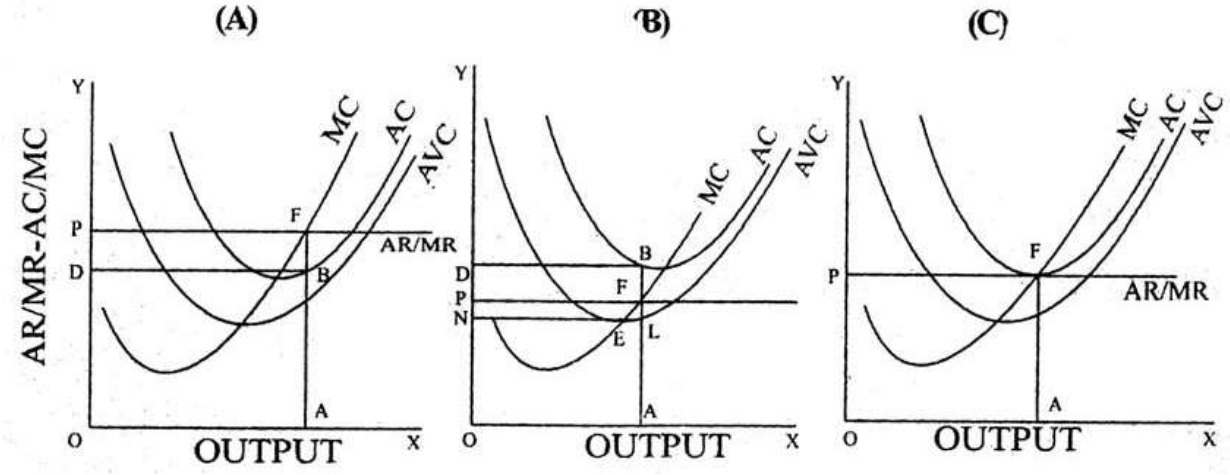


Figure 20.4

The diagrams in Figure 20.4 illustrate three possible short-run equilibrium scenarios for a firm operating under perfect competition. In each case, equilibrium is established at point F, where the horizontal Average Revenue (AR) and Marginal Revenue (MR) curve intersects the rising Marginal Cost (MC) curve.

In Figure A, the firm is earning abnormal profits. The market price, represented by the horizontal AR/MR curve, is AF, while the average cost is AB. Consequently, the firm's abnormal profit per unit of output is BF, with total abnormal profits represented by the area of rectangle PFBD. Conversely, Figure B shows a scenario where the firm incurs losses, depicted by the area of rectangle PDF, because the market price (OP = AF) falls below the average cost (AB). The loss per unit of output is BF. Meanwhile, Figure C represents a situation where the firm is breaking even, earning neither abnormal profits nor incurring losses. In this case, the AR/MR curve is tangential to the average cost curve at F, meaning the price just covers the average cost.

A firm may choose to continue production despite incurring losses in the short run, as illustrated in Figure B, because stopping production entirely would result in greater losses. If the firm ceases operations, it would still have to bear total fixed costs as a loss. However, by continuing production, even though the price does not fully cover the average cost (which includes both average variable cost and average fixed cost), it at least covers the average variable cost (AL) and a portion of the average fixed cost (LF). The remaining uncovered portion of the average fixed cost

is BF. Therefore, by producing output OA, the firm minimizes its short-run losses, which would otherwise equal total fixed costs if production were halted.

20.6.2 Long-run Equilibrium

In the long run, a key characteristic of perfect competition is the unrestricted entry and exit of firms. Consequently, the presence of abnormal profits or losses, as depicted in Figures A and B, is only temporary and persists only in the short run. The short run refers to a period in which firms cannot adjust their productive capacity to the desired level. During this time, firms can only modify their production levels by altering the intensity of their fixed equipment usage—that is, by increasing or decreasing the application of variable factors—without changing their existing fixed assets. Similarly, new firms are unable to enter the industry during the short run due to these constraints.

