

# Microeconomics Theory and Analysis I

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## DEECO525

Edited by:  
Dr. Vishal Sarin



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# **Microeconomics Theory and Analysis - I**

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## Unit 01: Introduction to Microeconomics

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#### Objectives

- 1.1 Introduction
- 1.2 Nature of Economics
- 1.3 Micro and Macro Economics
- 1.4 Production Possibility Frontier
- 1.5 Macroeconomics
- 1.6 Deductive and Inductive Methods
- 1.7 Summary

#### Keywords

#### Review Questions

#### Further Readings

### Objectives

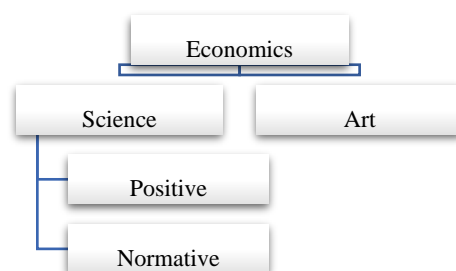
After this lecture, you would be able to

- Demonstrate an understanding, usage, and application of basic economic principles.
- Describe the concept of economics as a science or art and assumptions.
- To identify the basic economic problems.
- How to utilize the available resources with economy.
- learn about the development of theory on basis of statement.
- learn about how we make general statement to particular and generalize the statement.

### 1.1 Introduction

Economics is a social science concerned with the production, distribution, and consumption of goods and services. It studies how individuals, businesses, governments, and nations make choices about how to allocate resources. Economics is the study of human efforts to satisfy what appear to be unlimited and competing wants through the careful use of relatively scarce resources. As such, it is a social science because it deals with the behavior of people as they deal with this basic issue. Microeconomics and Macroeconomics are two ways of analyzing the Economic problems. First is related to study of economic individuality while the second is related to study of the whole economical conditions. Ranger Frisch was the first person who used the Micro and Macro words in Economics in 1933.

### 1.2 Nature of Economics



### **Economics as a Science**

Science is a systematic study of knowledge and fact which develops the relationship between cause and effect. Economics is regarded as a social science because it uses scientific methods to build theories that can help explain the behaviour of individuals, groups, and organizations. Economics is a **social science** because it deals with one aspect of human behaviour, viz., how men deal with problems of scarcity. Samuelson says that Economics is "the queen of the social sciences".

### **Characteristics of Any Science**

Based on systematic study of knowledge or Facts.

- Economics is also a systematic study of knowledge and facts.
- All the theories and facts related with both micro and macro economics are systematically collected, classified, and analyzed.
- It develops relationship between cause and effect.
- Economics deals with the relationship between cause and effect.
- For example, supply is a positive function of price, i.e., change in price is cause but change in supply is effect.
- All the laws are universally accepted.
- All the laws in economics are also universally accepted, like, law of demand, law of supply, law of diminishing marginal utility etc.
- All the laws are tested and based on experiments.
- Theories and laws of economics are based on experiments, like, mixed economy to is an experimental outcome between capitalist and socialist economies.
- It can make future predictions.
- Forecasting is the process of making predictions about the economy.
- Forecasts can be carried out at a high level of aggregation – for example for GDP, inflation, unemployment, or the fiscal deficit – or at a more disaggregated level, for specific sectors of the economy or even specific firms.
- It has a scale of measurement.
- Economics has a scale of measurement. According to Prof. Marshall, 'money' is used as the measuring rod in economics.
- However, according to Prof. A.K. Sen, Human Development Index (HDI) is used to measure economic development of a country.

### **Economics as Positive and Normative Science**

Positive economics and normative economics are two standard branches of modern economics. Positive economics describes and explains various economic phenomena, while normative economics focuses on the value of economic fairness or what the economy should be.

To put it simply, positive economics is called the "what is" branch of economics. Normative economics, on the other hand, is considered the branch of economics that tries to determine people's desirability to different economic programs and conditions by asking what "should" be or what "ought" to be.

Positive economics is sometimes described as "what is" economics. Normative economics discusses "what should be". The distinction was laid out by John Neville Keynes (1891) and was elaborated by Milton Friedman in an influential essay in 1953.

### **Economics as Positive Science**

- Positive economics is a stream of economics that focuses on the description, quantification, and explanation of economic developments, expectations, and associated phenomena. It relies on objective data analysis, relevant facts, and associated figures. It attempts to establish any cause-and-effect relationships or behavioral associations which can help ascertain and test the development of economics theories.

- Positive economics is objective and fact-based where the statements are precise, descriptive, and clearly measurable. These statements can be measured against tangible evidence or historical instances. There are no instances of approval-disapproval in positive economics.
- Positive economics is the branch of economics concerned with describing and explaining economic phenomena. It focuses on facts and behavioral relationships of cause and effect. For example, an increase in government spending will reduce the unemployment rate.

### Economics as Normative Science

- Normative economics focuses on the ideological, opinion-oriented, prescriptive, value judgments, and "what should be" statements aimed toward economic development, investment projects, and scenarios. Its goal is to summarize people's desirability (or the lack thereof) to various economic developments, situations, and programs by asking or quoting what should happen or what ought to be.
- Normative economics is subjective and value-based, originating from personal perspectives, feelings, or opinions involved in the decision-making process. Normative economics statements are rigid and prescriptive in nature. They often sound political or authoritarian, which is why this economic branch is also called "what should be" or "what ought to be" economics.
- Normative economics looks at how the economy should be or should have been rather than how it is or was it suggests policies for improving economic welfare. For example, "Government spending should be increased to reduce unemployment".

### Economics as an Art

Art is a branch of study that deals with expressing or applying the creative skills and imagination of humans to perform a certain activity. Similarly, economics also requires human imagination for the practical application of scientific laws, principles, and theories to perform a particular activity. Art is a system of rules for the achievement of a given end. We know that in practice, economics is used for achieving a variety of goals.

Every individual economic unit has an economic goal to achieve. It decides its course of action by keeping in mind the end to be achieved and the situation faced by it. Therefore, economic laws are widely used and relied upon at all levels of our economic activities. And that makes economics an art. According to Pigou, Marshall etc., economics is also considered as an art. Art is the practical application of knowledge for achieving goals.

Art tells us how to do the thing i.e., to achieve an objective. Economics is also used for achieving a variety of goals.

**For e.g.** All policies etc made in economics has the ultimate objective of solving economic problems. Art is the practical application of theoretical knowledge Like Art, Economics also practices its theoretical laws.

**For e.g.** The various policies are made only after having theoretical knowledge of the society and country. Hence, economics is also an art. Science gives us principles of any discipline however, art turns all these principles into reality.

### 1.3 Micro and Macro Economics

Ragnar Frisch has divided the study of economics into two parts in 1933. The study of economics has been divided into two parts namely microeconomics and macroeconomics. Microeconomics is the analysis of household firms, organizations and individual decisions on resource allocation and commodity prices. Macroeconomics looks at national and government decisions. For example, price stability, competition, interest rates.

#### What is Microeconomics?

Microeconomics is the study of individuals, households and firms' behavior in decision making and allocation of resources. It generally applies to markets of goods and services and deals with individual and economic issues. The study of economic activities of persons and the small group of persons is called Microeconomics. According to Prof. Boulding, "This includes the study of particular

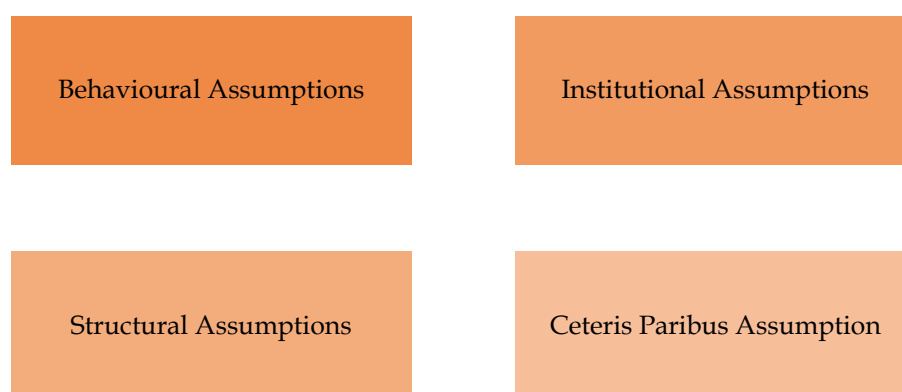
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firms, families, individual prices, labour, income, individual industries and particular things.” This makes important relation in distributing the resources in using experiments and analyzing the prices. The main sectors among the Microeconomics are: The decision about production balancing of firms and industries, the wages of labour work, rice, tea, or car etc. According to Ackley – “Microeconomics makes relations with the distribution of resources among competitive groups and distribution of total production of firms and industries. It deals with the prices of particular objects and services.” In fact, as Maurice Dobb said Microeconomics is a microscopic study of an economy. This is a source of seeing an economy through microscope so that one can know about the movements of producers and individual consumers and the markets of individual objects. In other words, we study co-relations of an individual family, firms, and individual industries in Microeconomics. Thus, economics is the study of aggregates.

**What are Assumptions in Economics?**

Assumptions are initial conditions made before a micro or macroeconomic analysis is built. Sometimes assumptions are used for simplification. Assumptions can be used to isolate the effects of a change in one variable on another. Many assumptions are criticised for being unrealistic.

*Economic theories are based on certain assumptions.*



1. *Behavioural Assumptions:* A rational consumer aims at the maximisation of his satisfaction from a given money income and its expenditure on goods and services. A rational producer aims at maximising his profits.
2. *Institutional Assumptions:* These assumptions in economic theory relate to social, political, and economic institutions. All economic theories have been developed on the assumption of a capitalist economy in which the means of production and distribution are privately owned and used for personal gain.
3. *Structural Assumptions:* These assumptions relate to the nature, physical structure or topography of the economy and the state of technology. In the short run, economic theories are based on the **assumptions of given resources and technology.**
4. *Ceteris Paribus Assumption:* The law of demand states that the amount demanded increases with a fall in price and diminishes with a rise in price, other things being equal. The “**other things**” are such assumptions as no change in income, tastes, habits, prices of related goods, etc.

**Basic economic problem-choice and scarcity**

We live in a world of scarcity. People want and need variety of goods and services. This applies equally to the poor and the rich people. It implies that human wants are unlimited but the means to fulfil them are limited. At any one time, only a limited amount of goods and services can be produced. This is because the existing supplies of resources are extremely inadequate. These resources are land, labour, capital, and entrepreneurship. Because human wants are virtually unlimited and the

resources available to satisfy these wants are limited. That is why the following economic problems are created:

- Scarcity
- Basic economic problems
- Production possibility analysis

## Scarcity

Every economy is endowed with scarce resources, which are used in the production of goods and services for consumption to satisfy our needs and wants. The basic economic problem of any society is the relative scarcity of resources in relation to the unlimited needs and wants of consumers.

*Resources:* Resources include **land, labour, capital, and enterprise**. All resources that can be combined in many ways to produce goods and services of various types to help satisfy people's unlimited needs and wants.

*Land:* Broadly defined to include all that nature provides, including minerals, forest products, and water and **land** resources. Examples: soils, crops, minerals, forests, ocean, and factor income is rent.

*Labor:* Physical and mental work of people, whether **skilled or unskilled** Examples: mechanics, doctors, farmers, computer programmers Most flexible resource Most abundant resource in developing countries and factor income is wages

*Capital:* Capital can be classified in to two types of physical capital and human capital. Physical Capital- Any human-made resource that is used to create other goods and services (tools, tractors, machinery, buildings, factories, etc.). Human Capital - Any skill or knowledge gained by a worker through education and experience through college degrees, vocational training, etc.

*Enterprise:* Management (e.g., ownership, control and/or coordination) of the other three factors of production (entrepreneurship) Covers the various organizational skills of entrepreneurs' Example: business managers and factor income is profit.

## Basic economic problems

The fundamental economic problem is the issue of scarcity and how best to produce and distribute these scarce resources. Scarcity means there is a finite supply of goods and raw materials. Finite resources mean they are limited and can run out. Unlimited wants mean that there is no end to the quantity of goods and services people would like to consume. Because of unlimited wants - People would like to consume more than it is possible to produce (scarcity). For satisfaction of unlimited wants with limited resources we require to make choices for our wants.



*Choices:* Because ALL resources, goods, and services are limited - WE MUST MAKE CHOICES! We make choices about how we spend our money, time, and energy so we can fulfill our NEEDS and WANTS.

*NEEDS and WANTS:* Students need to understand the difference between needs and wants and how they influence financial decisions. A need is something thought to be a necessity or essential items required for life. Examples include food, water, and shelter. A want is something unnecessary but desired or items which increase the quality of living. Examples include a car stereo, CD's, car, and designer clothes. Depending upon what a person defines as a need or a want will influence



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his/her financial decisions. For example, a person who deems a vehicle as a need will have larger expenses than a person who relies on a bicycle for transportation and sees a vehicle as a want.

**Satisfying Needs and Wants:**

The four basic problems of an economy, which arise from the central problem of scarcity of resources, are:

- What to produce?
- How to produce?
- For whom to produce?
- What provisions (if any) are to be made for economic growth?

**1.4 Production Possibility Frontier**

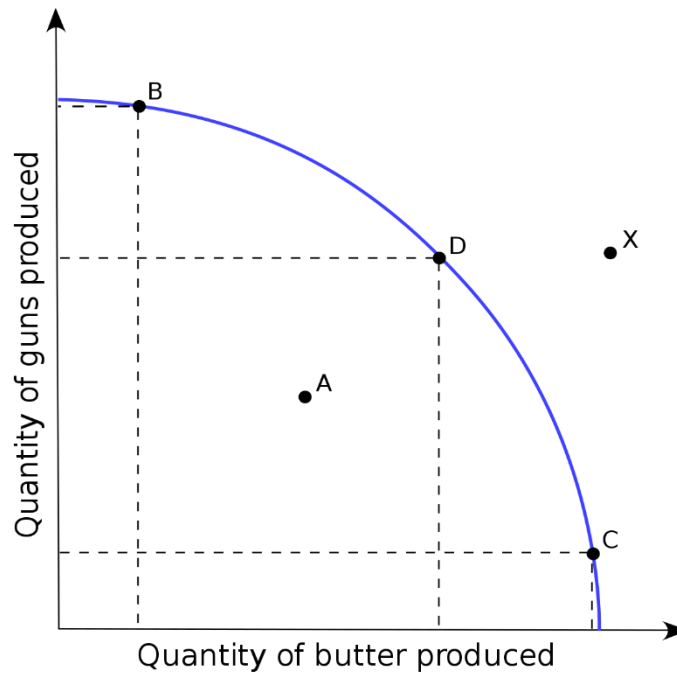
The production possibility frontier (PPF) is a curve that illustrates the variations in the amounts that can be produced of two products if both depend upon the same finite resource for their manufacture.

PPF also plays a crucial role in economics. It can be used to demonstrate the point that any nation's economy reaches its greatest level of efficiency when it produces only what it is best qualified to produce and trades with other nations for the rest of what it needs. The PPF is also referred to as the production possibility curve or the transformation curve.

The production possibility frontier demonstrates that there are, or should be, limits on production. An economy, to achieve efficiency, must decide what combination of goods and services can and should be produced. A simplified economic model which portrays scarcity, choice, and opportunity cost. The Static Production Possibility Frontier

**Assumptions of Production Possibility Frontier**

- a) There is a fixed quantity of resources
- b) The economy only produces two products
- c) Resources can be used interchangeably
- d) All resources within the economy are used
- e) Resources are used at maximum efficiency

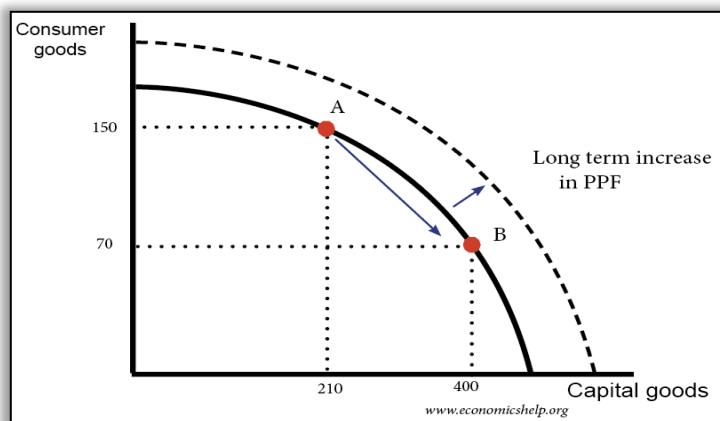


For example, consider the chart below. Imagine a national economy that can produce only two things: Gun and butter. According to the PPF, points A, B, and C on the PPF curve represent the most efficient use of resources by the economy. For instance, producing five units of guns and five units of butter

(point B) is just as desirable as producing three units of guns and two units of cotton. Point X represents an inefficient use of resources, while point Y represents a goal that the economy simply cannot attain with its present levels of resources.

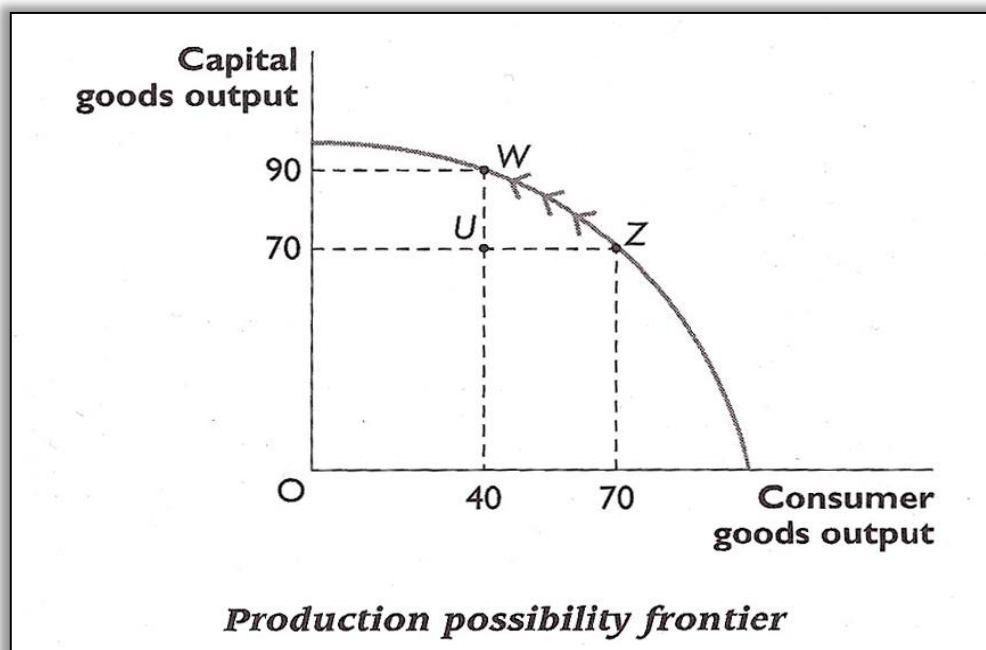
**What to produce?**

This problem involves selection of goods and services to be produced and the quantity to be produced of each selected commodity. Every economy has limited resources and thus, cannot produce all the goods. What possible commodities to produce: An economy must decide, which consumer goods (rice, wheat, clothes, etc.) and which of the capital goods (machinery, equipment's, etc.) are to be produced. In the same way, economy must make a choice between civil goods (bread, butter, etc.) and war goods (guns, tanks, etc.)



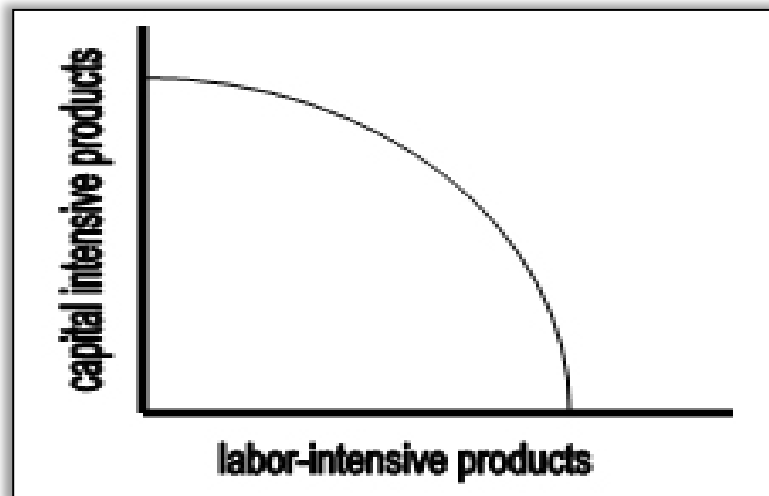
**HOW MUCH to produce (quantity):** After deciding the goods to be produced, economy must decide the quantity of each commodity that is selected. It means, if involves a decision regarding the quantity to be produced, of consumer and capital goods, civil and war goods and so on.

Amount of Consumer Goods and Capital Goods



**HOW to produce (quantity)?**

This problem refers to selection of technique to be used for production of goods and services. A good can be produced using different techniques of production. By 'technique', we mean which combination of inputs to be used. Generally, techniques are classified as: Labour intensive techniques (LIT) and Capital-intensive techniques (CIT).

**For Whom to Produce**

This problem refers to selection of the category of people who will ultimately consume the goods, i.e., whether to produce goods for poorer and less rich or richer and less poor. Since resources are scarce in every economy, no society can satisfy all the wants of its people. Thus, a problem of choice arises.

Goods are produced for those people who have the paying capacity. The capacity of people to pay for goods depends upon their level of income. It means, this problem is concerned with distribution of income among the factors of production (land, labour, capital and enterprise), who contribute in the production process.

*The problem can be categorised under two main heads:*

- i. Personal Distribution: It means how national income of an economy is distributed among different groups of people.
- ii. Functional Distribution: It involves deciding the share of different factors of production in the total national product of the country. Guiding Principle of 'For whom to Produce': Ensure that urgent wants of each productive factor are fulfilled to the maximum possible extent.

**Limitations of microeconomics:**

In spite of its importance, there are some limitations of Economics, which are discussed below:

1. It depends on the unreal esteem of true employment in economical situation. According to Kenz, to adopt true employment is like adopting the situation that there is no problem at all. In this real world, true employment is not a rule but exceptional. Thus, Microeconomics is not a good method for economical analysis.
2. Microeconomics is based on Laissez Faire conditions. But nowadays this theory is not used at all. It is ruled out with the big crises of 1930. So, the study of microeconomics seems unreal.
3. Microeconomics deals with fraction and ignores the radical. As Bolding states, "It is impossible to define a huge and vast system like economical system as a personal unit." So, microeconomics produces a faded and unreal picture of economical system.

4. Various economic problems are not defined by Microeconomics even not identified too. It is not necessary that a rule which applies to a firm, a family or a company is also applicable to a huge economical system too.

### Self Assessment

Fill in the blanks:

1. Microeconomics is an important mean in ..... analysis.
2. Microeconomics helps to understand the problems of .....
3. The word 'micro' is taken from Greek word .....

## 1.5 Macroeconomics

### Its meaning

Macroeconomics is the study of aggregate or things related to the entire economy like total employment, unemployment, national income, national production, total investment, total consumption, total saving, total supply, total demand and general pricing, interest rates and cost structure. In other words, macroeconomics scans each other relation, their bonding and their ups and downs. Thus, as per Ecle, "Macroeconomics deals with major incidents. This deals with the economical experience as an elephant's structure and in spite of checking the bones and hips, it checks the whole size, shapes, and structures. It studies the nature of forest and not the nature of trees which make them forest." Macroeconomics is also known as "theory of income and employment" or "income analyzation". Unemployment, economical ups and downs, inflation, instability, motionless, international trade, and economic development are studied under macroeconomics. It deals with the reason of unemployment and the various factors of employment. It connects with the business total production, total income, and total employment. In pricing factor, it studies the general pricing and its effect. Debit balance in international trade and the problems in foreign help come under macroeconomics. Above all the theory of macroeconomics deals in the study of a nation's total income and its difficulties as well as its ups and downs. At last, it studies the reason, which affects on the growth of an economical structure of a nation.

### Distinction between Microeconomics and Macroeconomics

Following are the differences between Microeconomics and Macroeconomics: 'Micro' word came from Greek word 'micros' which means small. Microeconomics deals with humans and a small group of humans. It is the study of exclusive family, firms, companies, things, and prices. 'Macro' word is also from Greek word 'macro' which means 'Big'. It deals in a big manner like with nation's capital and not with a person's income, normal price range and not with an individual price, national productivity and not with an individual productivity.



Micro' word is derived from the word 'Micros' and 'Macro' word is derived from the Greek word 'Macros'.

Microeconomics maximizes the use of demand and maximizes the profit over minimum input of supply. On the other hand, the main motto of macroeconomics is purposeful employment, fixed pricing, rise on economical condition and favorable payment balance. The base of microeconomics is pricing which works with the help of supply and demand. This power helps to equalize the pricing in market. On the other hand, the base of macroeconomics is national income, productivity, employment, and general pricing which defines by total demand and total supply. Microeconomics is based on prudent behavior of humans. "All things are equal" used in it to define various economical laws. On the other hand, the recognition of macroeconomics deals with the total volume of economical condition and its range, graph of national income and normal life.

### Self Assessment

Multiple choice questions:

4. The efficiency of distribution of factors is related to the study of ..... economics.  
 (a) welfare      (b) micro      (c) macro      (d) social

## Notes

5. The demand of productive factors comes from ..... .  
 (a) consumers (b) producers (c) pricing (d) owners
6. The relation of price theory relates to ..... use.  
 (a) factors (b) distribution (c) less consuming (d) appointment
7. In the real world, full employment is not real but ..... .  
 (a) unreal (b) exception (c) employment (d) analysis
8. Microeconomics is the key of ..... economical analysis.  
 (a) unreal (b) full (c) exceptional (d) successful

Microeconomics is based on the partial equilibrium, which helps to clarify the constant terms of a person, a firm, a company, and a resource. On the other hand, macroeconomics is based on general equilibrium, which helps in studying the various economical conditions and their relations. In microeconomics, the study of equilibrium terms happens in a specific period. This period does not describe any entity. Thus, microeconomics is a static condition. On the other hand, macroeconomics is based on the time lags, laws of changes and pricing. So, it relates to the detailing of things. The microeconomics is used for wide range of conditions, problems, markets, and the different types of associations. It relates to recognition and methodology which helps to get solutions of problems.

In respect of this, microeconomics helps to get practical knowledge of economics where there are less economical problems and their solutions. Microeconomics and macroeconomics, both are the study of aggregate. But the aggregates are different from each economics. Microeconomics deals with the aggregation of individual family, individual firm and individual companies. For example, the term 'company' adds many firms and things. The demand for shoes can add various families and the supply is also added on various firms. The demand and supply of labor in a region is the recognition of a group." But the study of aggregates is different from micro to macroeconomics. In macroeconomics, the groups used as "addition of whole economy" but in microeconomics, it is not conjugating with an economy but relates to individual firm, family and industry.



Give your opinion on micro and macroeconomics.

### Problems of Interrelation and Integration of the Two Approaches

The differences of micro and macroeconomics are not rigid because their parts effects all the quantities. **Dependence of microeconomics on macroeconomics:** For example, put the dependencies of macroeconomics on microeconomics, when the demand increases in prosperity, then the demand of individual things also increases. If this is due to the less interest rate, then product demand will also increase. This will increase the demand of a specific labour for the pricing company. If the labour is rigid, then the cost of labour will increase. This happens due to increase in the cost of things. Hence the macro economical changes changed the pricing of microeconomics. Thus, the shape of income in economical condition, employment production, pricing affects the individual company and firms. Thus, this affects the structure of price, production, employment of individual firm and industries in terms of income, production, employment, and cost in economics. Take another example, when the production falls in crises, then the production of price falls rather than production of products. So, the benefits, employment and job fall mostly in product-industry rather than pricing-product industry.

**Dependence of macroeconomics on microeconomics:** On the other hand, macro-economic theory also depends on an individual. Whole is made with parts. The national income is an addition of people, firm and company's income general price range is an average of all prices of things and services. The general price is the average of all prices of products and services. Thus, the production is an average of whole production of all the units in an economy.

We can put some examples on micro and macroeconomics. If economy concentrates their factors only to the agricultural products, then the production of an economy will cut because all other regions will not cover. In an economy, the income and the employment status also depend upon the distribution of income. If there is unequal distribution of income like some rich people get maximum income, then the consumer product will have less demand. This will affect profit and invest, and

production will increase unemployment and at last, there is crisis situation in economy. Thus, the process of studying and analyzing depends on both micro and macroeconomics.

### Self Assessment

State whether the following statements are True/False:

9. Regner Frish was the first man who used the terms Macro and Micro in economics in 1933.

10. The study of small individual groups as well as individuals is macroeconomics.

11. Microeconomics is the study of pricing law.

12. The consumption and productivity is based on social welfare and perfect efficiency of individual welfare.

*Non-interdependencies between the two* — Apart from this relationship, there are various economical problems, which are not related to an individual, and many problems do not relate to whole economical structure. For example, there is the difference between a person's income and his expenditure, but for a whole economical state, the income and expenditure are always equal. An individual can invest without savings, but savings and investment should always be equal to an economy. When there is full employment in an economy then a firm can increase its production attracting the of other firms. But the whole industry could not increase resources of that type. The export of a country can be more than import or vice versa but for the whole world the export import should be equal.

*Proper integration of the two approaches* — Actually, there is not a true line between micro and macroeconomics. Both should come under a simple law of economics. There is a simple theory, that both should come under a general theory of the economy. This principle should be the prices, production, income, individuals, individual firms, and industries to explain the behavior of groups and individual variables. In macroeconomics and microeconomics really, no line can be drawn correctly. A general theory of the economy clearly will embrace both; personal behavior, personal income, and prices will interpret and create groups with individual results add or averages macroeconomics is concerned. There is a general principle, but the scope has left fewer things from it. Thus, the main thing is to mix both economics. Prof. Ackley has given suggestion that the microeconomics should give the building blocks for macroeconomics. But to understand the macroeconomics, microeconomics is also helpful. For example, if we search some economical theories for stable microeconomics which should not match with macro economical theory or not related to any behavior which is avoided by macroeconomics then microeconomics should allow to update our knowledge and behavior but to ride on this way, we do not need to know the technical difficulties which states that "the macro economical theory of pricing and income depends on micro economic theories."

### 1.6 Deductive and Inductive Methods

The deductive method involves reasoning from a few fundamental propositions, the truth of which is assumed. The inductive method involves collection of facts, drawing conclusions from them and testing the conclusions by other facts.

#### The Deductive Method

Deduction Means reasoning or inference from the general to the particular or from the universal to the individual. The deductive method derives new conclusions from fundamental assumptions or from truth established by other methods. It involves the process of reasoning from certain laws or principles, which are assumed to be true, to the analysis of facts.

Then inferences are drawn which are verified against observed facts. Bacon described deduction as a "descending process" in which we proceed from a general principle to its consequences. Mill characterised it as a priori method, while others called it abstract and analytical.

#### Deduction Method involves four steps.

(1) Selecting the problem.

(2) The formulation of assumptions on the basis of which the problem is to be explored.

**Notes**

(3) The formulation of hypothesis through the process of logical reasoning whereby inferences are drawn.

(4) Verifying the hypothesis.

**(1) Selecting the problem:**

The problem which an investigator selects for enquiry must be stated clearly. It may be very wide like poverty, unemployment, inflation, etc. or narrow relating to an industry. The narrower the problem the better it would be to conduct the enquiry.

**(2) Formulating Assumptions:**

The next step in deduction is the framing of assumptions which are the basis of hypothesis. To be fruitful for enquiry, the assumption must be general. In any economic enquiry, more than one set of assumptions should be made in terms of which a hypothesis may be formulated.

**(3) Formulating Hypothesis:**

The next step is to formulate a hypothesis on the basis of logical reasoning whereby conclusions are drawn from the propositions. This is done in two ways: First, through logical deduction. If and because relationships (p) and (q) all exist, then this necessarily implies that relationship (r) exists as well. Mathematics is mostly used in these methods of logical deduction.

**(4) Testing and Verifying the Hypothesis:**

The final step in the deductive method is to test and verify the hypothesis. For this purpose, economists now use statistical and econometric methods. Verification consists in confirming whether the hypothesis is in agreement with facts. A hypothesis is true or not can be verified by observation and experiment. Since economics is concerned with human behaviour, there are problems in making observation and testing a hypothesis. This is done in two ways: First, through logical deduction. If and because relationships (p) and (q) all exist, then this necessarily implies that relationship (r) exists as well.

**Testing and Verifying the Hypothesis**

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- Verification consists in confirming whether the hypothesis agrees with facts.
- A hypothesis is true or not can be verified by observation and experiment.

**Deductive Method (Examples)**

The classic example

All men are mortal. (major premise)

Socrates is a man. (minor premise)

Therefore, Socrates is mortal. (conclusion)

The above is an example of a **sylogism**.

**Sylogism:** An argument composed of two statements or **premises** (the **major** and **minor** premises), followed by a **conclusion**.

For any given set of premises, if the conclusion is guaranteed, the arguments is said to be **valid**.

If the conclusion is not guaranteed (at least one instance in which the conclusion does not follow), the argument is said to be **invalid**.

Examples:

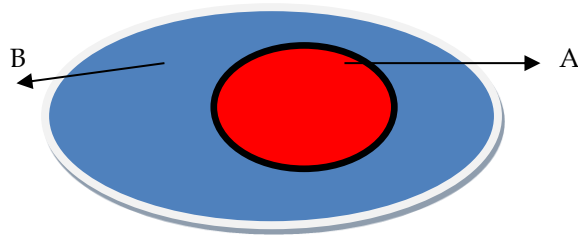
1. All students eat pizza; Henry is a student at LPU., Therefore, Henry eats pizza.
2. All athletes work out in the gym; Barry Bonds is an athlete., Therefore, Barry Bonds works out in the gym.
3. All math teachers are over 7 feet tall; Mr. D. is a math teacher., Therefore, Mr. D is over 7 feet tall.

**The argument is valid but is certainly not true.**

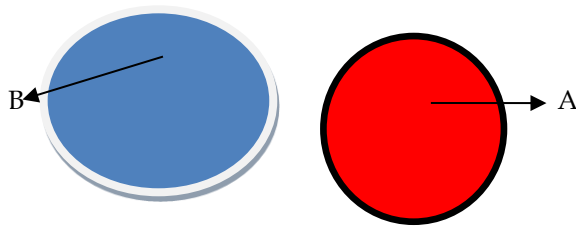
4. A snake is an animal; All snakes have four legs. (**not valid**)

## Venn Diagrams

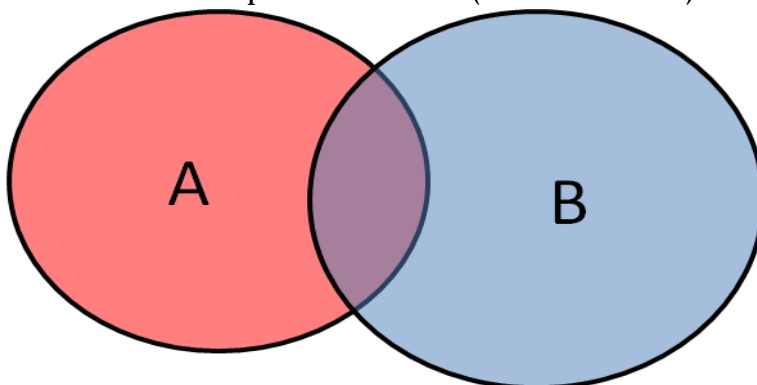
- **Venn Diagram:** A diagram consisting of various overlapping figures contained in a rectangle called the universe. This is an example of **all A are B**. (If A, then B.)



This is an example of **No A are B**.



This is an example of **some A are B**. (At least one A is B.)



### Merits of Deductive Method

- I. This method is near to reality. It is less time consuming and less expensive.
- II. The use of mathematical techniques in deducing theories of economics brings exactness and clarity in economic analysis.
- III. There being limited scope of experimentation, the method helps in deriving economic theories.
- IV. The method is simple because it is analytical.

### Demerits of Deductive Method

- I. The deductive method is simple and precise only if the underlying assumptions are valid. More often the assumptions turn out to be based on half truths or have no relation to reality. The conclusions drawn from such assumptions will, therefore, be misleading.
- II. Professor Learner describes the deductive method as 'armchair' analysis. According to him, the premises from which inferences are drawn may not hold good at all times and places. As such deductive reasoning is not applicable universally.
- III. The deductive method is highly abstract. It requires a great deal of care to avoid bad logic or faulty economic reasoning. As the deductive method employed by the classical and neo-



*Notes*

classical economists led to many facile conclusions due to reliance on imperfect and incorrect assumptions. Therefore, under the German Historical School of economists, a sharp reaction began against this method. They advocated a more realistic method for economic analysis known as inductive method.

**Inductive Method**

It moves from particular to general based on our experience.

According to Wilson Gee, "Inductive method is the process of reasoning from particular to general or from individual to universal."

We study the behaviors of an individual and reach certain conclusion.

If we reach the same conclusion, we generalize the statement as an observed truth and the theory is propounded.

Ram is a man

Ram is mortal

So, all men are mortal

For example, if we find that **A** purchases more garments when its price falls.

We observed that **B** does the same thing. **C** and **D** also behave in the same way.

Finally, we can generalise their behavior and an economic theory that customers have tendency to buy more of a commodity when its price falls is formed.

**Micro economic theories are formulated according to inductive method.**

**Inductive method** which also called **empirical method** was adopted by the "Historical School of Economists".

It involves the process of reasoning from particular facts to general principle.

This method derives economic generalizations based on:

- I. Experimentations
- II. Observations and
- III. Statistical methods.

In this method, data is collected about a certain economic phenomenon. These are systematically arranged, and the general conclusions are drawn from them.

**Example**

We observe 200 persons in the market.

We find that nearly 195 persons buy from the cheapest shops,

Out of the 5 which remains, 4 persons buy local products even at higher rate just to patronize their own products, while the fifth is a fool.

From this observation, we can easily draw conclusions that people like to buy from a cheaper shop unless they are guided by patriotism or they are devoid of commonsense.

**Steps of Inductive Method**

- I. Observation.
- II. Formation of hypothesis.
- III. Generalization.
- IV. Verification.

**Merits of Inductive Method**

- I. It is based on facts as such the method is realistic.
- II. To test the economic principles, method makes statistical techniques. The inductive method is, therefore, more reliable.
- III. Inductive method is dynamic. The changing economic phenomenon are analyzed and based on collected data, conclusions and solutions are drawn from them.
- IV. Induction method also helps in future investigations.

### Demerits of Inductive Method

- I. If conclusions drawn from insufficient data, the generalizations obtained may be faulty.
  - II. The collection of data itself is not an easy task. The sources and methods employed in the collection of data differ from investigator to investigator. The results, therefore, may differ even with the same problem.
  - III. The inductive method is time-consuming and expensive.
- The above analysis reveals that both the methods have weaknesses.  
We cannot rely exclusively on any one of them. Modern economists are of the view that both these methods are complimentary.  
They partners and not rivals.

Alfred Marshall has rightly remarked:

“**Inductive and Deductive methods** are both needed for scientific thought, as the right and left foot are both needed for walking”.

### Summary

There should be no line in micro and macroeconomics. Both should come under a simple line of economics. There should be a law which can describe the pricing, production, income, individual, individual firm and company. In fact, we cannot draw a line between micro and macroeconomics. A simple theory of economy can relate with both; will describe an individual behaviour, income and pricing and this average will add or create a group which will create macroeconomics. However, this type of theory we have but the wholeness affects this to use widely. To reach the true result, we can find that the problem of micro can be defined by microeconomics and vice versa.

### Keywords

Microeconomics: The study of smallest part of an economy

Macroeconomics: The study of a wide range of economy

Deductive Method: It involves the process of reasoning from certain laws or principles, which are assumed to be true, to the analysis of facts. Then inferences are drawn which are verified against observed facts

Inductive Method: Inductive method is the process of reasoning from particular to general or from individual to universal

### Review Questions

1. What do you mean by microeconomics?
2. What do you mean by macroeconomics?
3. Give differences between micro and macroeconomics.
4. Describe the dependencies of micro over macroeconomics.

#### Answers: Self Assessment

- |            |             |           |         |           |
|------------|-------------|-----------|---------|-----------|
| 1. Analyse | 2. Taxation | 3. Micros | 4. (a)  | 5. (b)    |
| 6. (c)     | 7. (b)      | 8. (a)    | 9. True | 10. False |
| 11. True   | 12. False   |           |         |           |

### Further Readings



1. Microeconomics – Frank Kowell, Oxford University Press, 2007.
2. Microeconomics – Robert S. Pindik, Daniel L. Rubinfeld and Prem L. Mehta, Pearson Education, 2009, PBK, 7th Edition.
3. Microeconomics – David Basenco and Ronald Brutigame, Wiley India, 2011, PBK, 4th Edition.

## Unit 02: Demand and Supply Analysis

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### Objectives

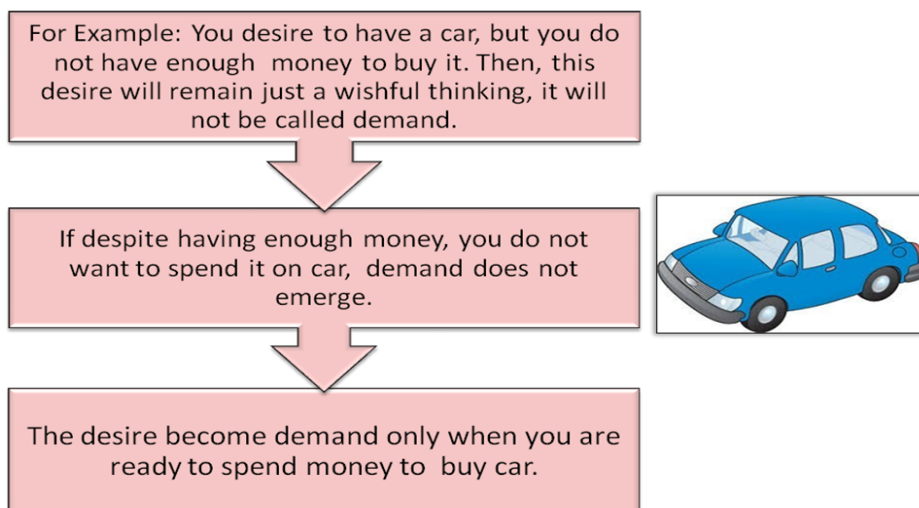
After this lecture, you would be able to

- to understand the individual demand market demand
- to evaluate the law of demand and its exception
- to understand the supply and law of supply,
- to evaluate the exception of law of supply.
- to understand the factors those are responsible for change in demand and supply.
- to understand the mechanism of change in market demand and supply.
- to understand the mechanism of Market Equilibrium in response to market forces
- analyze the responsiveness of market price due to change in Demand and Supply.

### Introduction

#### 2.1 Concept of Demand

The Demand for a product refers to the quantity of goods and services that the consumers are willing to buy at a particular price for a given point of time. Demand for a commodity refers to the desire to buy a commodity backed with sufficient purchasing power and the willingness to spend.



### Effective Demand

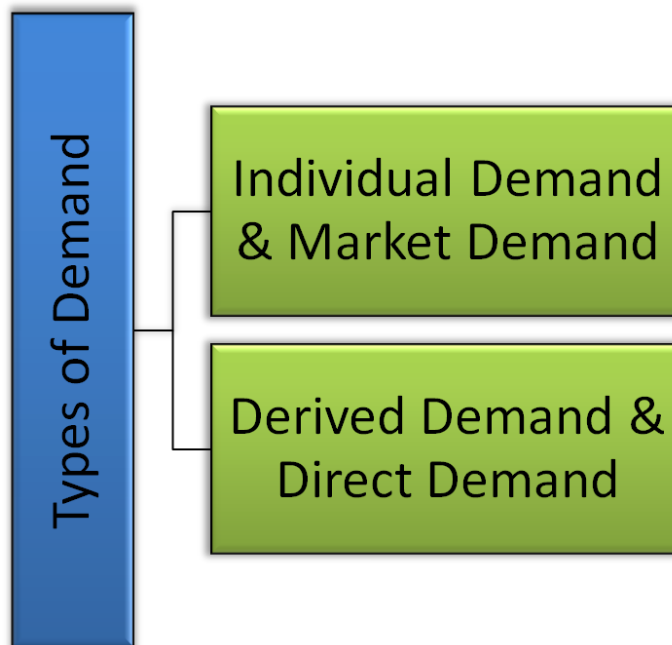
- In Economics, demand refers to effective demand, which implies three things:
- Desire,
- Means to purchase, and
- On willingness to use those means for that purchase



### Features of Demand

- Desires and Demand: Demand is the amount of commodity for which a consumer has willingness and ability to buy.
- Demand and Price: Demand is always at a price. Unless price is stated, the commodity has no meaning. The consumer must know both the price and the commodity.
- Point of Time: The amount demanded must refer to some period. Such as 10 kg of rice per week. The amount demanded and price must refer to a particular date.
- Utility: Demand depend upon utility of the commodity. A consumer is rational and demands only those commodities which provide utility.

## Types of Demand



### 1. Individual Demand and Market Demand

- The individual demand refers to the demand for goods and services by the single consumer,
- whereas the market demand is the demand for a product by all the consumers who buy that product.

### 2. Derived Demand and Direct Demand

- When the demand for a product/outcome is associated with the demand for another product/outcome is called as the derived demand or induced demand.
- Demand for cotton yarn is derived from the demand for cotton cloth.

## Objectives of Demand Analysis

- Demand Forecasting: Forecasting of demand is the art of predicting demand for a product or a service at some future date based on certain present and past behavior patterns of some related events.
- Production Planning: Demand analysis is prerequisite for the production planning of a business firm. To avoid overproduction and consequent losses.
- Sales Forecasting: Sales forecasting is based on the demand analysis.
- Control of Business: For controlling the business, it is essential to have a well-conceived budgeting of costs and profits that is based on the estimation of annual demand/sales and prices.
- Inventory Control: A satisfactory control of business inventories requires satisfactory estimates of the future requirements which can be traced through demand analysis.
- Growth and Long-Term Investment Programs: Demand analysis is necessary for determining the growth rate of the firm and long-term investment planning.
- Economic Planning and Policy Making: Demand analysis at macro level for the nation as a whole is of great help, the government can determine its import and export policies in view of the long-term demand forecasting and estimation for various goods in the country,

## Demand & Quantity Demanded

- The term Demand refers to various quantities of commodity that the consumer is ready to buy at different possible prices of a commodity.
- The term Quantity Demanded refers to a specific quantity to be purchased against a specific price of a commodity.
- Example: A Consumers' Demand is 2 ice creams if the price per ice cream is Rs.15, and 4 ice cream if the price per ice cream is Rs.10.
- Quantity Demanded is 4 ice creams if price happens to be Rs. 10 per ice cream.
- Demand Schedule is that schedule which expresses the relation between different quantities of the commodity demanded at different price.
- According to Samuelson, "The table relating to price and quantity demanded is called the demand schedule.

## Demand Curve

- Demand Curve is simply a graphic representation of demand schedule.
- According to Leftwich, "The Demand Curve represents the maximum quantities per unit of time that consumer will take at various prices.

### Types

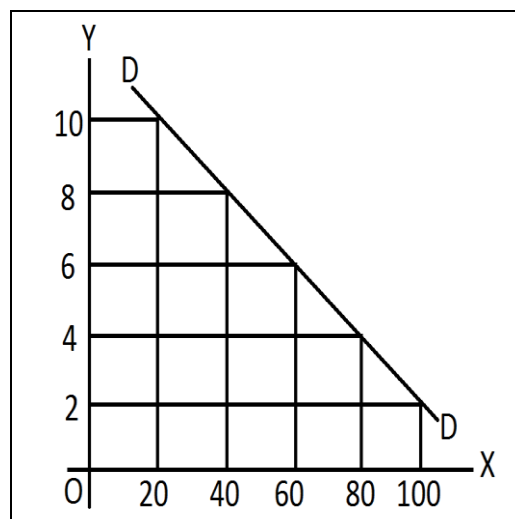
- Demand Schedule and Demand Curve are of two types.
  - Individual Demand Schedule & Individual Demand Curve
  - Market Demand Schedule & Market Demand Curve

**Individual Demand Schedule and Individual Demand Curve:** Refers to a tabular representation of quantity of products demanded by an individual at different prices and time.

### Individual Demand Schedule

Price (Rs)	Q quantity Demanded
60	2
40	3
30	5
24	7

### Individual Demand Curve



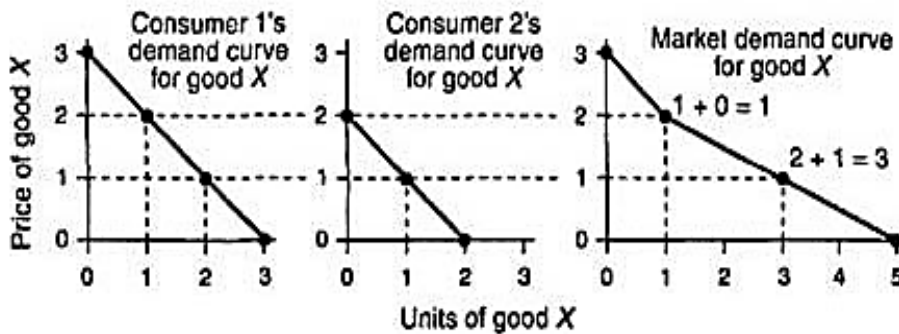
**Market Demand Schedule:** Market demand schedule shows total demand of all the consumers in the market at different prices of the commodity.