Conversely, the long run is a period long enough to allow changes in all production factors, making them variable. In this phase, existing firms have the flexibility to either continue operations by selecting the most profitable combination of resources or exit the industry if future prospects appear unfavorable. Likewise, new firms can enter the market when the potential for profitability is high. Since all inputs can be adjusted over time, no factor remains fixed in the long run. However, the duration of the long run is not uniform across industries—it varies significantly. For instance, in industries like steel manufacturing, the long run may span several years, whereas for a small-scale business such as fishing, it might last only a few weeks.

Once a firm commits to a particular industry and invests in fixed assets, its choices become constrained by these factors. Firms enter an industry expecting to earn at least as much as they could in alternative sectors over the long run. These earnings are known as "normal profits" and are incorporated into the firm's average costs as a component of fixed costs. However, these expectations are not always realized.

If a firm is unable to achieve normal profits in the long run and anticipates continued losses, it may reconsider its earlier decision, opting to exit the industry or adjust its production scale accordingly. Conversely, when firms earn more than normal profits (abnormal profits) and expect this situation to persist, they tend to expand their production capacity. This also encourages new firms to enter the market. As a result, overall industry output increases, leading to a decline in market prices. When prices fall, abnormal profits diminish, and new firms continue entering the industry until the market price equals the average cost. At this equilibrium point, only normal profits remain, eliminating incentives for further new entries or expansions.

Similarly, when firms experience persistent losses, some may exit the industry while others reduce their production scale. This leads to a decrease in total industry output, causing market prices to rise. As prices increase, losses are minimized, and firms eventually reach a point where price equals average cost, ensuring normal profits.

In perfect competition, the unrestricted entry and exit of firms play a crucial role in maintaining long-run equilibrium by aligning market prices with average costs. This mechanism ensures that no firm earns sustained abnormal profits or incurs prolonged losses, stabilizing the industry over time.

Diagram 20.5 illustrates the process through which firms enter the market and existing firms expand their production capacity in response to abnormal profits. This competitive adjustment continues until a long-run equilibrium is achieved for both individual firms and the industry as a whole.