### Market Demand Schedule

Price (Rs)	A's Demand (1)	B's Demand (2)	Market Demand (1+2)
1	4	5	4+5=9
2	3	4	3+4=7
3	2	3	2+3=5
4	1	2	1+2=3

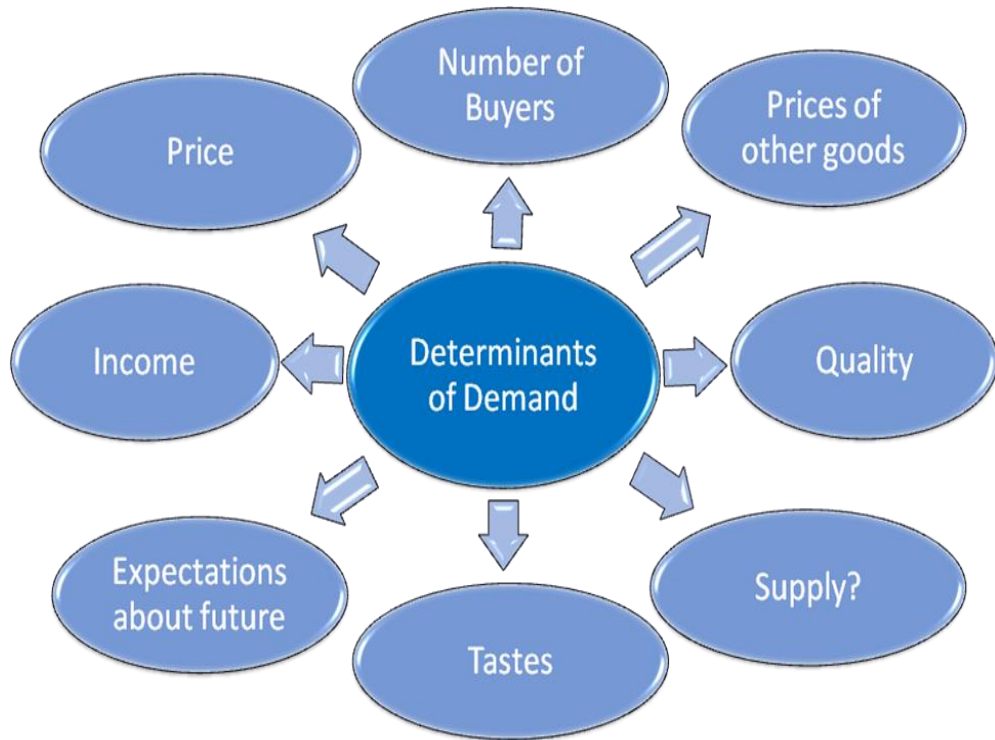
**Market Demand Curve:** Derivation of the market demand curve from consumers' individual demand curve

Market Demand Curve

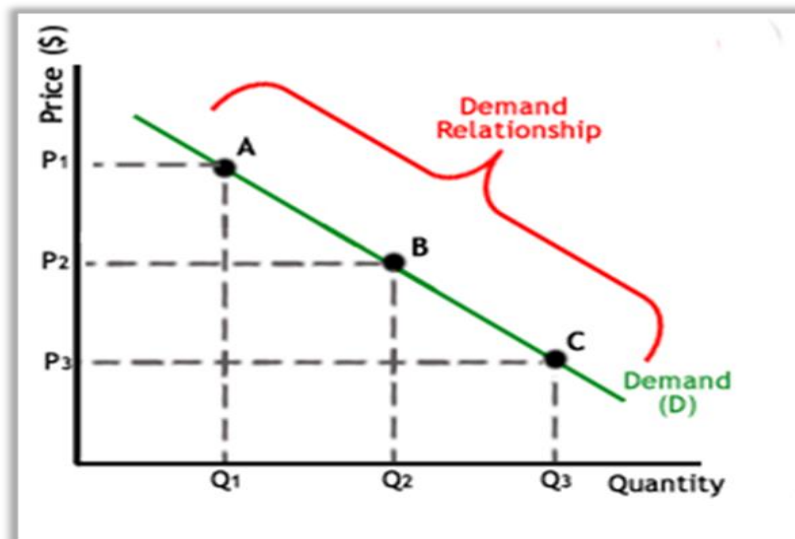


**Determinants of Demand**

The demand of a product is influenced by several factors. An organization should properly understand the relationship between the demand. Its each determinant to analyze and estimate the individual and market demand of a product. Determinants are the factor or component which tends to change the quantity demanded for commodity. The major factors are highlighted by raising light on following points:-

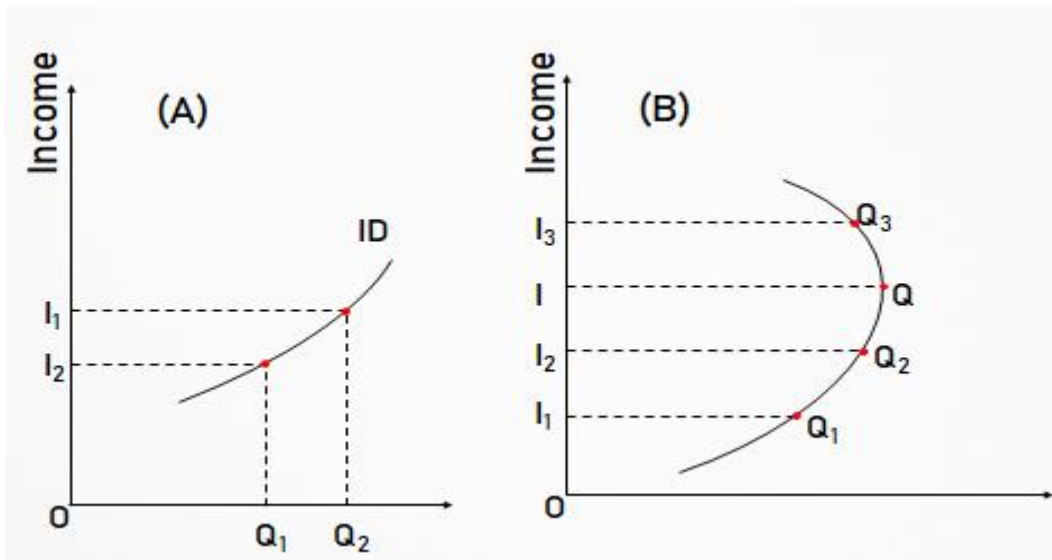


**Price:** Price is the most important determinant of demand. A “demand curve” plots combinations of prices and quantity demanded. A shift in price causes a shift along the demand curve



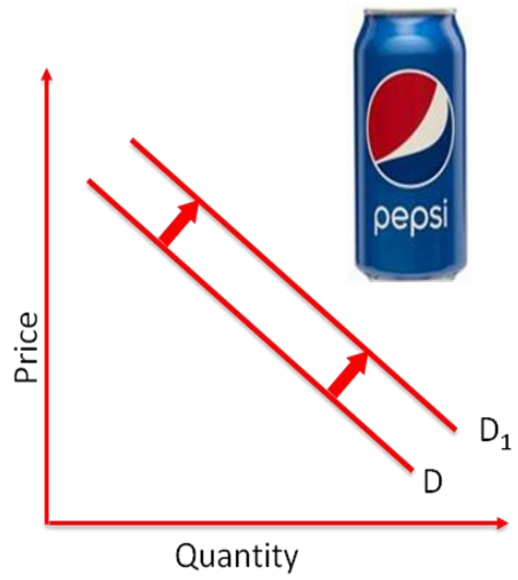
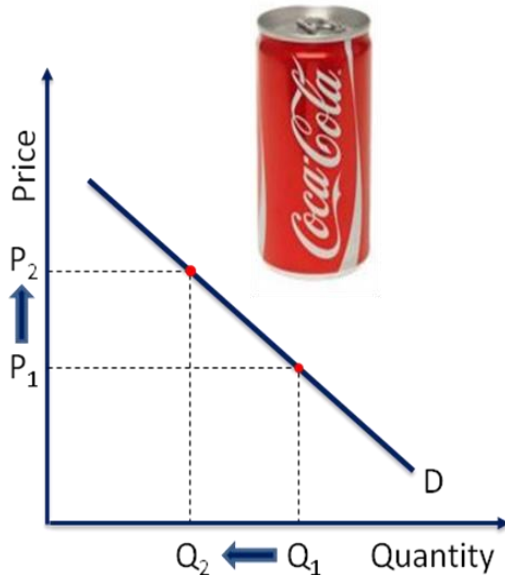
- **Income;** Changes in income can increase or decrease demand. A good whose demand decreases with an increase in income is called an “inferior good.” A good whose demand increases with an increase in income is called a “normal good.”





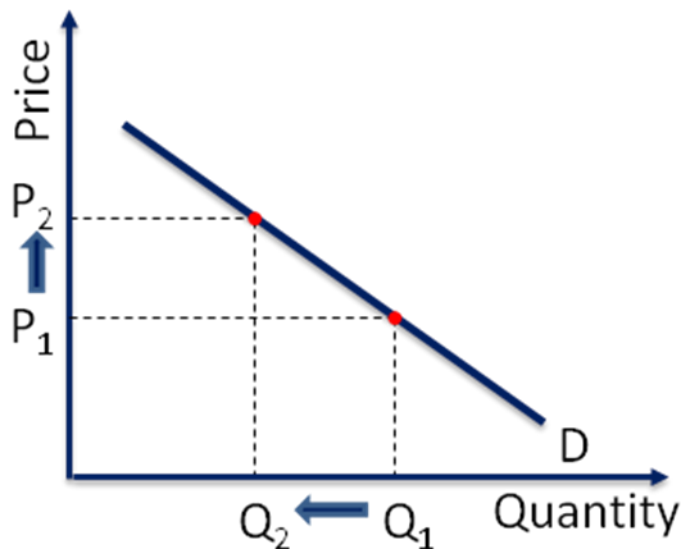
- *Prices of other goods (substitute good):* Changes in the prices of other goods can increase or decrease demand. A good that causes an increase in the demand for another good when its price increases is called a “substitute good.”



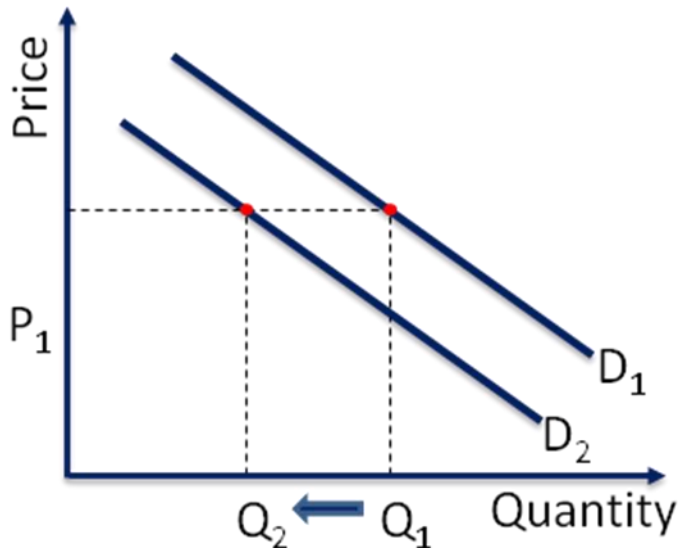


*Prices of other goods (complementary good):* A good that causes a decrease in the demand for another good when its price increases is called a “complementary good.”

**Demand for Petrol-** An increase in price of petrol leads to a decrease in the quantity demand.

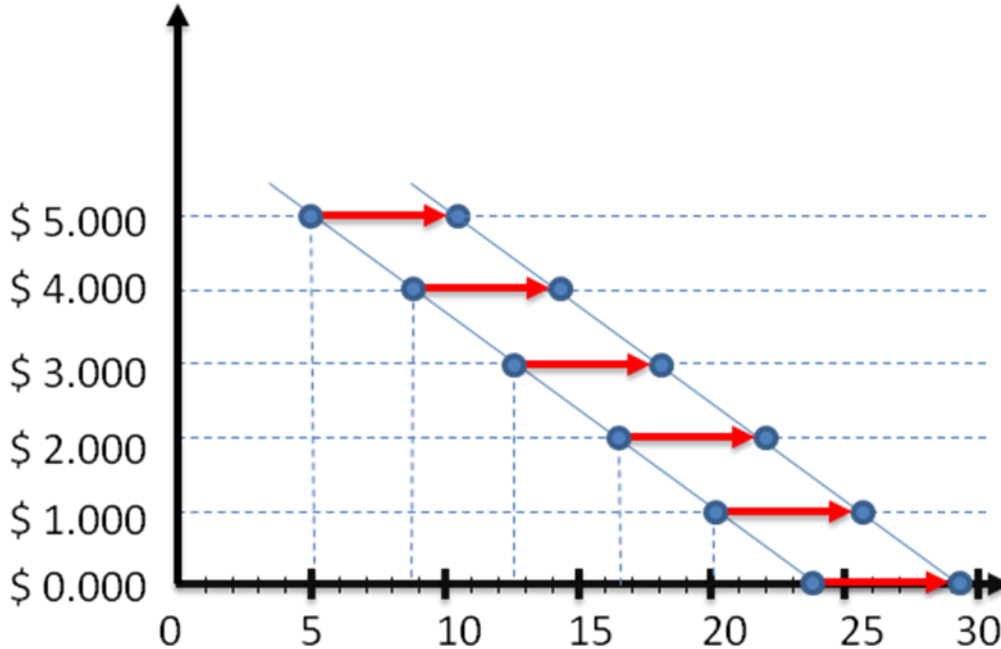


- *Demand for Cars:* The Demand for cars will decrease.



*Number of buyers:* An increase in the number of potential buyers will increase the demand for the good. For example, the demand for land increases as the population increases. Similarly, baseball tickets are generally more expensive in larger cities.

**Demand Curve Shifters number of buyers increase**



Suppose the number of buyers increases. Then at each price, quantity demanded will increase (by 5 in this example)

*Future Expectations of Consumers:* An increase in the expected future price of a good increases current demand. A decrease in expected future price of a good decreases current demand. For example, if consumers expect that the prices of petrol would rise in the next week, then the demand of petrol would increase in the present.

On the other hand, consumers would delay the purchase of products whose prices are expected to be decreased in future, especially in case of non-essential products.

**Tastes:** Demand curves can shift due to changes in tastes over time. For example, demand for cereal may be high in the morning but low at night.

**Effect of Advertisements:** Catching the attention of consumers and informing them about the availability of a product.



Demonstrating the features of the product to potential consumers. Persuading them to purchase the product. Consumers are highly sensitive about advertisements.



**Distribution of Income in the Society:** Influences the demand for a product in the market to a large extent. If income is equally distributed among people in the society, the demand for products would be higher than in case of unequal distribution of income.

### Demand Function

**Individual Demand Function:** Individual Demand function shows how demand for a commodity, by an individual consumer in the market, is related to its various determinants. It is expressed as:

$$D_x = f (P_x, P_r, Y, T, E)$$

**Market Demand Function:** Market Demand Function shows how market demand for a commodity (or aggregate demand for a commodity in the market) is related to its various determinants.

$$\text{Mkt. } D_x = f (P_x, P_r, Y, T, E, N, Y_d)$$

## 2.2 Law of Demand

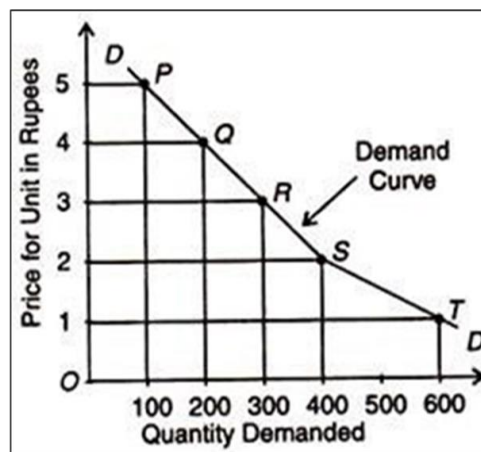
- The Law of Demand States that, other things being constant (*Ceteris Paribus*), the demand for a good extends with a decrease in price and contracts with an increase in price. In other words, there is an inverse relationship between quantity demanded of a commodity and its price. The term other thing being constant implies that income of the consumer, his taste and preferences and price of other related goods remains constant.

### Assumptions Law of Demand

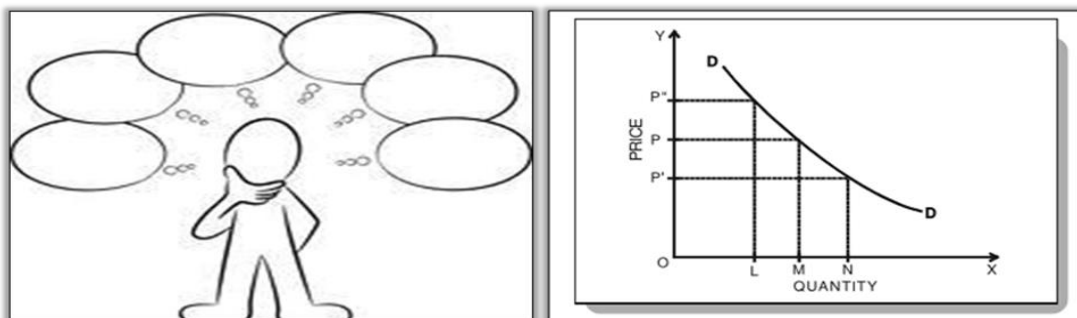
- Tastes and Preferences of the consumers remain constant.
- There is no change in the income of the consumer.
- Prices of the related goods do not change.
- Consumers do not expect any change in the price of the commodity in near future.

**Explanation:** The demand curve  $DD_1$  shows increase in demand of orange when its price falls. This indicates the inverse relation between price and demand.

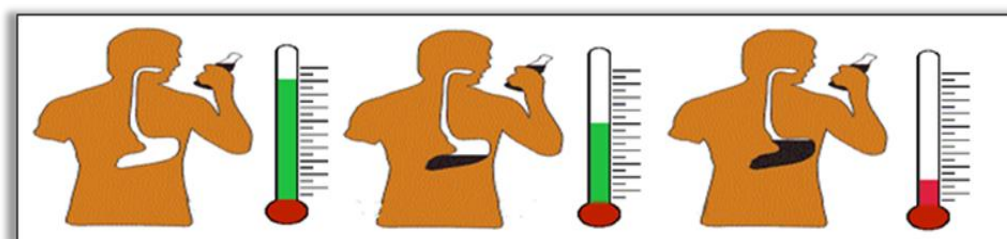
<i>Price (Rs)</i>	<i>Quantity Demanded</i>
5	100 Units
4	200 Units
3	300 Units
2	400 Units
1	600 Units



### Why Does Demand Curve Slope Downwards?



1. *Law of Diminishing Marginal Utility*: According to this law, as consumption of a commodity increases, the utility from each successive unit goes on diminishing to a consumer. Accordingly, for every additional unit to be purchased, the consumer is willing to pay less and less price. Thus, more is purchased only when price of the commodity falls.



2. *Income Effect*: Income effect refers to change in quantity demanded when real income of the buyer changes as a result of change in price of the commodity. Change in the price of a commodity causes change in real income of the consumer. With a fall in price, real income increases. Accordingly, demand for the commodity expands.

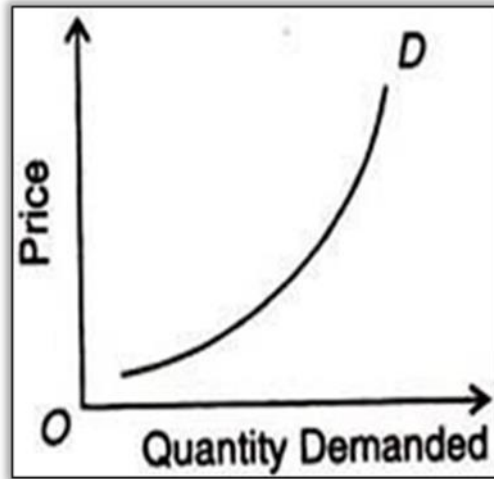
3. *Substitution Effect*: Substitution effect refers to substitution of one commodity for the other when it becomes relatively cheaper. Thus, when price of commodity X falls, it becomes cheaper in relation to commodity Y. Accordingly, X is substituted for Y.

4. *Size of Consumer Group*: When price of a commodity falls, it attracts new buyers who now can afford to buy it.

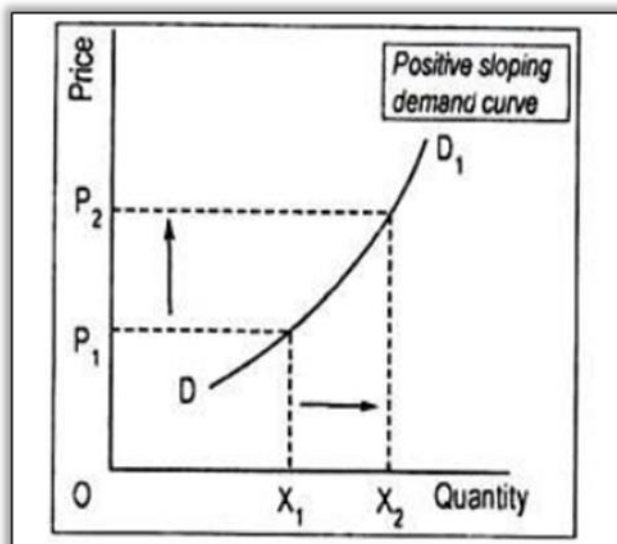
5. *Different Uses*: Many goods have alternative uses. Milk, for example, is used for making curd, cheese, and butter. If price of milk reduces its uses will expand. Accordingly, demand for milk expands.

### Exception to the Law of Demand

In certain cases, the demand curve slopes up from left to right, i.e., it has a positive slope. Under certain circumstances, consumers buy more when the price of a commodity rises, and less when price falls. Many causes are attributed to an upward sloping demand curve.



Articles of Distinction: This exception was first of all discussed by Veblen. According to him, articles of distinction have more demand only if their prices are sufficiently high. Diamond jewelry, etc.



The Giffen Goods: Giffen Goods are those Inferior Goods whose Demand falls even when their Prices Falls. For example 'Bajra'. Only those Inferior Goods are called Giffen Goods where Law of Demand Fails.

Expectation of Rise or Fall in Price in Future: Prices are likely to Rise More in the Future then even at the Existing Higher Price people may Demand more Units of the Commodity in the Present and vice versa.

Ignorance: Many a time, Consumers out of sheer Ignorance or Poor Judgment consider a Commodity to be of Low Quality if its Price is Low and of High Quality if its Price is High.

### **Self Assessment**

Multiple Choice Questions

1. What kind of relationship exists between demand for a good and price of its substitute goods?

- (a) Direct                      (b) Inverse                      (c) No effect                      (d) Can be direct or inverse

2. What kind of relationship exists between price of a good and demand of its complementary good?

- (a) Direct      (b) Inverse      (c) No effect      (d) Can be direct or inverse

3. What kind of relationship exists between income and demand of inferior good?

- (a) Direct      (b) Inverse      (c) No effect      (d) Can be direct or inverse

4. What kind of relationship exists between income and demand of a normal good?

- (a) Direct      (b) Inverse      (c) No effect      (d) Can be direct or inverse

5. Increase in demand is shown by:

- (a) Upward movement on the demand curve  
 (b) Downward movement on the demand curve  
 (c) Rightward shift of the demand curve  
 (d) Leftward shift of the demand curve

### 2.3 Law of Supply

'Supply refers to the quantity of a commodity which producers or sellers are willing to produce and offer for sale at a particular price', in a given market, at a particular period of time.



#### Three Important Aspects of Supply

- Supply is a desired quantity
- Supply is always explained with reference to Price
- Time during which it is offered for sale

#### Supply Schedule and Supply Curve

- Supply schedule shows a tabular representation of law of supply.
- It presents the different quantities of a product that a seller is willing to sell at different price levels of that product.
- The graphical representation of supply schedule is called supply curve.

#### Types of Supply Schedule and Supply Curve

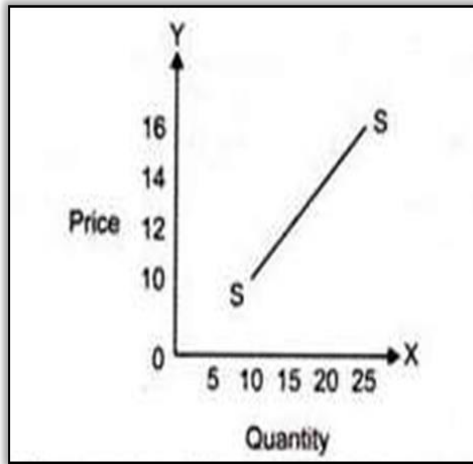
- Individual Supply Schedule & Individual Supply Curve
- Market Supply Schedule & Market Supply Curve
- Individual Supply Schedule & Curve: Refers to a supply schedule that represents the different quantities of a product supplied by an individual seller at different prices. The supply curve is showing a straight line and an upward slope. This implies that the supply of a product increases with increase in the price of a product.



Individual Supply Schedule

Price of milk (per litre in Rs)	Quantity supplied (1000 per day in litres)
10	10
12	15
14	20
16	25

Individual Supply Curve

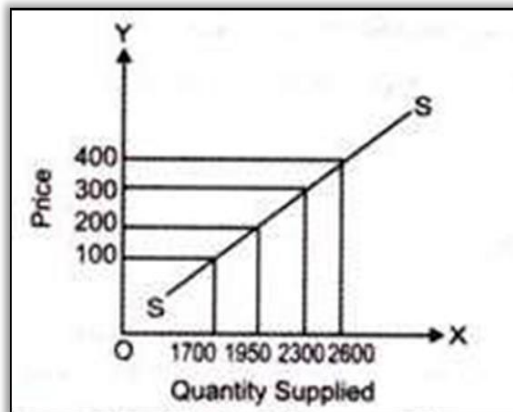


**Market Supply schedule and Curve:** Refers to a supply schedule that represents the different quantities of a product that all the suppliers in the market are willing to supply at different prices. Market supply curve also represents the direct relationship between the quantity supplied and price of a product.

Market Supply Schedule

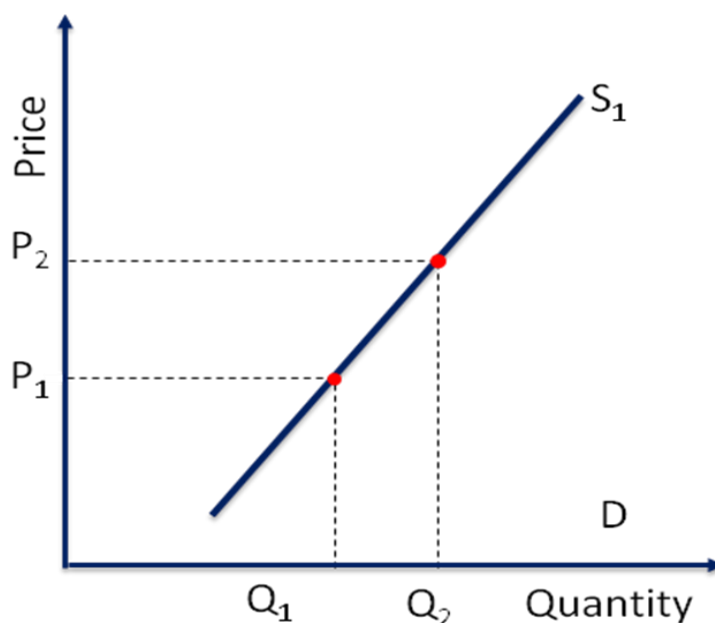
Price of Product X	Individual Supply			Market Supply
	A	B	C	
100	750	500	450	1700
200	800	650	500	1950
300	900	750	650	2300
400	1000	900	700	2600

Market Supply Curve



**Determinants of Supply**

- **Price of the Commodity:** There is a direct relationship between price of a commodity and its quantity supplied. When price increases, supply also increases because it motivates the firm to supply more to get more profit. When price decreases, smaller quantity will be supplied as profit decreases.