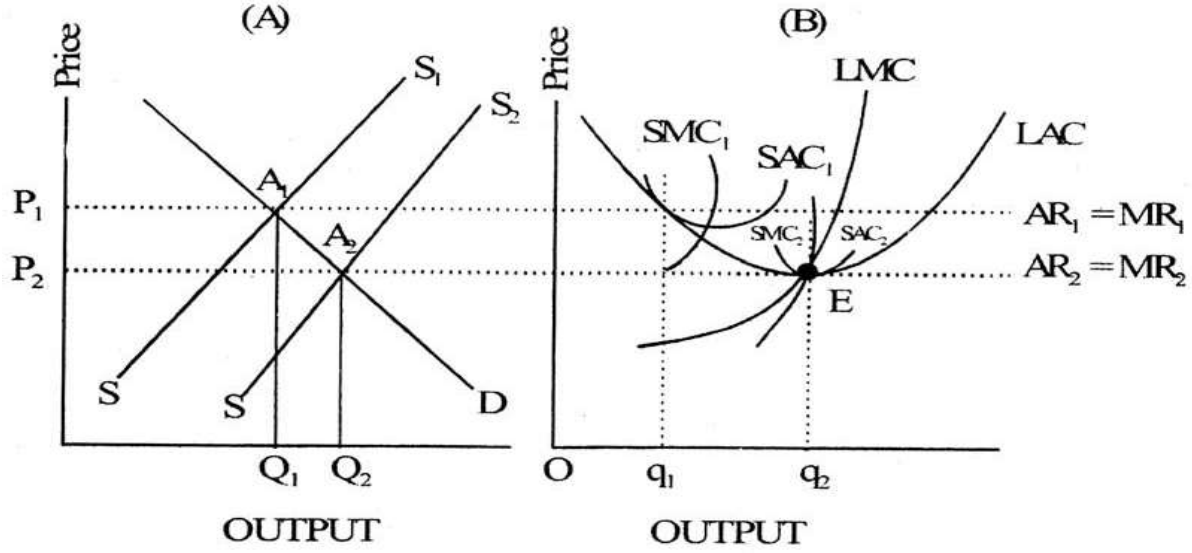


Figure 20.5

In the given diagram, Part B illustrates the position of an individual firm, whereas Part A represents the price determination process through the interaction of market demand and supply forces. At the initial market price OP1 (as shown in Figure B), the firm experiences abnormal profits because the average cost is lower than the price. This attracts new firms to enter the industry, while existing firms expand their production capacity. As a result, the total output of the commodity increases, leading to a rightward shift in the market supply curve from SS1 to SS2 (in Figure A). The new supply curve SS2 intersects the existing market demand curve at point A2, establishing OP2 as the equilibrium price and OQ2 as the equilibrium quantity.

The decline in market price from OP1 to OP2 causes the firm's horizontal AR1/MR1 curve (in Figure B) to shift downward to AR2/MR2, which intersects the marginal cost (MC) curve at point E. This process of new firms entering the industry and existing firms expanding production continues until the increased total output pushes the market price down to a level where it just covers the average cost. When the market supply curve shifts to SS2 in Figure A, reducing the market price to OP2, the corresponding AR2/MR2 curve in Figure B becomes tangential to the U-shaped average cost curve at point E. At this stage, the firm earns only normal profits.

Once firms in the industry make only normal profits, the entry of new firms ceases. In the long run, the industry reaches equilibrium when firms earn only normal profits, meaning that price equals the minimum average cost. The industry is considered to be in long-run equilibrium when there is no incentive for new firms to enter or for existing firms to exit.

Self-Check Exercise-2

Q.1 Diagrammatically discuss short run equilibrium of a firm under Perfect completion.

Q.2 Diagrammatically discuss Long run equilibrium of a firm under Perfect completion.

20.7 THE LONG-RUN INDUSTRY SUPPLY CURVE (PERFECT COMPETITION)

The long-run industry supply curve represents the relationship between the equilibrium price and the quantity of output firms are willing to supply after all necessary market adjustments, including firm entry and exit, have taken place. When product demand increases, leading to a rise in price, new firms are encouraged to enter the market. This entry continues until the additional profits generated by higher prices are eliminated, ensuring that all firms cover their average total costs. Conversely, when industry demand declines, causing prices to drop, firms begin exiting the market. If the price falls below the average total cost but remains above the average variable cost, firms gradually exit as their capital depreciates and is not replaced. However, if the price falls below the average variable cost, firms exit rapidly by scrapping or reallocating their resources.

The long-run supply curve, therefore, represents the different equilibrium positions that emerge after these demand-driven changes occur. Its shape or slope depends on how factor prices respond to market changes in a competitive industry. Based on this, industries can be classified into three types: (i) constant cost industries, (ii) increasing cost industries, and (iii) decreasing cost industries..

20.7.1 Long-run supply curve in constant cost industry:

A constant cost industry is one where the prices of inputs remain unchanged regardless of an increase or decrease in industry output. As a result, the long-run cost curves of existing firms remain unaffected. This means that additional output can be supplied without any change in price, leading to a horizontal supply curve. This concept is illustrated in Diagram 18.6.