- **Price of Related Goods;** Producers always have the tendency of shifting from the production of one commodity to another commodity. If the price of another commodity increases, especially substitute goods, producers will find it more profitable to produce that commodity by reducing the production of the existing commodity.

*For Example*

Suppose the seller of tea notice that the price of coffee increases. They may reduce the number of resources devoted to the selling of tea in favor of coffee.



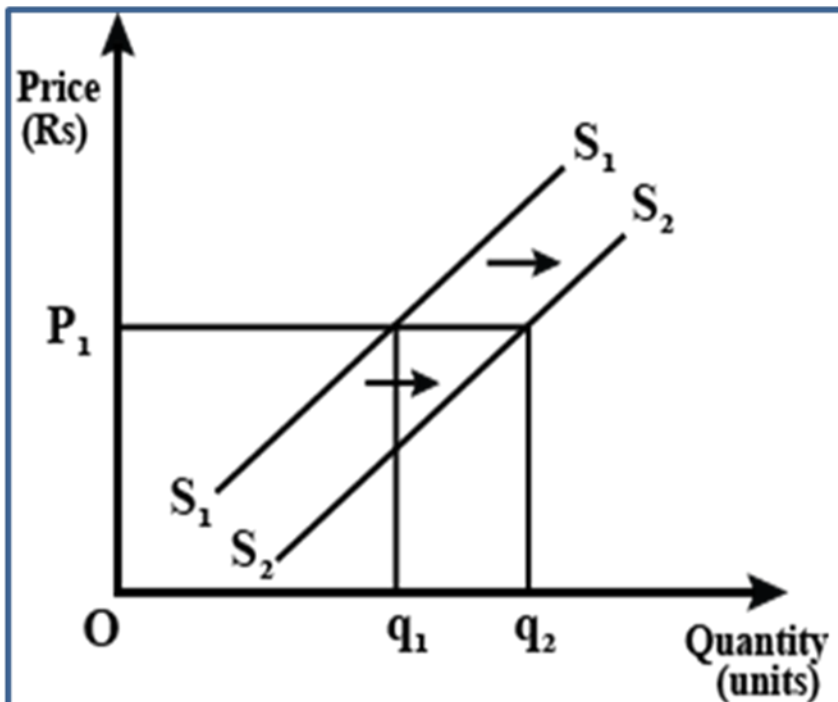
**Number of Firms:** Market supply of a commodity depends upon number of firms in the market. Increase in the number of firms implies increase in the market supply, and decrease in the number of firms implies decrease in the market supply of a commodity.

**Goal of the Firm:** Profit Maximization: If goal of the firm is to maximize profits, more quantity of the commodity will be offered at a higher price. Sales Maximization: If goal of the firm is to maximize sale more will be supplied even at the same price.

**Price of the Factor of Production:** Supply of a commodity is also affected by the price of factors used to produce the commodity. If the factor price decreases, cost of production also reduces. Accordingly, more of the commodity is supplied at its existing price. Conversely, if the factor price increases cost of production also increases. In such a situation less of the commodity is supplied at its existing price.



**Change in Technology:** Change in technology also affects supply of the commodity. Improvement in the technique of production reduces cost of production. So, more of the commodity is supplied at its existing price.



**Expected Future Price:** If the producer expects price of the commodity to rise soon, current supply of the commodity will reduce. If on the other hand, all in the price is expected, current supply will increase.

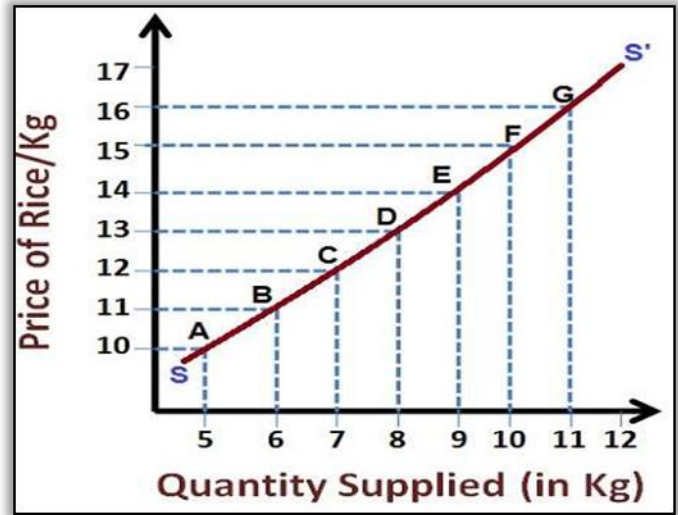


T = Technology  
 E<sub>x</sub> = Expected Future Price  
 G<sub>p</sub> = Government Policy

## Law of Supply

'Law of supply states that other things remaining the same, the quantity of any commodity that firms will produce and offer for sale rises with rise in price and falls with fall in price.' i.e., higher the price, higher will be quantity supplied and lower the price smaller will be quantity supplied. 'Other things remaining the same' means determinants other than own price such as technology, goals of the firm, government policy, price of related goods etc. should not change.

Price of Rice (Rs)	Quantity Supplied (kg)
10	5
11	6
12	7
13	8
14	9
15	10
16	11



- SS Slopes upward from left to right.
- It shows positive relationship between price of the commodity and its quantity supplied.
- As price rises quantity supplied also rises.

## Exceptions to the Law of Supply

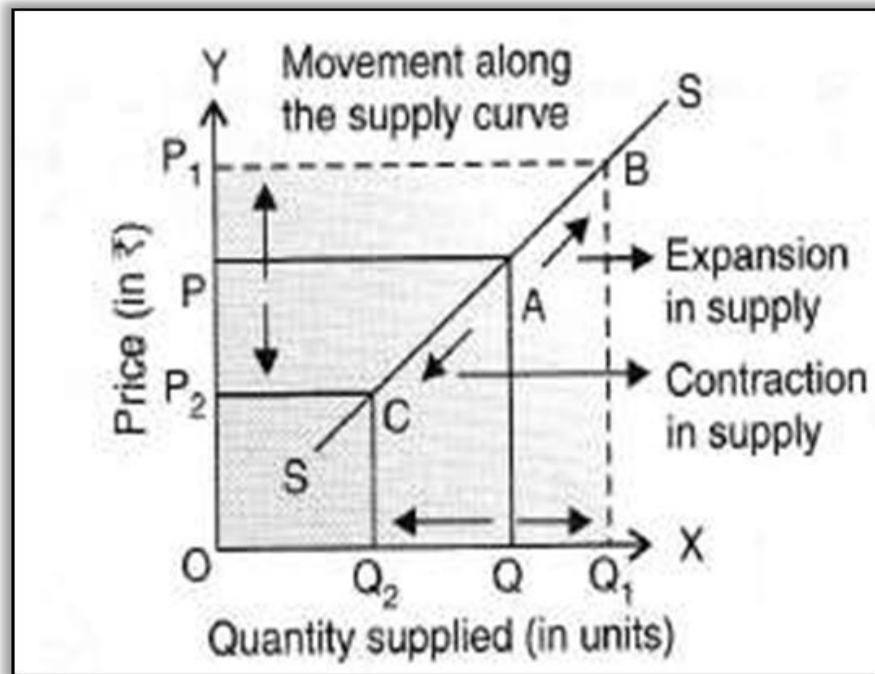
- The law of supply does not apply strictly to agricultural products whose supply is governed by natural factors.
- If due to natural calamities, there is fall in the production of wheat, then its supply will not increase, however high the price may be.
- Supply of goods having social distinction will remain limited even if their price tends to rise.
- Seller may be willing to sell more units of a perishable commodity at a lower price.

## Why Does Demand Curve Slope Upwards?

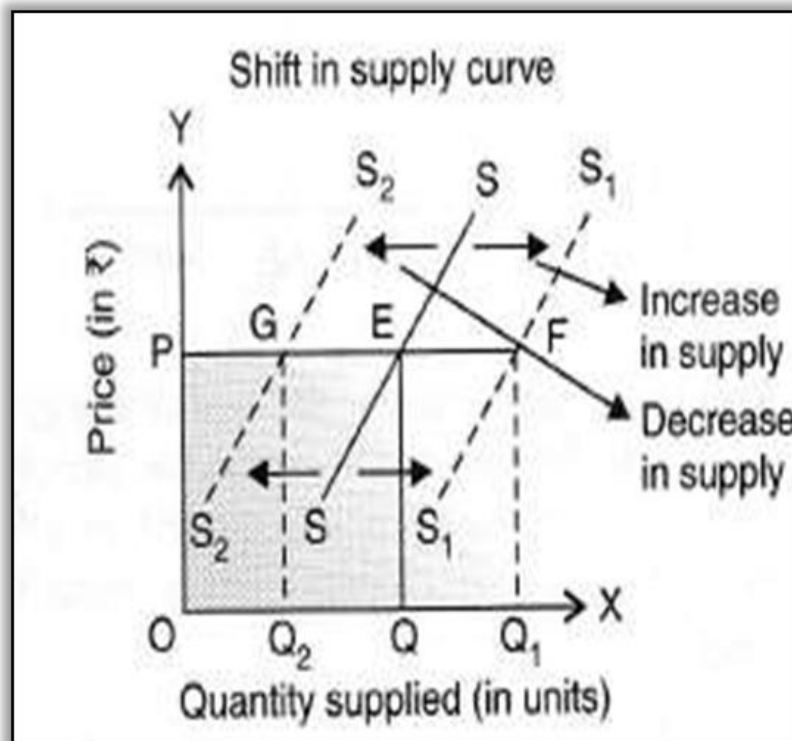
- **Increase in Price:** The level of price determines profit. i.e., higher the price, higher the profit and vice versa. So higher the price, the greater is the incentive for the producer to produce and supply more in the market, other things remain the same.
- **Rise in the Cost of Production:** Positive slope of supply curve is also caused by the rise in the cost of production. Usually cost of production increases with increase in production. In this situation a producer will produce and sell more units only at a higher price.

## Change in Quantity Supplied

- **Extension and Contraction of Supply or Movements along the Supply Curve:** Increase in quantity supplied of a commodity due to rise in its price is called Extension of Supply and decrease in quantity supplied due to fall in its price is called Contraction of Supply.



- **Change in Supply or Increase and Decrease in Supply or Shift in Supply Curve:** Increase in Supply occurs when more is supplied at the existing price, while decrease in supply occurs when less is supplied at the existing price. While increase in supply cause a forward shift in supply curve, decrease in supply cause a backward shift in supply curve.



**Self Assessment**

Multiple Choice Questions

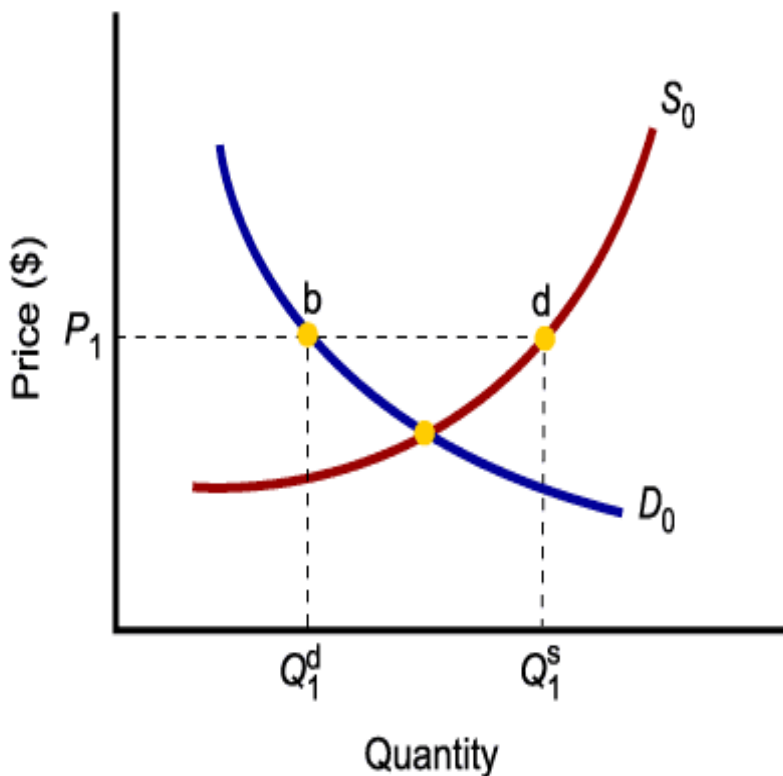
6. Each point on a supply curve represents

- A) the highest price sellers can get for each unit over time.

- B) the lowest price buyers will accept per unit of the good.
- C) the lowest price for which a supplier can profitably sell another unit.
- D) the highest price buyers will pay for the good.
7. Because of increasing marginal cost, most supply curves
- A) are horizontal.
- B) have a negative slope.
- C) are vertical.
- D) have a positive slope.
8. The quantity supplied of a good is
- A) equal to the difference between the quantity available and the quantity desired by all consumers and producers.
- B) the same thing as the quantity demanded at each price.
- C) the amount that the producers are planning to sell at a particular price during a given time period.
- D) the amount the firm would sell if it faced no resource constraints.

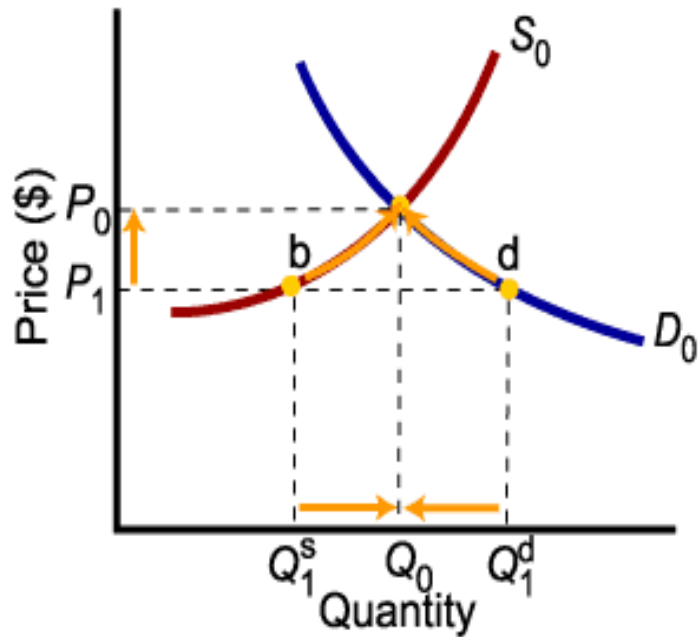
## 2.4 Market Equilibrium

The operation of the market depends on the interaction between buyers and sellers. Equilibrium is the condition that exists when quantity supplied, and quantity demanded are equal. At equilibrium, there is no tendency for the market price to change. Only in equilibrium is quantity supplied equal to quantity demanded. At any price level other than  $P_0$ , the wishes of buyers and sellers do not coincide.

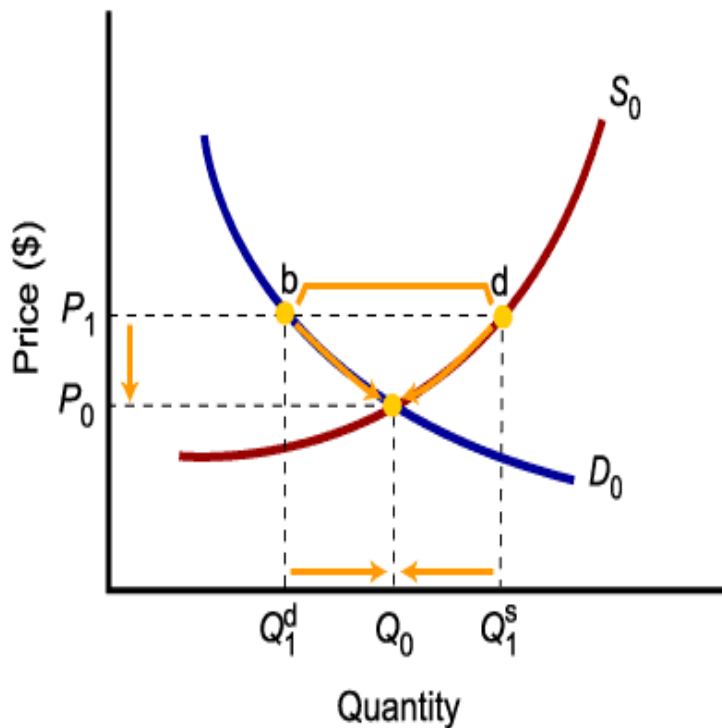


### 2.5 Market Disequilibria

Excess demand, or shortage, is the condition that exists when quantity demanded exceeds quantity supplied at the current price. When quantity demanded exceeds quantity supplied, price tends to rise until equilibrium is restored.



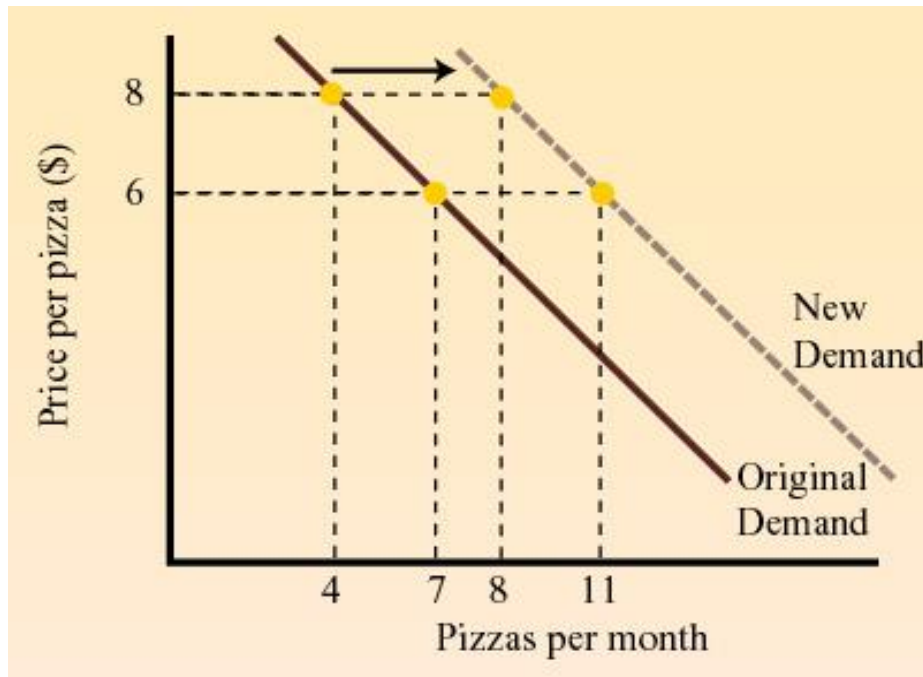
Excess supply, or surplus, is the condition that exists when quantity supplied exceeds quantity demanded at the current price. When quantity supplied exceeds quantity demanded, price tends to fall until equilibrium is restored.



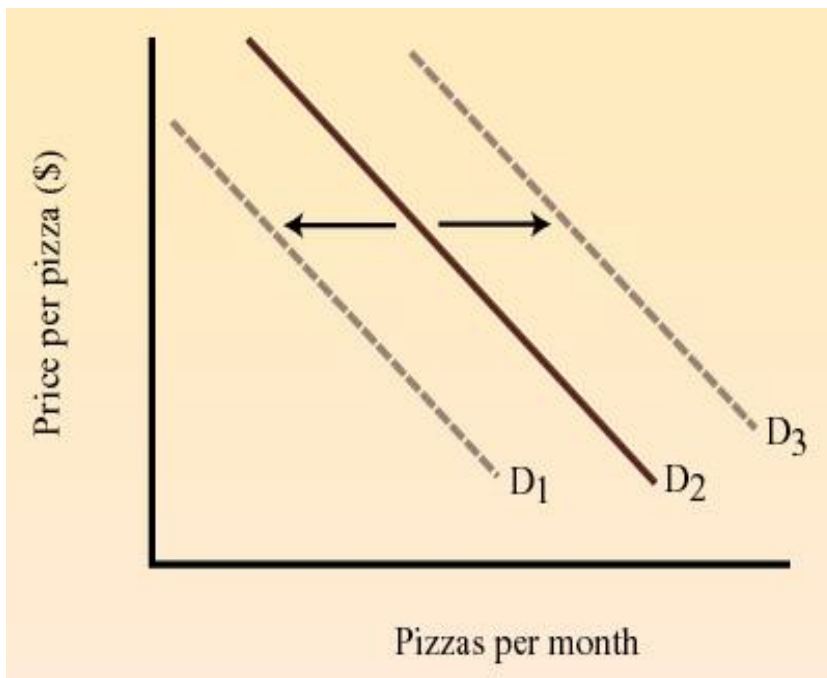


## A Change in Demand

A change in demand is a change in the amount of a good demanded resulting from a change in something other than the price of the good, which causes a shift of the entire demand curve. An increase in demand (rightward shift) results in higher quantity demanded at each price level.



*Shifting the Demand Curve:* Changes in determinants of demand other than price cause the demand curve to shift. A rightward shift shows an increase in demand and a leftward shift a decrease in demand.

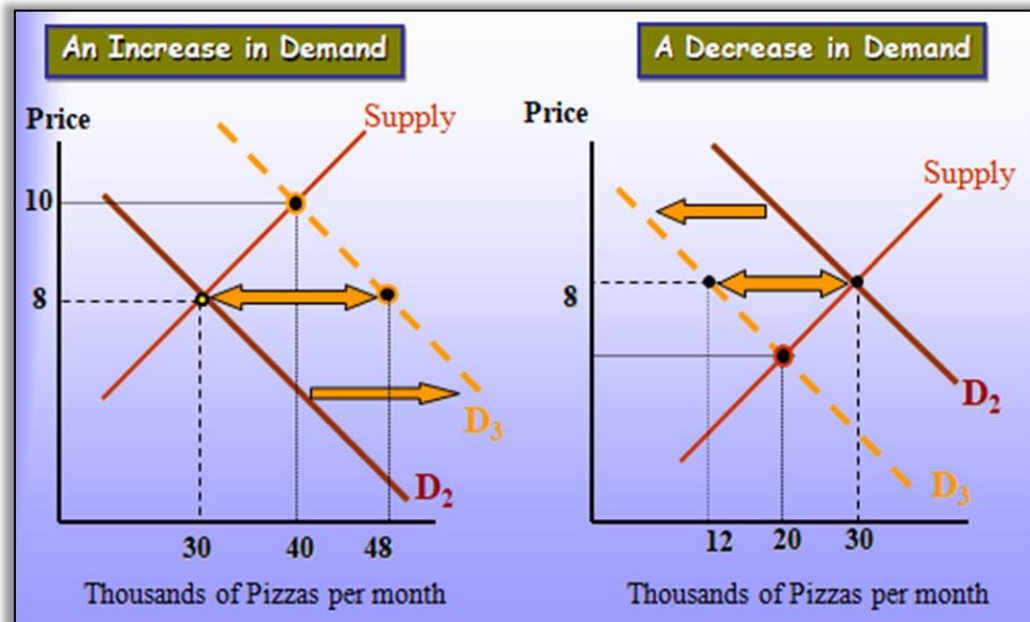


### Causes of an Increase in Demand

- An increase in income (normal goods) and a decrease in income (inferior goods)
- An increase in the price of a substitute good
- A decrease in price of a complementary good

- Higher preference for the good in question
- Favorable advertising
- An increase in the number of consumers (population)
- An expectation of higher future prices

### Market Effects of a Change in Demand



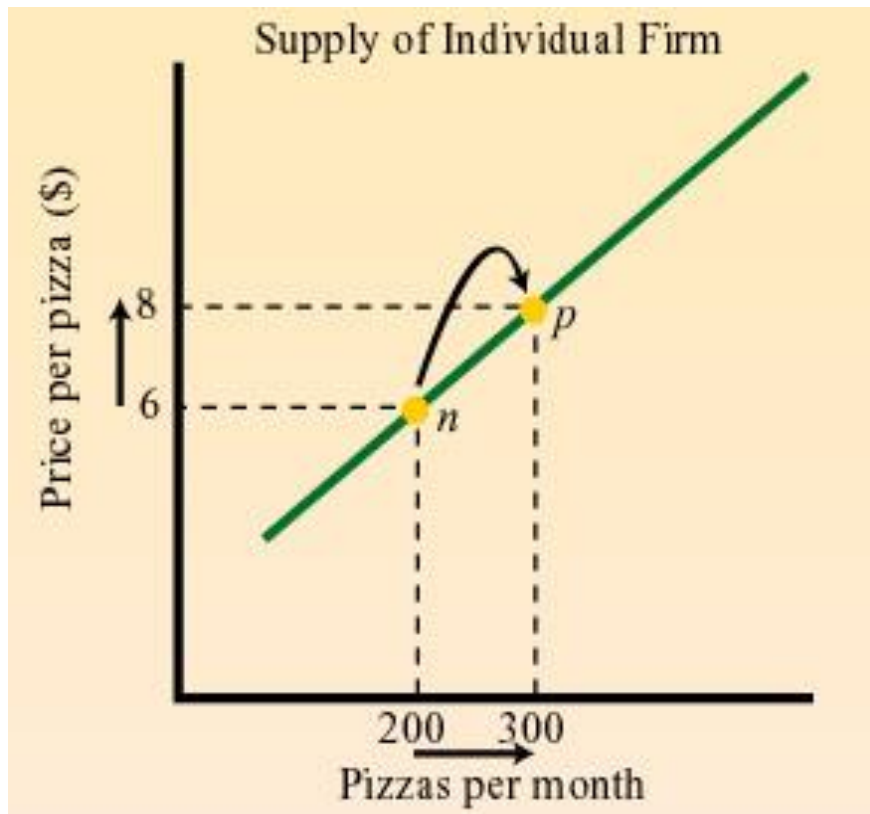
### Causes of a Decrease in Demand

- A decrease in income (normal goods) or an increase in income (inferior goods)
- A decrease in the price of a substitute good
- An increase in the price of a complementary good
- Less preference for the good in question
- An expectation of lower future prices
- A decrease in the number of consumers

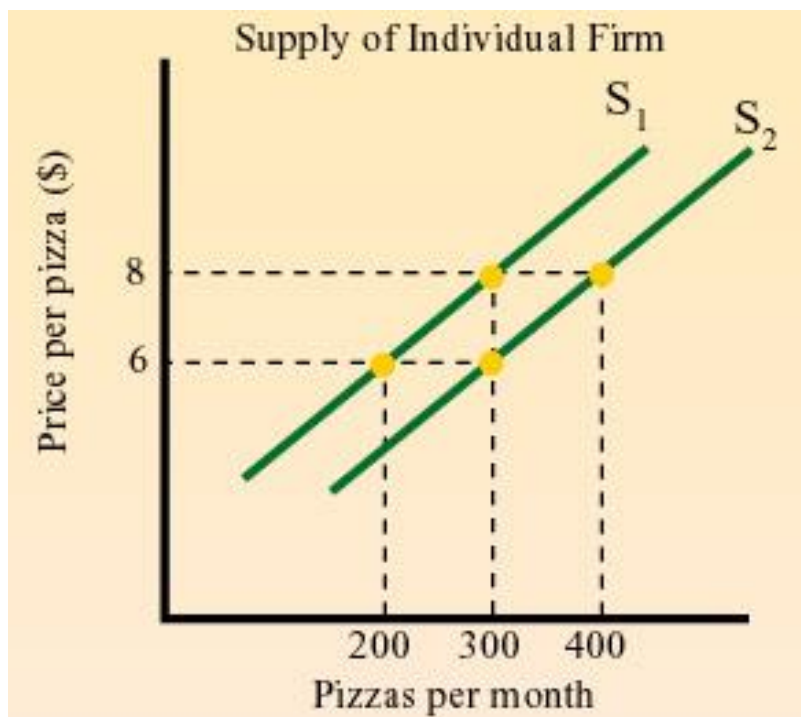
### Normal Versus Inferior Goods

- A normal good is a good for which the demand increases as real income rises.
- An inferior good is a good for which demand decreases as real income rises.
- For normal goods, the law of demand makes sense because the substitution and income effects reinforce each other.
- Lower prices result in higher quantity demanded.
- For inferior goods, the substitution and income effects conflict with each other, blurring the law of demand.
- The substitution effect tends to increase consumption while the income effect tends to decrease it.
- The law of demand is correct only as long as the substitution effect outweighs the income effect.

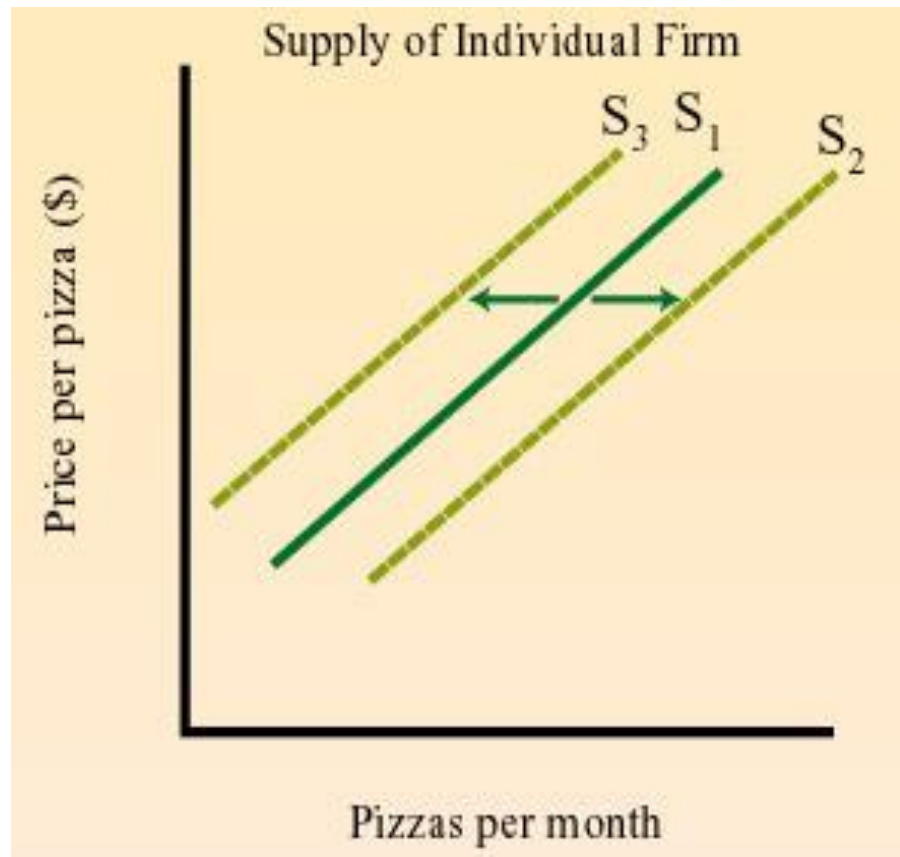
**A Change in Quantity Supplied:** A change in quantity supplied is caused by a change in the price of the good, which causes a movement along the supply curve.



**A Change in Supply:** A change in supply is caused by a change in something other than the price of the good, which causes a shift of the entire supply curve. An increase in supply results in higher quantity supplied at each price level.



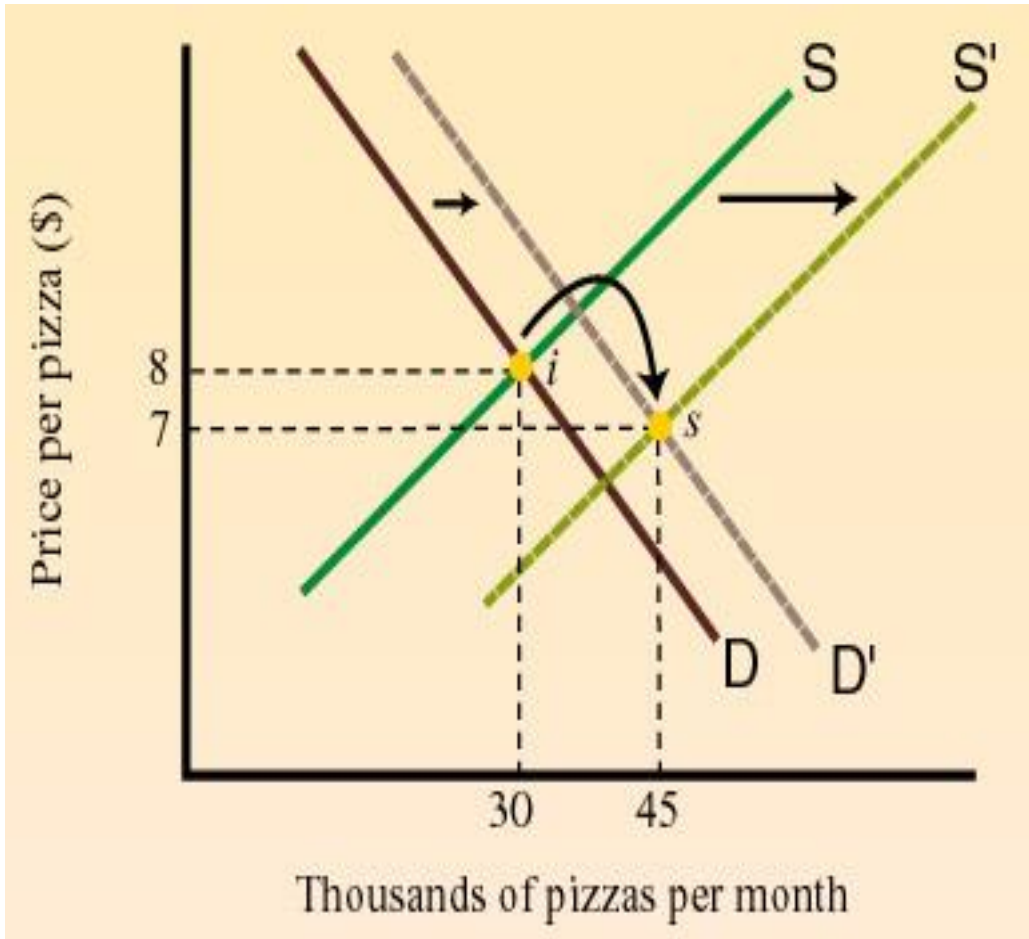
**Shifting the Supply Curve:** Changes in determinants of supply other than price cause the supply curve to shift. A rightward shift shows an increase in supply and a leftward shift a decrease in supply.



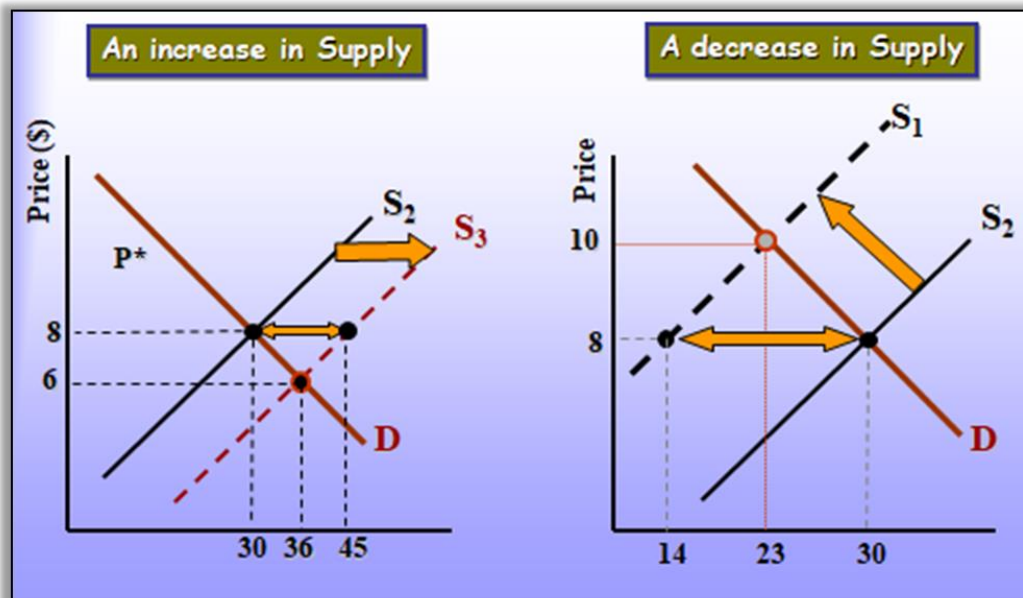
#### Causes of an Increase in Supply:

- A decrease in the cost of inputs
- A technological improvement that decreases cost of production
- Lower future prices than anticipated
- Subsidies
- An increase in the number of producers (firms)
- An increase in the cost of inputs
- A loss of technology
- A decrease in the number of producers (firms)
- Higher future prices than anticipated
- Higher taxes imposed on the producers of the good in question

*Market Effects of Simultaneous Changes in Supply and Demand:* When the magnitude of an increase in demand is smaller than the magnitude of an increase in supply, equilibrium quantity increases and market price decreases.

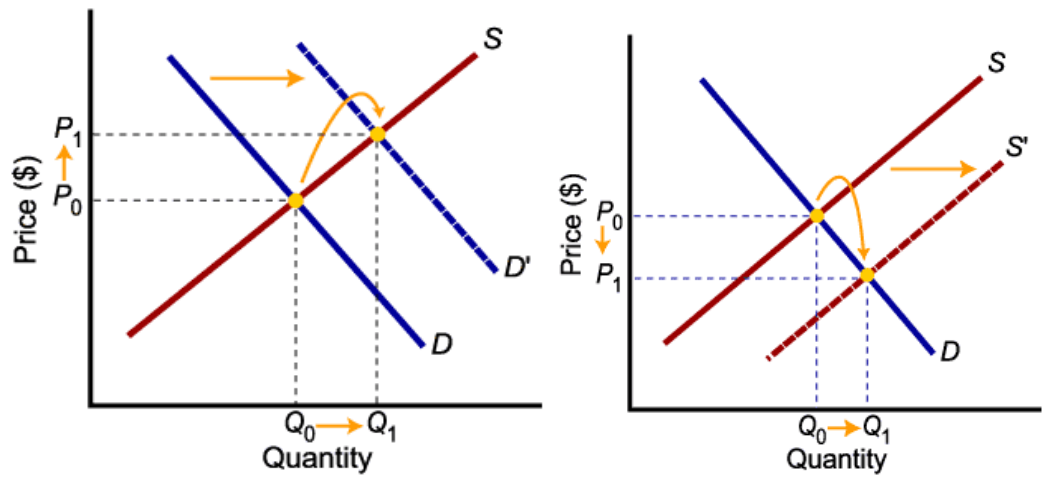


Market Effects of A Change in Supply



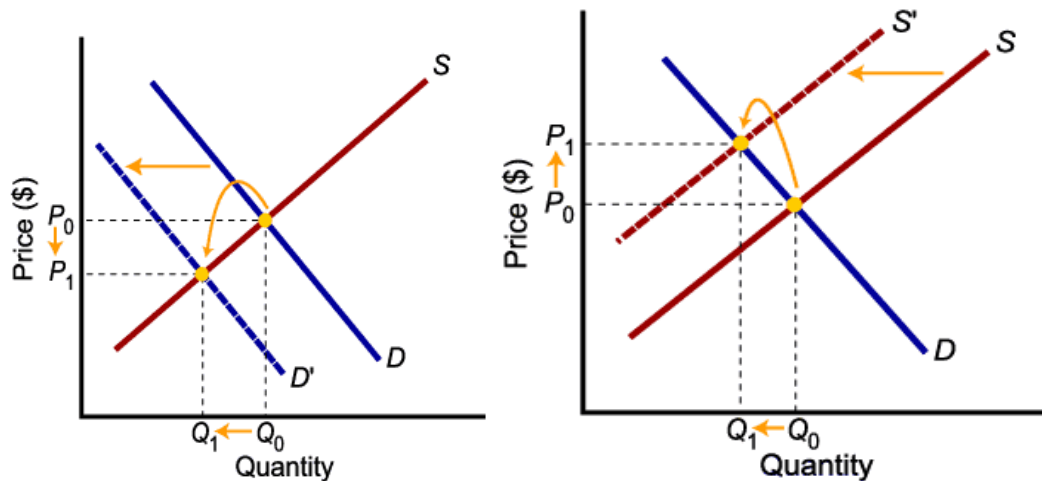
### Increases in Demand and Supply

Higher demand leads to higher equilibrium price and higher equilibrium quantity. Higher supply leads to lower equilibrium price and higher equilibrium quantity.



### Decreases in Demand and Supply

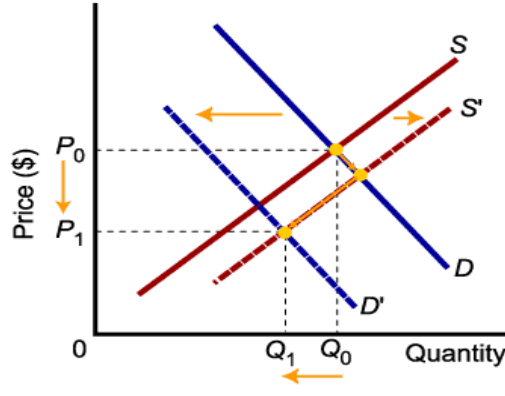
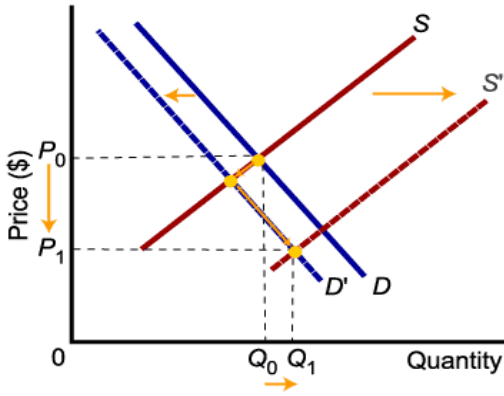
Lower demand leads to lower price and lower quantity exchanged. Lower supply leads to higher price and lower quantity exchanged.



### Market Effects of Simultaneous Changes in Supply and Demand

The relative magnitudes of change in supply and demand determine the outcome of market equilibrium.

$$\uparrow S > \downarrow D \rightarrow \uparrow Q, \downarrow P \quad \uparrow S < \downarrow D \rightarrow \downarrow Q, \downarrow P$$

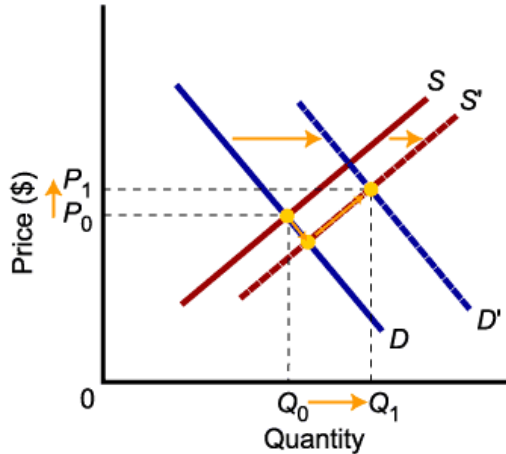
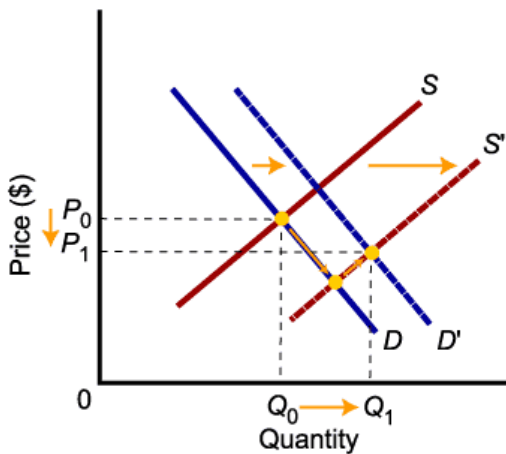


**Relative Magnitudes of Change**

When supply and demand both increases, quantity will increase, but price may go up or down.

$$\uparrow S > \uparrow D \rightarrow \uparrow Q, \downarrow P$$

$$\uparrow D > \uparrow S \rightarrow \uparrow Q, \uparrow P$$



**Market Equilibrium, the Invisible Hand, and Efficiency**

The “invisible hand” describes how the actions of individual buyers and sellers, each acting on their own self interest, leads to a market equilibrium. But does this market equilibrium promote the social interest, or could society do better?

Four conditions must be met in order to promote the social interest:

1. Buyers and sellers must have enough information to make informed decisions.
2. The market must be perfectly competitive.
3. There must be no spillover benefits.
4. There must be no spillover costs.

**Self Assessment**

Multiple choice questions:

9. Which of the following will always raise the equilibrium price?

- A) an increase in demand combined with a decrease in supply
- B) a decrease in both demand and supply

- C) an increase in both demand and supply  
 D) a decrease in demand combined with an increase in supply
10. A rise in the price of a good causes producers to supply more of the good. This statement illustrates
- A) the nature of an inferior good.  
 B) the law of demand.  
 C) the law of supply.  
 D) a change in supply.
11. If both demand and supply increase, what will be the effect on the equilibrium price and quantity?
- A) The price will rise but the quantity could either increase, decrease, or remain the same.  
 B) The quantity will increase but the price could either rise, fall, or remain the same.  
 C) Both the price and the quantity will increase.  
 D) The price will fall but the quantity will increase.
12. Which of the following definitely causes a fall in the equilibrium price?
- A) a decrease in both demand and supply  
 B) an increase in demand combined with a decrease in supply  
 C) a decrease in demand combined with an increase in supply  
 D) an increase in both demand and supply

**Answers: Self Assessment**

- |         |         |        |        |         |
|---------|---------|--------|--------|---------|
| 1. (a)  | 2.. (b) | 3. (b) | 4. (a) | 5. (c)  |
| 6. (c)  | 7. (d)  | 8. (d) | 9. (a) | 10. (c) |
| 11. (b) | 12. (c) |        |        |         |

**Summary**

Demand is an economic principle referring to a consumer's desire to purchase goods and services and willingness to pay a price for a specific good or service. Holding all other factors constant, an increase in the price of a good or service will decrease the quantity demanded, and vice versa. Market demand is the total quantity demanded across all consumers in a market for a given good. Aggregate demand is the total demand for all goods and services in an economy. Supply and demand factors are unique for a given product or service. These factors are often summed up in demand and supply profiles plotted as slopes on a graph. On such a graph, the vertical axis denotes the price, while the horizontal axis denotes the quantity demanded or supplied. A demand curve slopes downward, from left to right. As prices increase, consumers demand less of a good or service. A supply curve slopes upward. As prices increase, suppliers provide more of a good or service. The point where supply and demand curves intersect represents the market clearing or market equilibrium price. An increase in demand shifts the demand curve to the right. The curves intersect at a higher price and consumers pay more for the product. Equilibrium prices typically remain in a state of flux for most goods and services because factors affecting supply and demand are always changing.

**Keywords**

**Demand:** all of the quantities of a good or service that buyers would be willing and able to buy at all possible prices; demand is represented graphically as the entire demand curve.

**Demand schedule:** a table describing all of the quantities of a good or service; the demand schedule is the data on price and quantities demanded that can be used to create a demand curve.



**Demand curve:** a graph that plots out the demand schedule, which shows the relationship between price and quantity demanded.

**Law of demand:** all other factors being equal, there is an inverse relationship between a good's price and the quantity consumers demand; in other words, the law of demand is why the demand curve is downward sloping; when price goes down, people respond by buying a larger quantity.

**Quantity demanded:** the specific amount that buyers are willing to purchase at a given price; each point on a demand curve is associated with a specific quantity demanded.

**Change in quantity demanded:** a movement along a demand curve caused by a change in price; a change in quantity demanded is a movement along the *same* curve:

**Change in demand:** when buyers are willing to buy a different quantity at all possible price, which is represented graphically by a shift of the entire demand curve; this occurs due to a change in one of the determinants of demand.

**Determinants of demand:** changes in conditions that cause the demand curve to shift; the mnemonic TONIE can help you remember the changes that can shift demand (T-tastes, O-other goods, N-number of buyers, I-income, E-expectations)

**Normal good:** a good for which demand will increase when buyers' incomes increase.

**Inferior good:** a good for which demand will decrease when buyers' incomes increase.

**Substitute goods:** goods that can replace each other; when the price of a good increases, the demand for its substitute will increase.

**Complement goods:** goods that tend to be consumed together; when the price of a good increases the demand for its complement will decrease.

## Review Questions

1. Define the quantity demanded of a good or service and illustrate it using a demand schedule and a demand curve.
2. Distinguish between the following pairs of concepts: demand and quantity demanded, demand schedule and demand curve, movement along and shift in a demand curve.
3. Define the quantity supplied of a good or service and illustrate it using a supply schedule and a supply curve.
4. Distinguish between the following pairs of concepts: supply and quantity supplied, supply schedule and supply curve, movement along and shift in a supply curve.
5. Use demand and supply to explain how equilibrium price and quantity are determined in a market.
6. Understand the concepts of surpluses and shortages and the pressures on price they generate.

## Further Readings



1. Microeconomics – Frank Kowell, Oxford University Press, 2007.
2. Microeconomics – Robert S. Pindik, Daniel L. Rubinfeld and Prem L. Mehta, Pearson Education, 2009, PBK, 7th Edition.
3. Microeconomics – David Basenco and Ronald Brutigame, Wiley India, 2011, PBK, 4th Edition.

## Unit 03: Elasticity of Demand

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### Objectives

After this lecture, you would be able to

- understand the reaction of consumer demand in response to change in price of a commodity.
- measure the elasticity of demand in response to change in price of a commodity.
- understand the quantity demanded of a good responds to a change in consumers' income.
- understand the consumers' behavior response to change in price of another commodity.
- understand the price elasticity of supply and able to use price elasticity of supply
- understand how concept of elasticity is important in decision making for business and state.