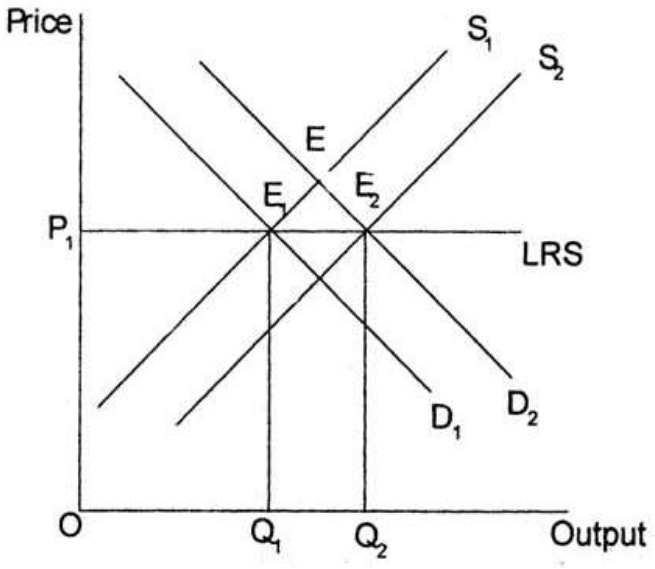


Figure 20.6

20.7.2 Long-run supply curve under increasing cost industry

An industry where the cost of inputs rises as the overall industry output expands (and decreases when output contracts) is known as an increasing cost industry. This occurs because the per-unit cost of production rises as output grows. Consequently, higher levels of output can only be supplied at increased prices. As a result, the long-run supply curve slopes upward. (Diag. 20.7)

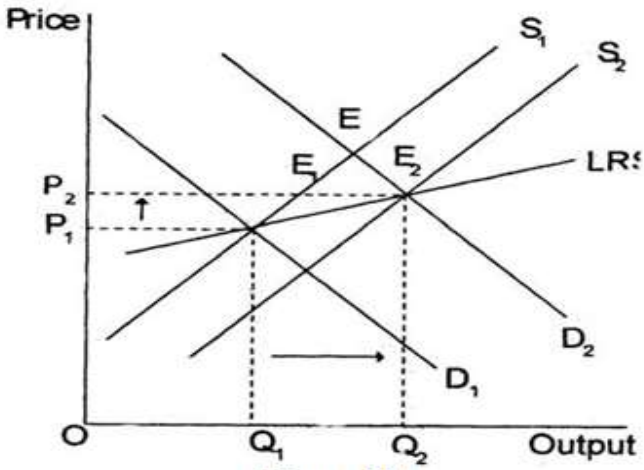


Figure 20.7

20.7.3 Long run supply curve in decreasing cost industry

A decreasing cost industry is one where the cost of inputs declines as the industry's overall output expands and rises when output contracts. In the long run, the per-unit cost of production decreases, resulting in a downward-sloping cost curve. This implies that as production increases, goods can be supplied at lower prices. This phenomenon can occur due to external economies. For instance, if the input-supplying industry benefits from increasing returns to scale, it can lead to reduced input costs, allowing the competitive industry to experience decreasing costs as well.

The initial equilibrium of the competitive industry is represented at point E1, where the original demand curve (D1) intersects with the original supply curve (S1). At this point, the equilibrium price and quantity are P1 and Q1, respectively. When there is an increase in demand, the demand curve shifts from D1 to D2, while the supply remains unchanged at S1. This results in a new equilibrium at point E, where the price rises above the initial price P1.