### Introduction

#### *Elasticity of Demand*

Demand of a commodity, specially depends upon its price, income of consumer and price of other related commodity. So it is known as elasticity of demand that on changing in price of a commodity or income of consumer or price of other goods, how much Notes changes occur in quantity of demand of that commodity. As per Dooley, "The elasticity of demand measures the responsiveness of the quantity demanded of a commodity to change in its price, price of other goods and changes in consumer's income." So elasticity of demand are of three types –

#### **Elasticity of Demand Means**

Elasticity of demand, demands a numerical determination of the percentage change in quantity demanded, and the result is the ratio of the percentage change

1. Price Elasticity of Demand,
2. Income Elasticity of Demand and
3. Cross Elasticity of Demand.

**Price Elasticity of Demand**

The elasticity of demand measures the responsiveness of the quantity demanded of a commodity to change in its price, Ceteris Paribus. **It is equal to the ratio of the percentage change in quantity demanded to a percentage change in its price.** This measures that how much changes in its quantity demanded to change in its price. Elasticity of demand represents a ratio at which demand is contracted to increase in price and extended to decrease in price. There is found an inverse relation between quantity demanded and its price. So Elasticity of demand is represented by negative sign. According to Lipsey, **“Because of the negative slope of the demand curve, the price and the quantity will always change in opposite directions. One change will be positive and the other will be negative, making the measured elasticity of demand negative.”** But according to tradition, negative sign has been left and price elasticity of demand is represented with numbers. For example, 15 % increase is responded in quantity demanded to 10% decrease in price of ice cream, and then elasticity of demand will be as follows:

$$E_d = \frac{(-)15\%}{(-)10\%} = 1.5$$

**Negative Sign** is too leaved because any Ambiguity do not arise. To say, this can be surprising that elasticity coefficient of (-) 4 will be more than -2, can be safe to this possible surprising. If we said only that multiplier of 4 represents more elasticity than multiplier of 2, so negative sign is generally not used before the value of elasticity of demand.

$$E_d = (-) \frac{\text{Percentage Change in Quantity Demanded}}{\text{Percentage Change in Price}}$$

Let’s assume that demand extends to 20% as a result of 10% decrease in price. Then elasticity of demand will be

$$E_d = \frac{(-)20\%}{(-)10\%} = 2$$

It means that if quantity of demand changes with 2% due to the 1% change in price.

Elasticity of Demand may be defined as the percentage change in the quantity demanded divided by the percentage change in the price. – Marshall

Price elasticity of demand measures the responsiveness of the quantity demanded of a goods to the change in the price. – Boulding

**Two Extreme Situations of Price Elasticity of Demand**

Two Extreme situations of price relativity of demand are (1) Zero and (2) Infinity.

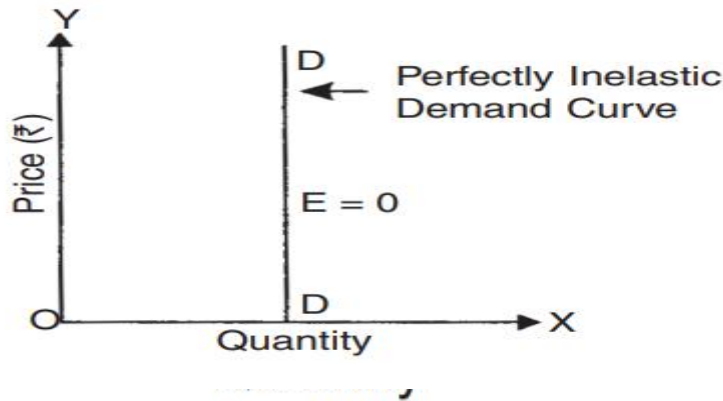
1. **Zero Price Elasticity of Demand:** Elasticity of demand becomes zero when no change in quantity demanded of goods to change in the price. It means no matter how much are brought in price, there will not be any contraction and extension in its quantity demanded. This situation is called Perfectly Inelastic Demand.

Zero Price Elasticity of Demand (E = 0)

In Fig. 3.1 a vertical straight line is presented which clears that no matter how much change will occur in price, demand OD of goods will remain stable. In this way, demand

curve is called Perfectly Inelastic Demand Curve. Any extension or contraction is expressed by this demand curve.

Fig. 3.1

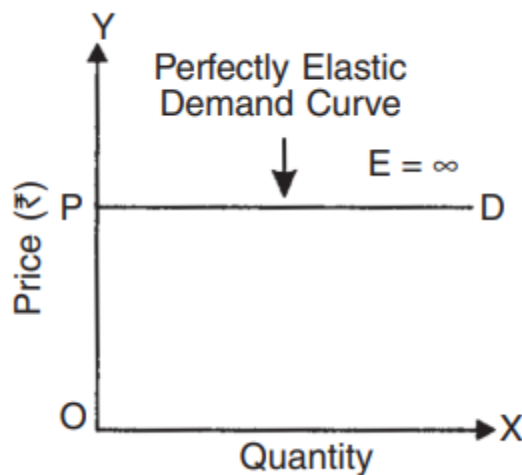


- 2. **Infinity Price Elasticity of Demand:** Elasticity of demand becomes infinity when quantity demanded changes infinitely with also very small change in price. Elasticity of demand becomes infinity when however much quantity of product of a firm is demanded at current prices, then entirely product of firm is not demanded.

Infinity price Elasticity of demand ( $E = \infty$ )

In Fig. 3.2, a Horizontal Straight Line is presented which clears that at price OP any amount of a commodity can be bought but not anymore quantity will be bought even if

Fig. 3.2



small rise from OP will occur. It can be said in other words that **there is infinity change from infinite demand to zero demand**. Demand curve of this type is called as **Perfectly Elastic Demand Curve**.

**Normal Situations of Price Elasticity of Demand**

Generally, price elasticity of demand can have the following situations:

- 1. **Elasticity of Demand = 1** (It is termed as Unitary Elastic Demand)

2. **Elasticity of Demand > 1** (It is termed as Greater than Unitary Elastic Demand). This price elasticity of demand is also known as the Unitary Elastic.
3. **Elasticity of Demand < 1** (It is termed as less than Unitary Elastic Demand). This is also known as less elastic demand. All the above situations of elasticity of demand can be cleared with the help of Figs. 3.3, 3.4 and 3.5.

**Demand Curves Showing  $E = 1$ ,  $E > 1$  and  $E < 1$**

Different situations of elasticity of demand is shown in the following Figs. 3.3, 3.4 and 3.5:

1. **Unitary Elastic Demand:** When the expenditure done on commodity remains stable on increase or decrease in price, then it is the Unitary Elastic Demand. The total expenditure is PQ. Here, P = price; Q = Demand. In Fig. 3.3, DD demand curve is showing Unitary Elastic Demand. It is clear that, when price is OP<sub>1</sub> then total expenditure will be OQ<sub>1</sub> MP<sub>1</sub>. Opposite to it when price decreases to OP<sub>2</sub> then total expenditure will be OQ<sub>2</sub> NP<sub>2</sub>.

$$\text{Area } OQ_1MP_1 = \text{Area } OQ_2NP_2$$

It means that total expenditure remains stable even after changing price of commodity. So elasticity of demand is unitary means  $E = 1$  (Unitary)

Fig. 3.3

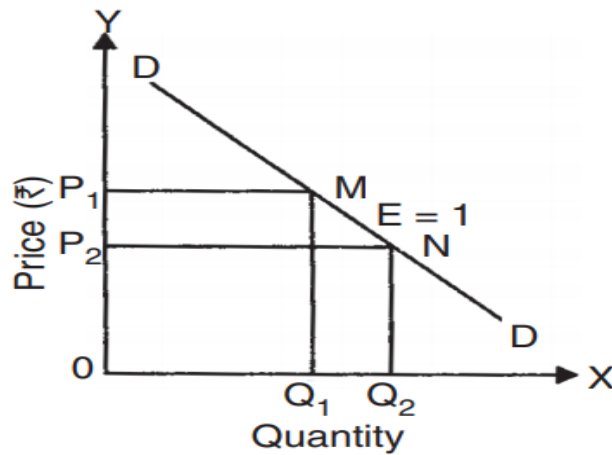
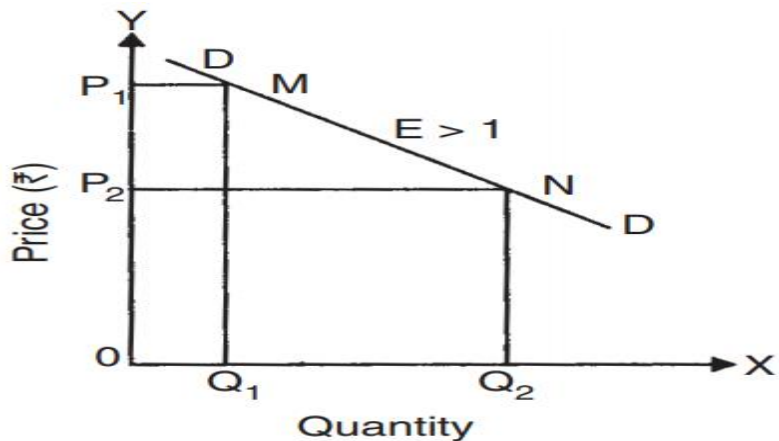


Fig. 3.4



2. **Greater than Unitary Elastic Demand:** When the total expenditure increases on decreasing the price of commodity and decreases on increasing the price of commodity, then it is greater than Unitary Elastic Demand. In Fig. 3.4, DD demand curve is showing greater than unitary elastic demand. It is shown that when price is  $OP_1$  then total expenditure will be  $OQ_1 MP_1$ . Opposite to it when decreases to  $OP_2$  then total expenditure will be  $OQ_2 NP_2$ . Therefore,

$$\text{Area } OQ_2 NP_2 > \text{Area } OQ_1 MP_1$$

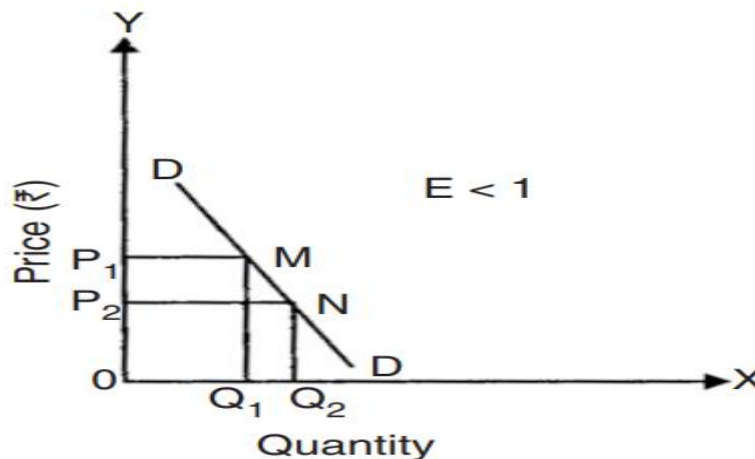
It means that total expenditure done has increased on decreasing the price of commodity. Therefore, elasticity of demand is greater than unitary or more elastic.

3. **Lesser than Unitary Elastic Demand  $E < 1$ :** Elastic Demand is lesser than unitary when expenditure done decreases on decreasing the price of commodity and increases on increasing the price of commodity. In Fig. 3.5, DD demand curve is showing lesser than unitary elastic demand. It shows that when price is  $OP_1$  then total expenditure will be  $OQ_1 MP_1$ . Opposite to it, when price is  $OP_2$  then total expenditure will be  $OQ_2 NP_2$ . Therefore,

$$\text{Area } OQ_2 NP_2 < \text{Area } OQ_1 MP_1$$

It means that total expenditure done has decreased on decreasing the price of commodity. Therefore elasticity of demand will be less than unitary ( $E < 1$ ) or less elastic.

Fig. 3.5



### 3.1 Measurement of Price Elasticity of Demand

It is come to know from measurement elasticity of demand, demand of any commodity is (i) Unitary or (ii) Greater than Unitary (iii) Lesser than Unitary. There are many methods of measurement of elasticity of demand –

1. Total Outlay or Total Expenditure Method
2. Proportionate or Percentage Method
3. Point Elasticity Method
4. Arc Elasticity Method Graphic Method
5. Revenue Method

#### 1. Total Outlay or Total Expenditure Method

Total Expenditure Method of measurement of elasticity of demand was invented by Dr. Marshal. According to this method, it should know that total expenditure done in

which direction on change in price of commodity for the measurement of elasticity of demand –

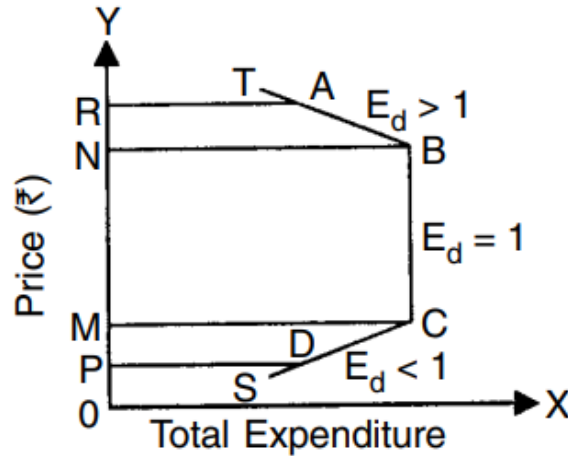
- (i) When there is no change in total expenditure on increase or decrease in the price of commodity then elasticity of demand will be equal to unitary ( $E_d = 1$ ).
- (ii) When total expenditure increases on decreasing the price of commodity and decreases on increasing the price of commodity, means total expenditure moves in opposite direction to the change in price then elasticity of demand will be greater than unitary ( $E_d > 1$ ).
- (iii) When total expenditure decreases on decreasing the price of commodity and increases on increasing the price of commodity, means total expenditure moves in that direction in which the price changes then elasticity of demand will be less than unitary ( $E_d < 1$ ).

Measurement of Elasticity of Demand can be cleared by Table 1: (Total Expenditure Method)

Following information is known from Table 1 –

1. **Unitary Elastic Demand:** We come to know from first part of table 1 that when price of commodity is 2 then total expenditure on commodity is 8. Opposite to it when price increases to 4 or decreases to 1, then also total expenditure remained 8. In other words, total expenditure is not affected by changing price.
2. **Greater than Unitary Elasticity:** We come to know from second part of table 5 that when price of commodity is 2 then total expenditure on commodity is 8. If price increases to 4, then total expenditure decreases to 4 from 8 and when price decreases to 1 then total expenditure increases to 10. In other words, total expenditure changes in the opposite direction on changing prices.
3. **Less than Unitary Elasticity:** We come to know from third part of table 5 that when price of commodity is 2 then total expenditure on commodity is 6. If price increases to 4, then total expenditure increases to 8. When price decreases to 1 then total expenditure decreases to 4. In other words, total expenditure changes in the same direction on changing prices.
4. Total Expenditure Method of measuring elasticity of demand can be cleared by Fig. 3.6. In this figure, total expenditure is shown on OX-axis and price is shown on OY-axis. ST curve is total expenditure curve. BC portion of ST curve represents the unitary elasticity. We come to know that when price is OM, then total expenditure is MC. When price increases to ON then total expenditure is NB (= MC) means remains the same as before. TB portion of ST curve representing greater than unitary elasticity. It is come to know that when price rises from ON to OR then total expenditure decreases to RA from BN Notes means the change occurs in opposite direction. SC portion of ST curve representing less than unitary elasticity. We come to know when price decreases from OM to OP then total expenditure decreases from MC to PD means changes in same direction.

Fig. 3.6



Price of Commodity (₹)	Purchased Quantity (Kg)	Total Expenditure (₹)	Change in total expenditure	Elasticity of Demand
2	4	8	Total expenditure does not change.	Unitary Elastic
4	2	8		
1	8	8		
2	4	8	When price increases, total expenditure decreases. When price decreases, total expenditure increases.	Greater than Unitary Elastic or Elastic
4	1	4		
1	10	10		
2	3	6	When price increases, total expenditure increases. When price decreases, total expenditure decreases.	Less than Unitary Elastic or Inelastic
4	2	8		
1	4	4		

2. Proportionate or Percentage Method

The second method of measuring price elasticity of demand is termed as percentage or proportionate method. According to this method, for assessment of price elasticity of demand, percentage change in demand is divided by percentage change in price. Its formula is written as follows –

$$E_d = \frac{\text{Change Per cent in Quantity Demanded of X – Commodity}}{\text{Change Percentage in Price of Commodity}}$$

$$E_d = \frac{\frac{\text{Change in Demanded Quantity}}{\text{Initial Price}}}{\frac{\text{Change in Price}}{\text{Initial Price}}} \times 100$$



$$E_d = (-) \frac{\frac{(Q_1 - Q)}{Q}}{\frac{(P_1 - P)}{P}} \times 100$$

$$= (-) \frac{\frac{\Delta Q}{Q}}{\frac{\Delta P}{P}} \times 100$$

$$E_d = (-) \frac{\Delta Q}{Q} \div \frac{\Delta P}{P} = (-) \frac{\Delta Q}{Q} \times \frac{P}{\Delta P}$$

$$E_d = (-) \frac{P}{\Delta P} \times \frac{\Delta Q}{Q}$$

Here Q = Initial demanded quantity of commodity; Q<sub>1</sub> = changed demanded quantity; P = Initial price of commodity; P<sub>1</sub> = Changed price; ΔQ = ΔQ<sub>1</sub> - Q (change in demanded quantity); ΔP = P<sub>1</sub> - P = Change in price; Δ = Delta (this sign represents change).

Percentage change in quantity of X-commodity is defined as 100 times change in X-commodity means 100 ΔX is divided by X. For example, if quantity increases to 15 from 10 then we will say that ΔX = 15 - 10 = 5 and percentage increase in X =  $\frac{\Delta X}{X} \times 100 = \frac{5}{10} \times 100 = \frac{500}{10} = 50\%$ , similarly percentage change in price is represented by  $\frac{\Delta P}{P} \times 100$ .

**Illustration 1.**

Assume the percentage change in demand with the decrease in price 10%. Let the elasticity of demand

**Remember**

Percentage method is used in the condition in which change in price and then change in demand is very less.

quantity of commodity is = (-) 2.5.

Solution: Let percentage change in demand be X.

=

$$\text{Elasticity of Demand} = \frac{\text{Change Per cent in Quantity Demanded of X-Commodity}}{\text{Change Percentage in Price of Commodity}}$$

$$2.5 = (-) \frac{X}{10\%}$$

$$X = 2.5 \times 10\% = 25\%$$

**Answer:** Percentage Change in demanded quantity will be 25%

**3. Point Elasticity Method**

Elasticity of demand on single point of demand curve is called as Point Elasticity.

**According to Leftwich, "Elasticity computed at a single point on the curve for infinitely small change in price is point elasticity."**

Price elasticity on simple demand curve depends on the point on which it is measured or the slope of demand curve. Therefore, price elasticity will vary on different points of a demand curve. So the elasticity of demand is measured individually on individual point of demand curve.

**Linear Demand Curve:** In Fig. 3.7, MN demand curve is a simple curve. Elasticity of demand at 'A' point of demand curve will be equal to  $\frac{AN}{AM}$ , which can be calculated by the following method, as we know that

$$E_d = (-) \frac{P}{\Delta P} \times \frac{\Delta Q}{Q}$$

It is known by Fig. 3.7 that,  
 P = OP (= AQ); Q = OQ (= AP);  
 $\Delta P = PP_1 (= AB)$ ;  $\Delta Q = QQ_1 (= BC)$ ;  $\therefore$

$$E_d = (-) \frac{AQ}{AP} \times \frac{BC}{AB} \dots\dots\dots (i)$$

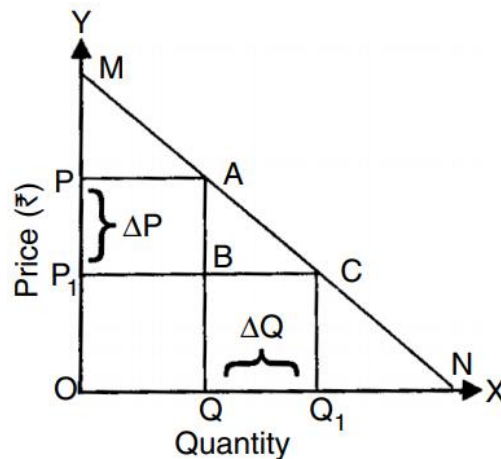
Because,  $\Delta ABC$  and  $\Delta AQN$  are similar triangles so ratio of their sides will be equal, means  $\frac{BC}{AB} = \frac{QN}{AQ}$  on the place of  $\frac{BC}{AB}$  in equation (i), we determine,

$$E_d = (-) \frac{AQ}{AP} \times \frac{QN}{AQ} = \frac{QN}{AP} = \frac{QN}{OQ} (AP = AQ)$$

Because  $\Delta AQN$  and  $\Delta MPA$  are similar triangles so ratio of their sides will be equal,

$$E_d = \frac{QN}{OQ} = \frac{QN}{AP} = \frac{AN}{AM} = \frac{\text{Lower Segment}}{\text{Upper Segment}}$$

Price elasticity is determined on different points of simple curve by Fig. 3.7



- (i) Point P is located in the middle of demand curve MN so PN (lower segment) and PM (upper segment) will be equal. Therefore,

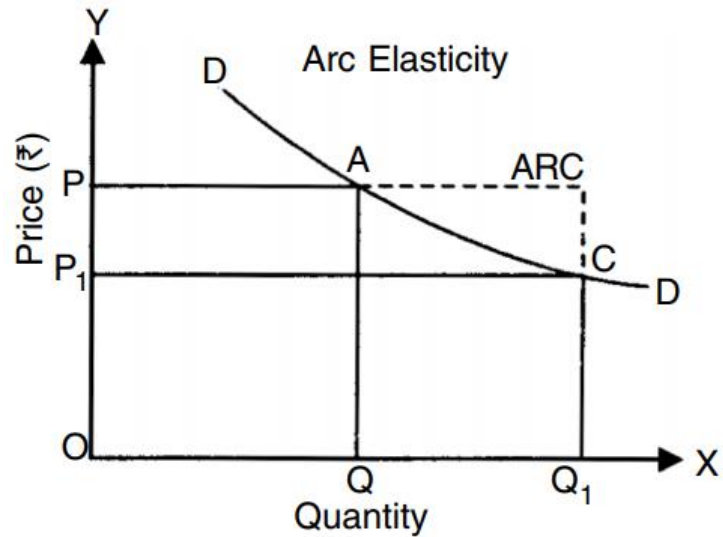
$$E_d = \frac{PN}{PM} = 1 \text{ (Unity) means elasticity of demand on point P will be unity.}$$

**4. Arc Elasticity Method**

Arc Elasticity Price is a measurement of the average responsiveness of change, which shows the portion between two points on the demand curve. An arc is the portion between two points on the demand curve. In fig. 3.8, the portion between A and C points

is an arc on demand curve DD. The elasticity which is to be found by using midpoint or average price and quantity, it is called as Arc Price Elasticity.

Fig. 3.8



Arc elasticity is the elasticity at the midpoint of an arc of a demand curve.

– Wastson.

Arc elasticity is a measure of the average elasticity between two points on the demand.

– Ferguson.

**Formula**

According to price elasticity formula –

$$E_d = (-) \frac{P}{\Delta P} \times \frac{\Delta Q}{Q}$$

It is clear that, change brought in quantity  $\Delta Q = Q_1 - Q$  and change in price  $\Delta P = P_1 - P$ . But what are the costs of P and Q? Because there are different costs of P and Q on the different points of AC arc, so it is not necessary to use the fixed value of one of these. According to law, average of P and Q is used so that:

$$Q = \frac{(Q_1 + Q)}{2} \text{ and } P = \frac{(P_1 + P)}{2}$$

Therefore, arc price elasticity of demand is determined by the help of following formula –

$$E_d = \frac{\text{Change in Quantity}}{\frac{1}{2} \text{ Sum of Quantities}} + \frac{\text{Change in Price}}{\frac{1}{2} \text{ Sum of Price}}$$

$$E_d = (-) \frac{\Delta Q}{\frac{1}{2}(Q_1 + Q)} + \frac{\Delta P}{\frac{1}{2}(P_1 + P)} = (-) \frac{\Delta Q}{\frac{1}{2}(Q_1 + Q)} \times \frac{\frac{1}{2}(P_1 + P)}{\Delta P}$$

or

$$E_d = (-) \frac{Q_1 - Q}{\frac{1}{2}(Q_1 + Q)} \times \frac{\frac{1}{2}(P_1 + P)}{P_1 - P} = (-) \frac{Q_1 - Q}{Q_1 + Q} \times \frac{P_1 + P}{P_1 - P}$$

Here, Q = Initial Demand; Q1 = New Demand; P= Initial Price; P1 = New price  
According to Arc Elasticity Method, if proportion of price of a commodity increases or decreases and as a result of that there is contraction or relaxation in that proportion in the demand of

commodity also, and then the elasticity of demand will be the same. But if percentage method is used, then elasticity of demand will be different in above condition. In first, this will be more than the unit (6) or elastic and in second, this will be less than the unit  $[\frac{3}{4}]$  or inelastic.

**Therefore, arc elasticity method is more actual and dependent method in comparison to percentage elasticity method.**

There is also difference between arc elasticity of demand and point elasticity. Arc elasticity is the average cost of elasticity on a special portion of demand curve while point elasticity is the the cost of elasticity on a special point of demand curve. According to Baumol, **“Point elasticity of demand is the corresponding concept, for each point on the demand curve. But at any such point there is no change in price ( $\Delta P = 0$ ) or in quantity ( $\Delta Q = 0$ ). We, therefore, take point elasticity to be the limit of the arc elasticity figure as the arc is made smaller and smaller.”**

**4. Revenue Method**

Revenue method is the fifth method of determining the elasticity of demand. Whatever the selling price is earned by the factory of its production that is called revenue income. Suppose a company earns 50 by selling 10 m of cloth. So, this 50 will be called as total revenue of the factory. If total revenue is divided by the quantity of units of production, then the quotient will be known as Average Revenue or Per Unit Price. Average Revenue of above factory will be  $\frac{50}{10} = 5$  per meter. Therefore, average revenue and price are the synonyms. The difference comes in total revenue by selling a more units of any commodity that is called the Marginal Revenues. If the factory earns 54 by selling 11 meter cloth, then it means the marginal revenue of 11th meter cloth will be  $54 - 50 = 4$ . An average revenue curve of a factory is also known as demand curve. The elasticity of demand by Average revenue and Marginal Notes revenue can be determined by the following formula –

$$E_d = \frac{A}{A - M}$$

(Here,  $E_d$ = Price elasticity of demand, A = Average Revenue; M = Marginal Revenue).

This formula of Elasticity of demand can be cleared with the help of Fig. 6.21. In this figure, revenue on OY-axis and quantity of commodity on OX-axis are shown. AB is average revenue (AR) or demand curve and AN is marginal revenue (MR) curve. Elasticity of demand on ‘P’ point of Demand curve (average revenue) can be determined with the help of following formula –

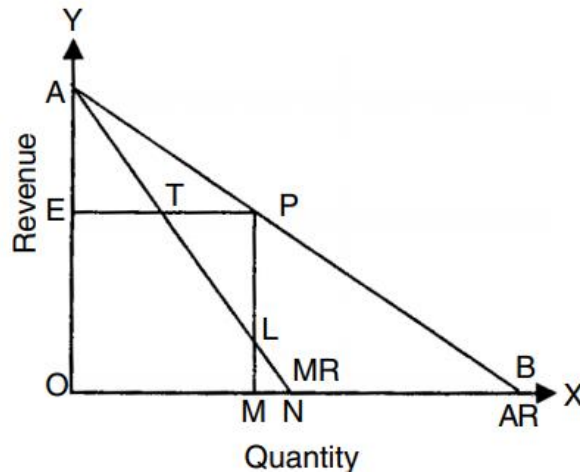
$$E_d = \frac{\text{Lower Part}}{\text{Upper Part}} = \frac{PB}{PA}$$

$\Delta PMB$  and  $\Delta AEP$  are congruent triangles, so the ratios of their sides are equal.

$$E_d = \frac{PB}{PA} = \frac{PM}{AE} \dots \dots \dots (i)$$

$\Delta AET$  and  $\Delta TPL$  are congruent triangles, so  $PL = AE$ .

Fig. 3.9



$$E_d = \frac{PM}{PL}$$

because  $PL = PM - LM$

therefore  $E_d = \frac{PM}{PM-LM}$

here  $PM = AR$  and  $LM = MR$

so  $E_d = \frac{PM}{PM-LM} = \frac{AR}{AR - MR}$  or  $\frac{A}{A - M}$   
 $= \frac{\text{Average Revenue}}{\text{Average Revenue} - \text{Marginal Revenue}}$

Marginal Revenue If the cost of Ed is same by using the above formula, then elasticity of demand will be unity. If it is more than one then price elasticity of demand will be more than the unity or elastic and if it is less than one then price elasticity of demand will be less than the unity or inelastic.

**Factors Determining the Price Elasticity of Demand**

As we see in actual life that elasticity of demand of some commodities is unity, elasticity of demand of some commodities is more than the unit or Elastic and elasticity of demand for some commodities is less than the unity or Inelastic. The reason behind this is that elasticity of demand is affected by many factors. The main factors of determining the elasticity of demand are as follows:

1. **Nature of the Commodity:** In economics, classification of commodities is mainly done in three categories; they are (i) **Necessaries**, (ii) **Comforts** and (iii) **Luxuries**. Generally, it has been seen that the demand of mandatory commodities like salt, kerosene oil, match boxes etc. is less than unity or Inelastic. The reason is that a customer buys a limited quantity of these commodities, whether price of these commodities increases or decreases. So, the change in their prices does not affect their demand as much. Opposite to it the demand of luxuries like air conditioner, expensive furniture etc. is more than the unity or Elastic. The reason is that the changes in their prices affect very much their demand. Price elasticity of comfortable things like transistor, cooler, fan etc. is equal to unity or near to it.
2. **Availability of Substitutes:** The elasticity of demand will be more as much as the availability of substitutes of the commodity. The substitutes of commodity like substitute of tea; coffee, substitute of pen; ball-pen, substitute of milkshake; lassi, substitute of sandals; sleeper etc. are available on worth price, so demands of these commodity is elastic. The reason is that if price of any commodity decreased in the comparison of its substitute then people will purchase it in more quantity. For example, if coffee costs cheap in comparison of tea then demand of coffee

will increase more, and demand of tea will decrease more. The demand of the commodities which do not have their substitutes like cigarette, wine etc. is inelastic.

3. **Goods with Different Uses:** The elasticity of demand is more elastic as much as the uses of a commodity. The elasticity of demand is elastic of those goods which are included in different uses. For example, the electricity has different uses. It is used in bulb, heater, heating iron etc. If price of electricity will increase then it will be used in the important work like bulb for lightning only. In this way, demand of electricity will decrease by more in comparison of upcoming increment in price.
4. **Postponement of Demand:** The demand of those commodities can be postponed these demands are elastic. For example, if demand of building house can be postponed then the demand of constituents of house like bricks, sand, cement, limestone etc. will be elastic. Opposite to it, demands of those commodities cannot be postponed for future, like food on hunger and liquids on thirst, and then the demand is inelastic.
5. **Income of the Consumer:** Those people having their income very much or very less, their demands are generally inelastic. The reason is that it does not affect demand by them as much by increase or decrease in price. Opposite to it, the demand of medium class people is elastic. On increment in price of the commodities demanded by these people, their demands become comparatively less.
6. **Habit of the Consumer:** The demand of those commodities is inelastic for which people get addicted like cigarette, coffee etc. The reason is that on increment in the prices of these commodities also the demands of costumer do not decrease.
7. **Proportion of Income Spent on a Commodity:** The ratio of income spent on a commodity is directly proportional to the elasticity of demand. Those commodities on which customer spends very less ratio of his income like newspaper, toothpaste, shoe polish, etc., the demand of those commodities is inelastic. The demand decreases on increasing the price of these commodities. Opposite to it, the demand of those commodities on which the customer spends more of its income like garments, best food, desert cooler, fruits etc. is elastic. The demand decreases on increasing their prices because customer starts finding their substitute commodity.
8. **Price Level:** The demand of very expensive and very cheap commodities is inelastic. The demand of more expensive commodities like diamond, jewellery, expensive carpets etc. is inelastic. The demand changes by little on changing the prices of these commodities. In this way, the demand of those commodities which have very less price like matchbox, postcard, cheaper vegetables etc. is also inelastic. The demand does not affect as much on change in price of these commodities. Opposite to it, the demand of those commodities which are medium price goods or those which are neither very cheap nor very expensive is elastic. The demand is comparatively high on decrease in price of these commodities.
9. **Time:** The demand is more elastic in long-term in comparison to short-term. As the duration of time increases the customer gets more time to adjust with the new prices, so the demand will be more elastic. If customer gets less time to adjust with the new prices then the demand will be more inelastic. Therefore, demand of any commodity is inelastic in short-term and elastic in long-term.
10. **Complementary Goods:** The goods which demand as in joint or adjustable are generally inelastic like car and petrol, pen and ink, camera and film. If the price of petrol increases, the demand will be the same if the demand of Cars would remain same.

### 3.2 Income Elasticity of Demand

Other things mean, on the stability of the price of specific commodity, prices of related commodities, choice of the customer etc., the ratio of the percentage change in demand of specific commodity on the percentage change in income of a customer is known as income elasticity of demand.

"Income elasticity of demand means the ratio of the percentage change in quantity demanded to percentage change in income."  
 – Watson

"The responsiveness of demand to change in income is termed as income elasticity of demand."  
 – Richard G. Lipsey

## Measurement of Income Elasticity of Demand

Income elasticity of demand can be measured by the following formula –

$$E_y = \frac{\text{Proportionate or Percentage Change in Quantity Demanded}}{\text{Proportionate or Percentage Change in Income}}$$

$$E_y = \frac{\frac{\Delta Q}{Q}}{\frac{\Delta Y}{Y}} = \frac{\Delta Q}{\Delta Y} \times \frac{Y}{Q} = \frac{Y}{Q} \times \frac{\Delta Q}{\Delta Y}$$

$$E_y = \frac{Y}{Q} \times \frac{\Delta Q}{\Delta Y}$$

Here  $E_y$  = Income Elasticity of Demand;  $Q$  = Initial Income;  $Y$  = Initial Income;  $\Delta Q$  = Changes in the Volume of Demand;  $\Delta Y$  = Changes in Income.

### **Illustration**

When your monthly income ( $Y$ ) is 300 then you buy 10 ice creams ( $Q$ ), if your monthly income ( $Y_1$ ) increases to 600 then your demand increases to 30 ice creams. Find income Elasticity of Demand of Ice creams.

### **Solution:**

Income Elasticity of Demand can be measured by the help of following equation:

$$E_y = \frac{Y}{Q} \times \frac{\Delta Q}{\Delta Y}$$

Here  $Y = 300$ ;  $Y_1 = 600$ ;  $\Delta Y = Y_1 - Y = 600 - 300 = 300$ ;  $Q = 10$  Units of Ice cream;  $Q_1 = 30$  Units of Ice cream;  $\Delta Q = Q_1 - Q = 30 \text{ Units} - 10 \text{ Units} = 20 \text{ Units of Ice cream}$

$$E_y = \frac{300}{10} \times \frac{20}{300} = 2 \text{ (more than unity)}$$

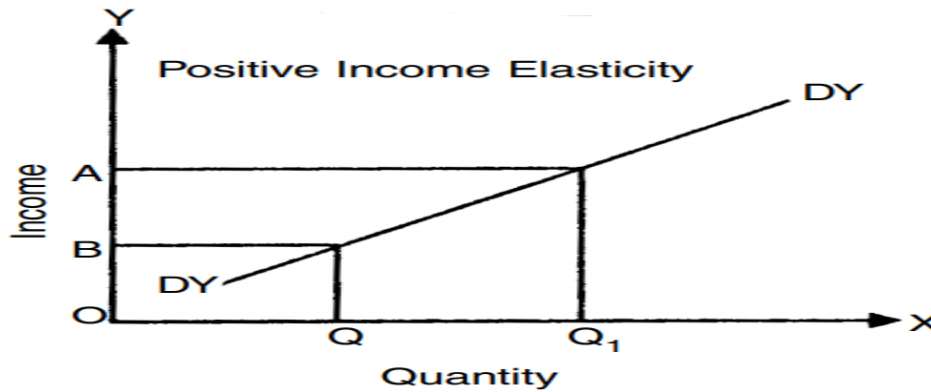
## **Degrees of Income Elasticity of Demand**

There are three types of income Elasticity of Demand:

1. **Positive Income Elasticity of Demand:** Income Elasticity of Demand of any object is positive on that condition when increase in income of consumer results in increase in demand of objects and decrease in demand of objects occurs with decrease in income. Income Elasticity of Demand for normal goods is positive.

Fig. 3.10

Income elasticity of demand



It can be described with the help of Fig. 3.10 Quality of demands of an object is shown on OX-axis and income of consumer is shown on OY-axis. Curve DYDY shows positive income elasticity of demand. Slope of this curve is inclined from left to right which indicates that on increasing income demand increases and decreases on decreasing income.

There can be three kind of positive income elasticity of demand –

- (i) **Unitary Income Elasticity of Demand:** Positive income elasticity of demand is unitary on that situation when changes in percentage of income, same percentage changes in the quantity of demand. Suppose that if income increases in percentage and also 100 percentage increase in demand then

$$E_y = \frac{100}{100} = 1 \text{ units (Unitary)}$$

- (ii) **Less than Unitary Income Elasticity of Demand or Income Inelastic Demand:** The less unitary income elasticity of demand happens when the percentage changes in demand is less than percentage changes in income. If income raises by 100% but demand increase by only 50 and then

$$E_y = \frac{50}{100} = \text{Less than } \frac{1}{2} \text{ units (Less than Unitary)}$$

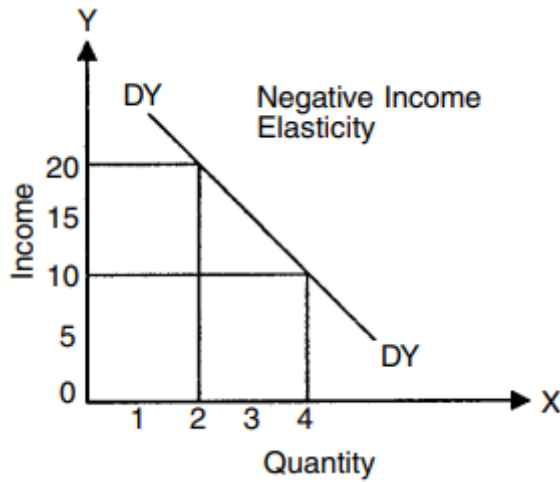
- (iii) **More than Unitary Income Elasticity of Demand or Income Elastic Demand:** This happens when the percentage changes in demand is greater than percentage changes in income. For example, if income rises by 100% and demand raises by 200% then

$$E_y = \frac{200}{100} = \text{More than } 2 \text{ units (Greater than Unitary)}$$

2. **Negative Income Elasticity of Demand:** The Income Elasticity of Demand is negative when the income of consumer increases but the demand of product decreases and vice versa. This mainly happens for inferior goods. For example, rough cloth, rough goods, etc. is the symbol of negative income elasticity of demand. In Fig. 3.11 DYDY demand curve is representing the negative income elasticity of demand. Slope of this is decline from right to left. This means that if income is 10 then demand of objects is 4 units when income increases 20 then its demand reduced to 2 units.

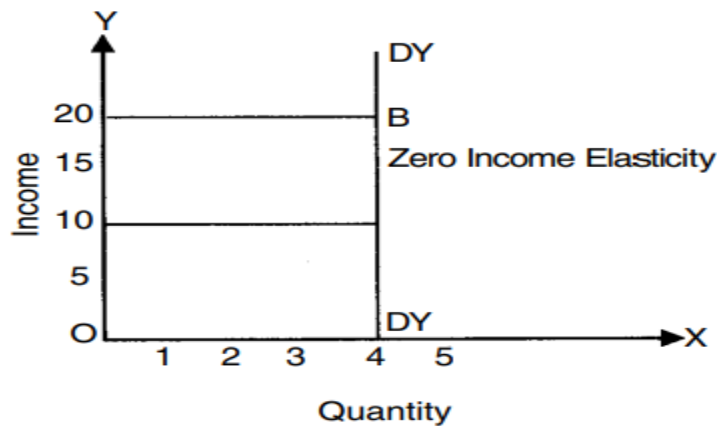
Fig. 3.11





3. **Zero income Elasticity of Demand:** Income Elasticity of demand of any object becomes zero at that time when changes in income of consumer of that object remain unchanged in demand of that object. This is clarified in Fig. 3.12. In this figure DYDY curve, indicates Zero income elasticity. This curve is Notes parallel to OY- axis. It indicates that if income increases from 10 to 20 then demand of that object remains 4 units. Essential needs such as kerosene, salt etc. have zero income elasticity of demand.

Fig. 3.12



### 3.3 Cross Elasticity of Demand

The changes in quantity of demand and price of any two goods related to each other change in price of a object causes the change in demand in quantity of other objects. For example, change in price of tea changes the demand of coffee. The corresponding relations of quantity of demand of an object and change in price of other objects can be measured by cross elasticity of demand. **Price of object X cross elasticity of demand change in proportional demand of object Y measurement change in propositional ratio.**

“The cross elasticity of demand is the proportional change in the quantity demanded of goods-X divided by the proportional change in the price of the related goods Y”.

–Ferguson

“The Cross elasticity of demand is a measure of the responsiveness of purchases of goods-X to change in the price of goods-Y”.

–Leibhafasky

#### Measurement of Cross Elasticity of Demand

Cross Elasticity of Demand can be measured by the following equation –

$$E_c = \frac{\text{Proportionate or percentage change in Quantity demanded of Goods X}}{\text{Proportionate or percentage change in the price of Goods Y}}$$

$$E_c = \frac{\frac{\text{Change in Quantity Demanded of X}}{\text{Original Quantity Demanded of Y}}}{\frac{\text{Change in Price of Y}}{\text{Original Price of Y}}} \times 100$$

$$E_c = \frac{\frac{\Delta Q_x}{Q_x}}{\frac{\Delta P_y}{P_y}} = \frac{\Delta Q_x}{Q_x} \times \frac{P_y}{\Delta P_y}$$

$$E_c = \frac{P_y}{Q_x} \times \frac{\Delta Q_x}{\Delta P_y}$$

Here  $E_c$  = Cross Elasticity of Demand;  $P_y$  = Y Initial Price of Goods;  $\Delta P_y$  = Y Change in Price of Goods;  $Q_x$  = X Initial Quantity of Goods;  $\Delta Q_x$  = X Change in Quantity of Demand of Goods

#### Nature and Degrees of Cross Elasticity of Demand

- (i) **Positive:** For Substitutes cross elasticity of demand is negative. In other words, when object substitutes to each other then in this situation the percentage increase in price of an object will increase in demand of other objects, for example, increase in price of coffee, demand of tea will increase because both are substitutes.

#### Illustration

Suppose price of coffee is 50 paise per cup, demand of tea is 50 cups. If the price increases to 70 paise per cup then demand of tea rises up to 100 cups. Therefore, cross elasticity of demand of tea is assumed on the basis of following equation –

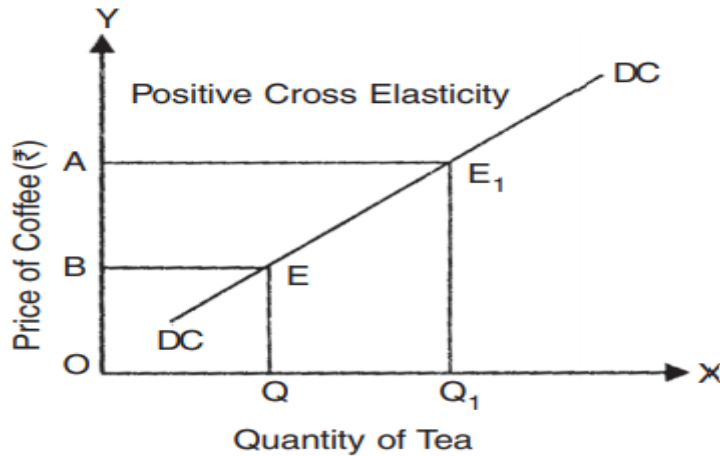
$$E_c = \frac{P_y}{Q_x} \times \frac{\Delta Q_x}{\Delta P_y}$$

$Q_x = 50$  cups;  $Q_{x1} = 100$  cups;  $\Delta Q_x = 100$  cups – 50 cups = 50 cups  
 $P_y = 50$  paise;  $P_{y1} = 70$  paise;  $\Delta P_y = 70$  paise – 50 paise = 20 paise

$$E_c = \frac{50}{50} \times \frac{50}{20} = \frac{5}{2} = 2.5 (E_c > 1)$$

Therefore, cross Elasticity of demand for tea is more than substitutes i.e., cross elasticity of demand or tea and coffee can be clearly shown in Fig. 3.13. In this figure on OX-axis quantity of tea and on OY-axis in cafe the price of coffee are shown. When price of coffee is OB then demand of tea is OQ cup. When the price of coffee increased to OA then demand of tea increased to OQ<sub>1</sub>. DCDC curve indicates demand of tea on different quantities on different prices of coffee This curve is lined from left to right. This proves that on increase of price of coffee demand of tea increases and decrease in price of coffee demand of tea decreases.

Fig. 3.13



- (ii) **Negative:** Cross Elasticity of demand for complementary goods is negative. Those demands Notes which are complimentary to each other or those whose demand are joint demands with proportional increase in price of any object then propositional demand for others decreases. In this condition cross elasticity of demand is negative. Thus, in this situation before the number of cross elasticity of demand the sign of Minus (-) is added.

**Illustration**

Bread and butter is complementary. When the price of bread is 80 paisa then demand of butter is 10 kg. If the price of bread increases to 1.20 then demand of butter decreases to 5 Kg. Find cross elasticity of demand of butter.

Cross elasticity of demand of butter can be solved in the following equation

$$E_c = \frac{P_y}{Q_x} \times \frac{\Delta Q_x}{\Delta P_y}$$

$P_y = 80$  paisa;  $P_{y1} = 120$  paisa;  
 $\Delta P_y = 120$  paisa - 80 paisa = 40 paisa  
 $Q_x = 10$  kg;  $Q_{x1} = 5$  kg  
 $\Delta Q_x = 5$  kg - 10 kg = - 5 kg

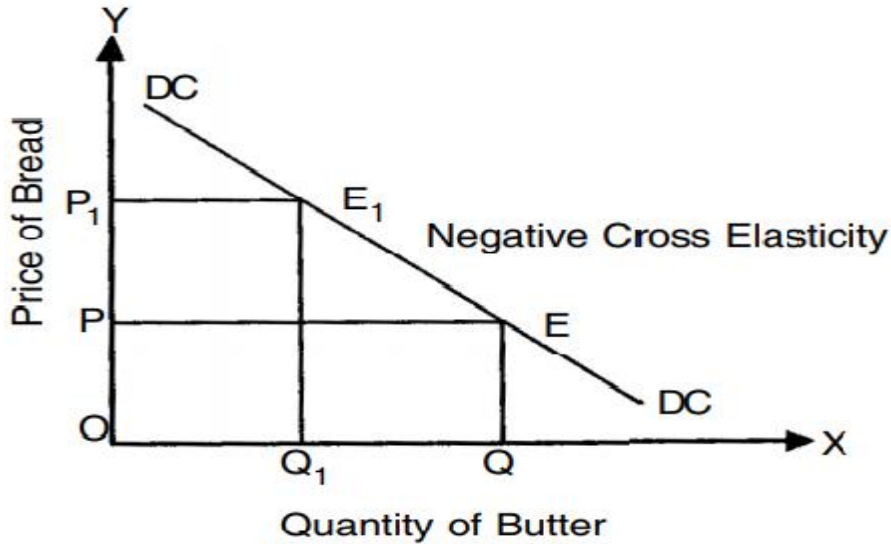
$$E_c = \frac{80}{10} \times \frac{-5}{40} = -1$$

(Here x is used for butter and y is used for bread)

Negative cross Elasticity of Demand can be clarified in Fig. 3.14. In this figure on Ox-axis indicates quantity of butter and OY-axis shows price of bread. DCDC line indicates cross Elasticity of Demand. Slope of this line declines from left to right which proves that on increasing price of bread, decrease demand of butter we know from point E and E1 that when OP is the price of bread then demand of butter is OQ and when price of bread increases OP, then demand of butter decreases to OQ1 .

- (iii) **Zero cross Elasticity of Demand:** Cross Elasticity of Demand becomes Zero when there is no relation between them, for example, increase in price of wheat demand would not any effect on book, therefore cross elasticity of demand will be Zero.

**Fig. 3.14**



### 3.4 Price Elasticity of Supply

Price elasticity of supply (PES) measures the responsiveness of quantity supplied to a change in price. It is necessary for a firm to know how quickly, and effectively, it can respond to changing market conditions, especially to price changes.

$$E_s = \frac{\% \Delta q}{\% \Delta p}$$

$$E_s = \frac{\Delta q}{(q + q')/2} \div \frac{\Delta p}{(p + p')/2}$$

Types of Price Elasticity of Supply

Perfectly elastic supply -  $E_s = \text{infinity}$

Relatively elastic supply -  $E_s > 1$

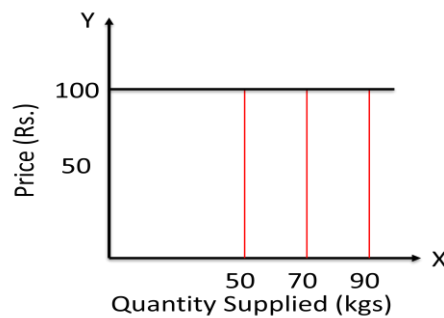
Elasticity of supply equal to utility -  $E_s = 1$

Relatively inelastic supply -  $E_s < 1$

Perfectly inelastic supply -  $E_s = 0$

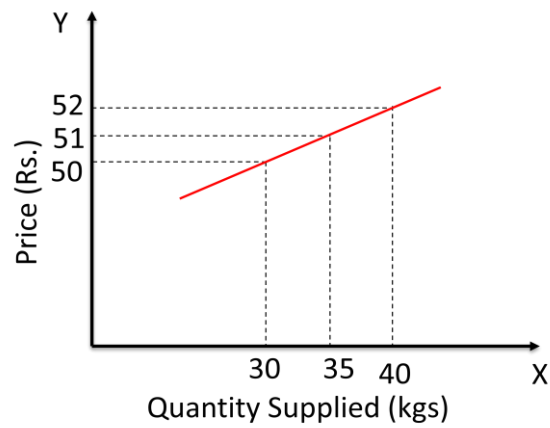
**Perfectly Elastic Supply -  $E_s = \text{infinity}$ :** When the supply for a product changes - increases or decreases even when there is no change in price, it is known as perfect elastic supply.

Fig. 3.15

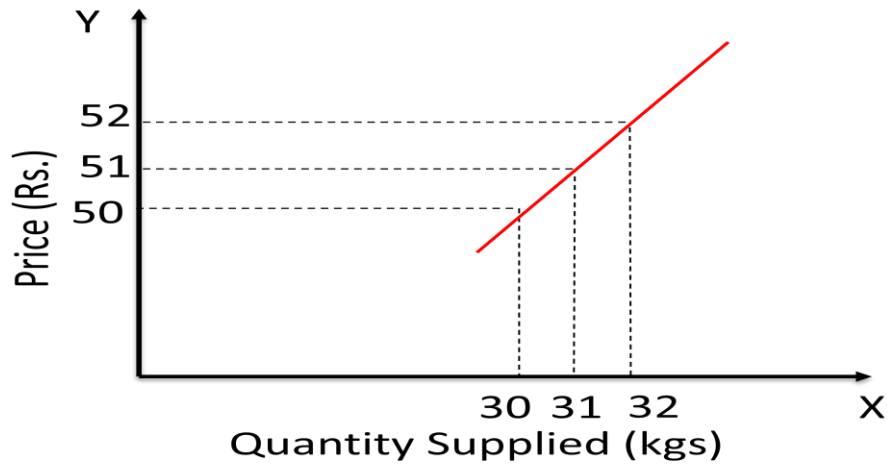


**Relatively Elastic Supply -  $E_s > 1$ :** When the proportionate change in the quantity supplied is more than proportionate change in the price of a product.