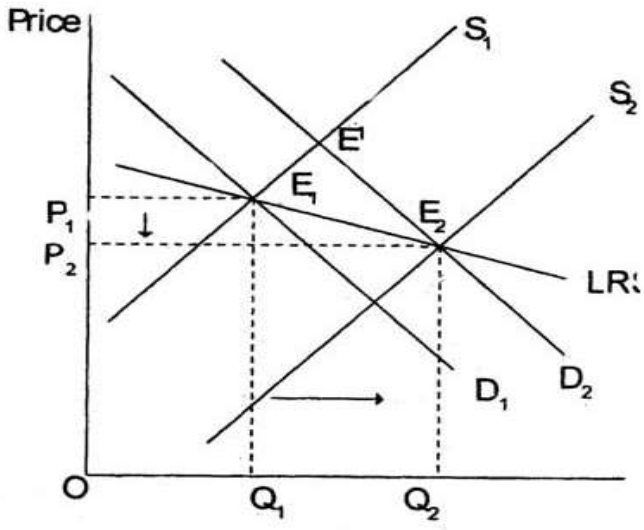


Figure 20.8

The prospect of higher profits encourages firms to increase production, leading to an expansion in industry output. Consequently, the supply curve shifts rightward from S_1 to S_2, causing the price to decrease from E. The final equilibrium is established at point E_2, where the new demand curve (D_2) intersects with the new

supply curve (S_2). By connecting points E_1 and E_2, the long-run supply curve can be determined.

In a constant cost industry, as illustrated in Diagram 20.6, the shift in supply matches the shift in demand ($S_1S_2 = D_1D_2$), resulting in a horizontal long-run supply (LRS) curve. This occurs because the initial price increase, caused by higher demand, is counterbalanced by an equal rise in supply, bringing the price back to its original level (P1).

In contrast, in an increasing cost industry, shown in Diagram 20.7, the long-run supply curve (E_1E_2) slopes upward. This happens because the rise in supply is smaller than the increase in demand ($S_1S_2 < D_1D_2$) due to higher production costs.

Meanwhile, in a decreasing cost industry, depicted in Diagram 20.8, the long-run supply curve (E_1E_2) slopes downward. This is because the supply expansion exceeds the demand increase ($S_1S_2 > D_1D_2$), driven by declining production costs.

Self-Check Exercise-3

Q.1 Discus Long-Run Industry Supply Curve under Perfect Competition in a constant cost industry, Increasing cost industry and decreasing cost industry.

20.8 ALLOCATIVE EFFICIENCY UNDER PERFECT COMPETITION

Allocative efficiency is achieved when resources are allocated in such a way that maximizes the overall benefit to society, which is reflected in the highest possible sum of consumer and producer surplus. Consumer surplus is the difference between what consumers are willing to pay for all units of a product and what they actually pay. Producer surplus, on the other hand, is the difference between the revenue producers receive from selling the product at the equilibrium price (where demand and supply are balanced) and the minimum amount they are willing to accept for it, referred to as transfer earnings. The total surplus, combining both consumer and producer surpluses, is maximized when the price of a product equals its marginal cost, a condition typically found in perfect competition. Since price reflects the value that consumers place on a product and marginal cost represents the opportunity cost of producing it, efficiency is achieved when these two values align. If the price exceeds the marginal cost, society benefits from increased production, while a price lower than the marginal cost suggests that reducing production would improve outcomes. Therefore, allocative efficiency is attained when price equals marginal cost.

In the left panel of diagram 20.9, the equilibrium of a competitive firm is illustrated, where price P0 equals marginal cost (MC) at point e. P0 is the market-clearing price where market demand (AD) equals supply (BS) at point E, as shown in the right-hand panel. For the equilibrium quantity Q0, the highest price consumers are willing to pay is represented at point A, so the consumer surplus is the area P0AE. Similarly, the minimum price at which producers are willing to supply the product is at point B, making the producer surplus the area BP0E. The total surplus is the area BAE, which is maximized at quantity Q0, as any deviation in quantity, either below or above Q0, would result in a lower total surplus.

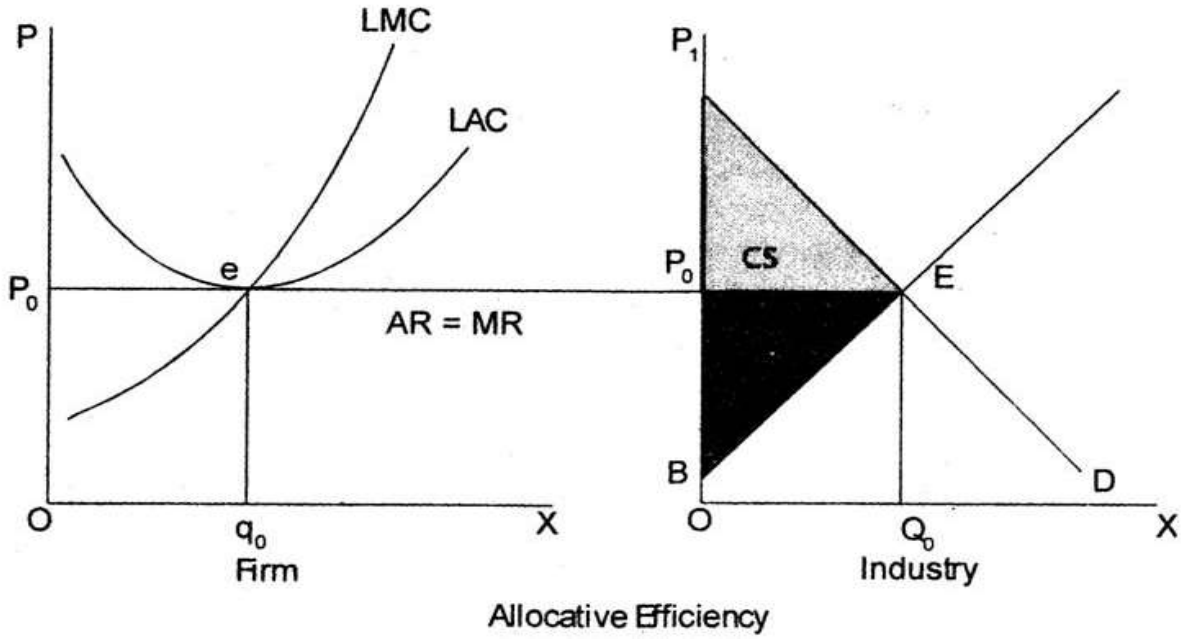


Figure 20.9

20.09 SUMMARY

This unit explores the characteristics of perfect competition, providing a detailed analysis of its key features. It examines how prices are determined in both the short run and long run for firms and industries operating under perfect competition. The study highlights market dynamics, emphasizing the role of supply and demand in price formation. Additionally, it delves into the impact of competition on profitability and market equilibrium over different timeframes. By understanding these principles, learners gain insight into the functioning of a perfectly competitive market and the factors influencing price adjustments in various economic conditions.

20.10 GLOSSARY

- **Market:** 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 prices paid in other parts.
- **Perfect competition:** A market structure characterized by a complete absence of rivalry among the individual firms.
- **Imperfect competition:** A market structure wherein individual firms exercise control over the price to a smaller or larger degree depending upon the degree of imperfection present in a case.
- **Monopoly:** Existence of a single producer or seller which is producing or selling a product which has no close substitutes.
- **Equilibrium:** Condition when the firm has no tendency either to increase or to contract its output.
- **Profit:** Difference between total revenue and total cost.
- **Market period:** A very short period in which the supply is fixed, that is no adjustment can take place in supply conditions.

- **Minimum price:** Price at which the sellers refuse to supply the goods at all and store it with themselves.

20.11 ANSWERS TO SELF-CHECK EXERCISES

Self-Check Exercise-1

Ans.1 Please refer to section 20.3 and 20.3.1

Ans.2 Please refer to section 20.4 and 20.5

Self-Check Exercise-2

Ans.1 Please refer to section 20.6.1

Ans.2 Please refer to section 20.6.2

Self-Check Exercise-3

Ans.1 Please refer to section 20.7,20.7.1,20.7.2 and 20.7.3

20.12 References/ Suggested Reading

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20.13 TERMINAL QUESTIONS

Q1. Explain the equilibrium of a competitive firm incurring losses?

Q2. Discuss price and output determination of a firm under perfect competition in the short run and Long run?