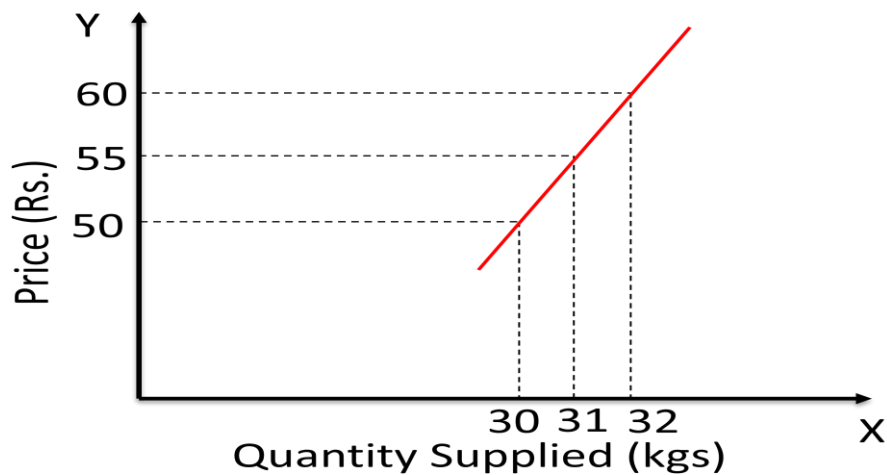
Fig. 3.16



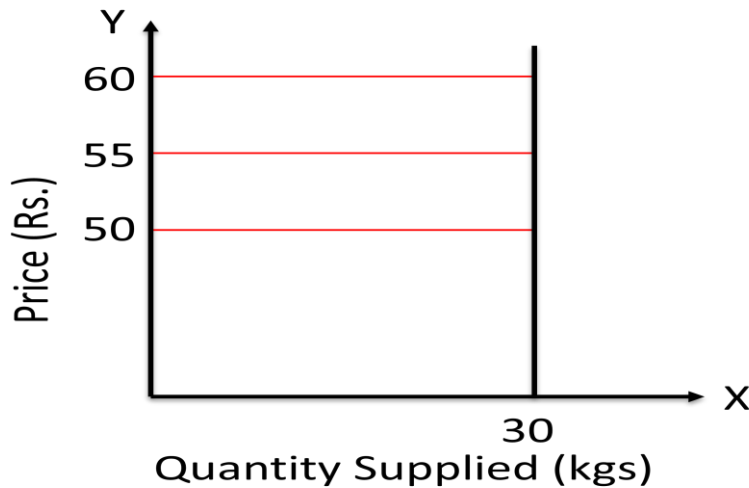
Elasticity of Supply Equal To Utility -  $E_s=1$ : When the proportionate change in the quantity supplied is equal to the Proportionate change in the price of a product.



Relatively Inelastic Supply -  $E_s < 1$ ; When the proportionate change in the quantity supplied is less than proportionate change in the price of a product.



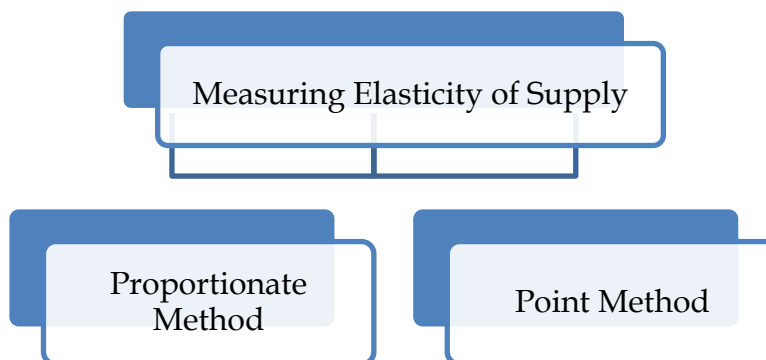
**Perfectly Inelastic Supply** -  $E_s = 0$  : When the quantity supplied does not change with respect to proportionate change in price of a product.



#### Factors Affecting Price Elasticity of Supply

- Number of producers: ease of entry into the market.
- Spare capacity: it is easy to increase production if there is a shift in demand.
- Ease of switching: if production of goods can be varied, supply is more elastic.
- Ease of storage: when goods can be stored easily, the elastic response increases demand.
- Length of production period: quick production responds to a price increase easier.
- Time period of training: when a firm invests in capital the supply is more elastic in its response to price increases.
- Factor mobility: when moving resources into the industry is easier, the supply curve in more elastic.
- Reaction of costs: if costs rise slowly it will stimulate an increase in quantity supplied. If cost rise rapidly the stimulus to production will be choked off quickly.

#### Methods of Measuring Elasticity of Supply



**Proportionate Method:** Percentage method or proportionate method is the commonly used method of measuring price elasticity of supply. According to this method, elasticity is measured in terms of rate of percentage change in supplied quantity to percentage change in price.

$$E_s = \frac{\text{percentage change in supplied quantity}}{\text{percentage change in price}}$$

Or

$$E_s = \frac{P}{S} \times \frac{\Delta S}{\Delta P}$$

**Example**

$P_1 = \text{Rs. } 55$

$P = \text{Rs. } 50$

$S_1 = 1500 \text{ units}$

$S = 1000 \text{ units}$

**Therefore,**

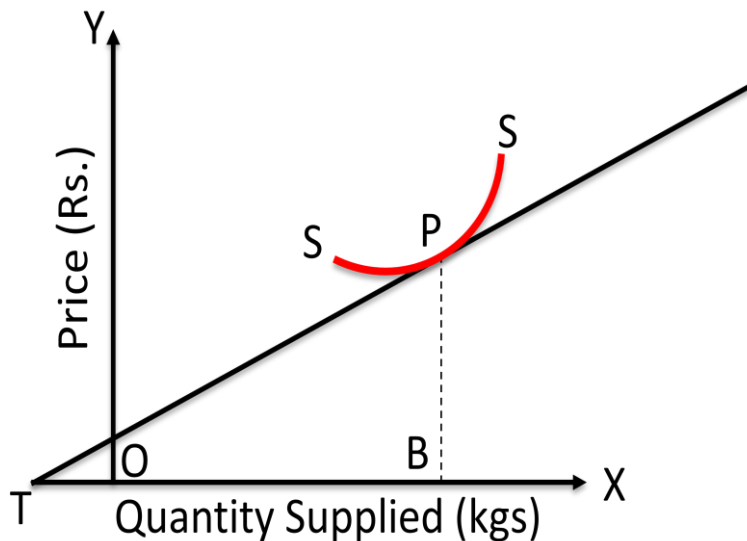
$$\Delta S = S_1 - S = 1500 - 1000 = 500 \text{ units and}$$

$$\Delta P = P_1 - P = \text{Rs. } 55 - \text{Rs. } 50 = \text{Rs. } 5$$

$$E_s = (P/S) * (\Delta S/\Delta P)$$

$$E_s = (50/1000) * (500/5) = 5 \text{ (More elastic supply)}$$

**Point Method:** Method in which elasticity of supply is measured at a particular point on the supply curve to measure the elasticity of supply, a tangent needs to be drawn along with the supply curve.



### 3.5 Importance of Price Elasticity of Demand

Following are the theoretical and practical importance of price Elasticity of Demand –

1. **Determination of price Under Monopoly:** Monopolist can alert on Elasticity of Demand of this object If –

(i) Demand is elastic then Monopolist will keep low price, sell will increase on keeping low price and total income will be maximum.

(ii) If demand is non-elastic then Monopolist will keep price high. With the increase in price sale of that object will be minimum but total revenue got from it will be high.

2. **Price Discrimination:** When Monopolist sells to different buyers in different prices, then this situation is called Price Discrimination. Monopolist can initiate the policy on price discrimination

when elasticity of demand of any objects is different for different uses for different consumers. He will take more price from consumer for these objects whose demand are non-elastic and take less price from them whose demand of that object is elastic. For example, demand of electricity for a person is non-elastic so electric supplier takes more price for electricity for house consumer. In opposition of this, demand of electric for a industry is elasticity. If price of electric is high then industry can use oil, diesel or coal for their machines in place of electric. So electric supplier/ Board takes low price from industry.

**3. Price Determination of Joint Supply:** Joint Supply objects are those whose production is done simultaneously, i.e., cotton and binola, oil and khal etc. To determine price of these objects, elasticity of demand is kept in mind. For example, if demand of cotton is non-elastic and in respect of it demand of binola is elastic then price of cotton will determine high and price of binola will be less.

**4. Taxation Policy:** Finance minister keeps in mind Elasticity of Demand to regular new taxation policy (i) reduced income in place of increasing to regular more taxation on those objects which have elasticity of demand. That is why on regulation of more tax on that object, price will be increased. Due to increase in price, demand would be reduced. (ii) The goods which are non-elastic, finance minister can increase price more but there is no more affect on demand so, income tax will get more.

**5. Distribution of Burden of Taxation:** By price elasticity of demand, it can be fixed like sales tax, production tax etc. whole how much affect a consumer and procedure of non-elasticity Demand of a object than indirect tax would affect more on consumer. Due to these tax prices object will be in demand but there will very less reduction in demand but there will very less reduction in demand. Opposite to it, if elasticity on indirect tax is relatively less consumers will bear the burden of indirect taxes.

**6. International Trade:** There is great importance of conception of elasticity demand in international trade. One country will get income after these important objects has non-elastic demand. If importing country has elastic demand of these objects then exporting country will reduce price of their exported object and will increase total export and will take advantage by this process. Like this a country will import on less process of those objects whose demand has elasticity.

**7. Paradox of Poverty:** People, who are related to agriculture are well familiar that even after good product of many agricultural products, income in money is less. It means that there is less income after more production. This unnatural condition is called paradox of poverty. It is because that maximum agriculture product has elastic demand. When these goods get low price after increasing product then demand of them has not increased. That is why income by selling these saved is low.

## Summary

• These days the concept of Elasticity of Demand is very much important for producers. To increase their income, they should reduce the price of their product on that time when the elasticity of demand is more than per unit of demand. The reason behind this, the cost of a product increases when elasticity of demand is high and the price of that product is low. The producers should increase the price of their product when the elasticity of demand decreases than unity.

## Keywords

- elastic: Sensitive to changes in price.
- demand: The desire to purchase goods and services.
- inelastic: Not sensitive to changes in price.
- supply: The amount of some product that producers are willing and able to sell at a given price, all other factors being held constant.



**Self Assessment**

- 1 The price elasticity of demand depends on
  - A) the units used to measure price but not the units used to measure quantity.
  - B) the units used to measure price and the units used to measure quantity.
  - C) the units used to measure quantity but not the units used to measure price.
  - D) neither the units used to measure price nor the units used to measure quantity
2. The price elasticity of demand measures
  - A) the slope of a budget curve.
  - B) how often the price of a good changes.
  - C) the responsiveness of the quantity demanded to changes in price.
  - D) how sensitive the quantity demanded is to changes in demand.
3. If demand is price elastic,
  - A) a 1 percent decrease in the price leads to an increase in the quantity demanded that exceeds 1 percent.
  - B) a 1 percent increase in the price leads to an increase in the quantity demanded that exceeds 1 percent.
  - C) the price is very sensitive to any shift of the supply curve.
  - D) a 1 percent decrease in the price leads to a decrease in the quantity demanded that is less than 1 percent.
4. Demand is perfectly inelastic when
  - A) the good in question has perfect substitutes.
  - B) shifts in the supply curve results in no change in price.
  - C) shifts of the supply curve results in no change in quantity demanded.
  - D) shifts of the supply curve results in no change in the total revenue from sales.
5. Suppose the price elasticity of demand for oil is 0.1. In order to lower the price of oil by 20 percent, the quantity of oil supplied must be increased by
  - A) 20 percent.
  - B) 2 percent.
  - C) 0.2 percent.
  - D) 200 percent.
6. The demand for salt is \_\_\_\_\_.
7. Income elasticity of demand for inferior goods is \_\_\_\_\_.
8. Perfectly elastic demand curve is \_\_\_\_\_.
9. Cross elasticity of demand is applicable to \_\_\_\_\_ goods.
10. The slope of demand curve is \_\_\_\_\_ in case of inelastic demand.
11. Perfectly elastic demand refers to a situation in which any price change for the good in question, no matter how small, will produce an "infinite" change in quantity demanded.
12. When the seller increases the price charged for a good with an elastic demand, the seller's revenues will go up.
13. Elasticity is the same as the slope of the demand curve.
14. Income elasticity of demand is always expressed as a positive number (absolute value).

15. When the income elasticity of demand is positive but less than 1, demand is called “income elastic.”

**Answers for Self Assessment**

- 1. D      2. C      3. A      4. C      5. B
- 6. inelastic   7. negative   8. Horizontal to OX axis   9. substitute   10. steeper
- 11. True      12. False      13. False      14. False      15. False

**Review Questions**

- 1. What is the meaning of conception of demand? Explain it.
- 2. What do you mean by Price Elasticity of Demand?
- 3. What is Point Elasticity Procedure? Explain with example.
- 4. What is Cross Elasticity of Demand and its types?



**Further Readings**

- 1. Microeconomics – Frank Cowbell, Oxford University Press, 2007.
- 2. Microeconomics – Shipra Mukhopadhyay, Annie Books, 2011.
- 3. Microeconomics: An Advanced Treatise – S.P.S. Chauhan, PHI Learning

## Unit 04: Demand Forecasting

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Objectives:

Introduction:

- 4.1 Demand forecasting
- 4.2 Objectives of Demand Forecasting:
- 4.3 Factors Influencing Demand Forecasting:
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- 4.5 Methods of Demand Forecasting

Summary

Keywords

Self Assessment

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### Objectives:

After this lecture, you would be able to

- To understand the meaning and objective of demand estimation
- To analyze the significance of demand forecasting for business
- To understand the methods of demand forecasting for future
- To execute the different method of demand forecasting for business activity

### Introduction:

Demand forecasting is a combination of two words; the first one is Demand and another forecasting. Demand means outside requirements of a product or service. Forecasting means making estimation in the present for a future occurring event. It is a technique for estimation of probable demand for a product or services in the future. It is based on the analysis of past demand for that product or service in the present market condition. Demand forecasting should be done on a scientific basis and facts and events related to forecasting should be considered. An organization faces several internal and external risks, such as high competition, failure of technology, labor unrest, inflation, recession, and change in government laws. Therefore, most of the business decisions of an organization are made under the conditions of risk and uncertainty. An organization can lessen the adverse effects of risks by determining the demand or sales prospects for its products and services in future.

### 4.1 Demand forecasting

Demand forecasting is a systematic process that involves anticipating the demand for the product and services of an organization in future under a set of uncontrollable and competitive forces. Demand forecasting enables an organization to take various business decisions, such as planning the production process, purchasing raw materials, managing funds, and deciding the price of the product. An organization can forecast demand by making own estimates called guess estimate or taking the help of specialized consultants or market research agencies.

### Definitions of demand forecasting:

According to Evan J. Douglas, "Demand estimation (forecasting) may be defined as a process of finding values for demand in future time periods."

In the words of Cundiff and Still, "Demand forecasting is an estimate of sales during a specified future period based on proposed marketing plan and a set of particular uncontrollable and competitive forces."

### Importance of Demand Forecasting:

Demand plays a crucial role in the management of every business. It helps an organization to reduce risks involved in business activities and make important business decisions. Apart from this, demand forecasting provides an insight into the organization's capital investment and expansion decisions.

**i. Fulfilling objectives:** Implies that every business unit starts with certain pre-decided objectives. Demand forecasting helps in fulfilling these objectives. An organization estimates the current demand for its products and services in the market and move forward to achieve the set goals.

For example, an organization has set a target of selling 50,000 units of its products. In such a case, the organization would perform demand forecasting for its products. If the demand for the organization's products is low, the organization would take corrective actions, so that the set objective can be achieved.

**ii. Preparing the budget:** Plays a crucial role in making budget by estimating costs and expected revenues. For instance, an organization has forecasted that the demand for its product, which is priced at Rs. 10, would be 10,00,000 units. In such a case, the total expected revenue would be  $10 \times 100000 = \text{Rs. } 10,00,000$ . In this way, demand forecasting enables organizations to prepare their budget.

**iii. Stabilizing employment and production:** Helps an organization to control its production and recruitment activities. Producing according to the forecasted demand of products helps in avoiding the wastage of the resources of an organization. This further helps an organization to hire human resource according to requirement. For example, if an organization expects a rise in the demand for its products, it may opt for extra labor to fulfill the increased demand.

**iv. Expanding organizations:** Implies that demand forecasting helps in deciding about the expansion of the business of the organization. If the expected demand for products is higher, then the organization may plan to expand further. On the other hand, if the demand for products is expected to fall, the organization may cut down the investment in the business.

**v. Taking Management Decisions:** Helps in making critical decisions, such as deciding the plant capacity, determining the requirement of raw material, and ensuring the availability of labor and capital.

**vi. Evaluating Performance:** Helps in making corrections. For example, if the demand for an organization's products is less, it may take corrective actions and improve the level of demand by enhancing the quality of its products or spending more on advertisements.

**vii. Helping Government:** Enables the government to coordinate import and export activities and plan international trade.

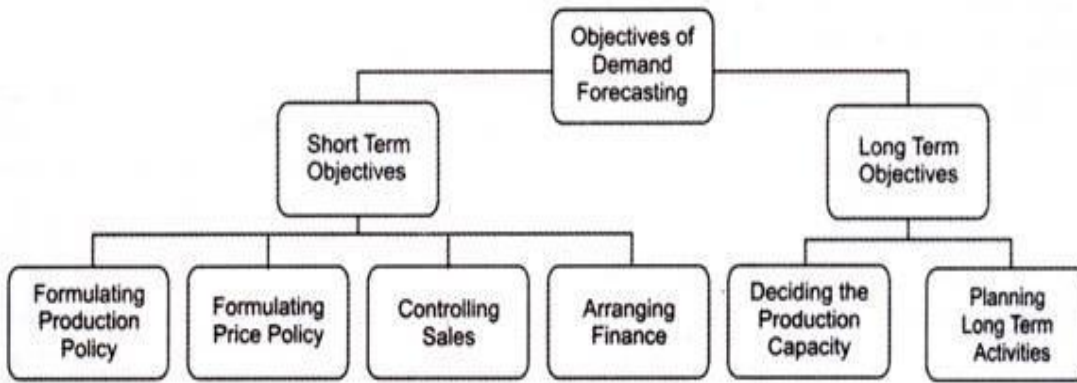


Demand forecasting is a systematic process that involves anticipating the demand for the product and services of an organization in future under a set of uncontrollable and competitive forces.

## 4.2 Objectives of Demand Forecasting:

Demand forecasting constitutes an important part in making crucial business decisions.

The objectives of demand forecasting are divided into short and long-term objectives, which are shown in Figure-4.1:



The objectives of demand forecasting (as shown in Figure-4.1) are discussed as follows:

i. Short-term Objectives include the following:

*a. Formulating production policy:* Helps in covering the gap between the demand and supply of the product. The demand forecasting helps in estimating the requirement of raw material in future, so that the regular supply of raw material can be maintained. It further helps in maximum utilization of resources as operations are planned according to forecasts. Similarly, human resource requirements are easily met with the help of demand forecasting.

*b. Formulating price policy:* Refers to one of the most important objectives of demand forecasting. An organization sets prices of its products according to their demand. For example, if an economy enters into depression or recession phase, the demand for products falls. In such a case, the organization sets low prices of its products.

*c. Controlling sales:* Helps in setting sales targets, which act as a basis for evaluating sales performance. An organization make demand forecasts for different regions and fix sales targets for each region accordingly.

*d. Arranging finance:* Implies that the financial requirements of the enterprise are estimated with the help of demand forecasting. This helps in ensuring proper liquidity within the organization.

ii. Long-term Objectives include the following:

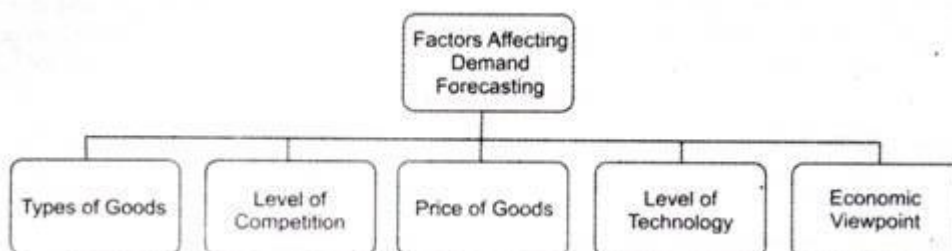
*a. Deciding the production capacity:* Implies that with the help of demand forecasting, an organization can determine the size of the plant required for production. The size of the plant should conform to the sales requirement of the organization.

*b. Planning long-term activities:* Implies that demand forecasting helps in planning for long term. For example, if the forecasted demand for the organization's products is high, then it may plan to invest in various expansion and development projects in the long term.

### 4.3 Factors Influencing Demand Forecasting:

Demand forecasting is a proactive process that helps in determining what products are needed where, when, and in what quantities. There are a number of factors that affect demand forecasting.

Some of the factors that influence demand forecasting are shown in Figure-2:



The various factors that influence demand forecasting ("as shown in Figure-2) are explained as follows:

**i. Types of Goods:** Affect the demand forecasting process to a larger extent. Goods can be producer's goods, consumer goods, or services. Apart from this, goods can be established and new goods. Established goods are those goods which already exist in the market, whereas new goods are those which are yet to be introduced in the market. Information regarding the demand, substitutes and level of competition of goods is known only in case of established goods. On the other hand, it is difficult to forecast demand for the new goods. Therefore, forecasting is different for different types of goods.

**ii. Competition Level:** Influence the process of demand forecasting. In a highly competitive market, demand for products also depend on the number of competitors existing in the market. Moreover, in a highly competitive market, there is always a risk of new entrants. In such a case, demand forecasting becomes difficult and challenging.

**iii. Price of Goods:** Acts as a major factor that influences the demand forecasting process. The demand forecasts of organizations are highly affected by change in their pricing policies. In such a scenario, it is difficult to estimate the exact demand of products.

**iv. Level of Technology:** Constitutes an important factor in obtaining reliable demand forecasts. If there is a rapid change in technology, the existing technology or products may become obsolete. For example, there is a high decline in the demand of floppy disks with the introduction of compact disks (CDs) and pen drives for saving data in computer. In such a case, it is difficult to forecast demand for existing products in future.

**v. Economic Viewpoint:** Play a crucial role in obtaining demand forecasts. For example, if there is a positive development in an economy, such as globalization and high level of investment, the demand forecasts of organizations would also be positive.

#### **Some other important factors that influence demand forecasting:**

##### **a. Time Period of Forecasts:**

Act as a crucial factor that affect demand forecasting. The accuracy of demand forecasting depends on its time period.

#### **Forecasts can be of three types, which are explained as follows:**

**1. Short Period Forecasts:** Refer to the forecasts that are generally for one year and based upon the judgment of the experienced staff. Short period forecasts are important for deciding the production policy, price policy, credit policy, and distribution policy of the organization.

**2. Long Period Forecasts:** Refer to the forecasts that are for a period of 5-10 years and based on scientific analysis and statistical methods. The forecasts help in deciding about the introduction of a new product, expansion of the business, or requirement of extra funds.

**3. Very Long Period Forecasts:** Refer to the forecasts that are for a period of more than 10 years. These forecasts are carried to determine the growth of population, development of the economy, political situation in a country, and changes in international trade in future. Among the aforementioned forecasts, short period forecast deals with deviation in long period forecast. Therefore, short period forecasts are more accurate than long period forecasts.

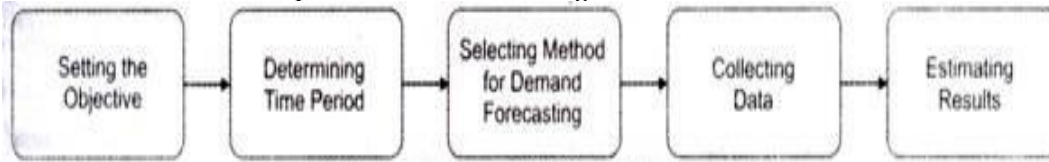
**4. Level of Forecasts:** Influences demand forecasting to a larger extent. A demand forecast can be carried at three levels, namely, macro level, industry level, and firm level. At macro level, forecasts are undertaken for general economic conditions, such as industrial production and allocation of national income. At the industry level, forecasts are prepared by trade associations and based on the statistical data. Moreover, at the industry level, forecasts deal with products whose sales are dependent on the specific policy of a particular industry. On the other hand, at the firm level, forecasts are done to estimate the demand of those products whose sales depends on the specific policy of a particular firm. A firm considers various factors, such as changes in income, consumer's tastes and preferences, technology, and competitive strategies, while forecasting demand for its products.

**5. Nature of Forecasts:** Constitutes an important factor that affects demand forecasting. A forecast can be specific or general. A general forecast provides a global picture of business environment, while a specific forecast provides an insight into the business environment in which an organization operates. Generally, organizations opt for both the forecasts together because over-generalization restricts accurate estimation of demand and too specific information provides an inadequate basis for planning and execution.

#### **4.4 Steps of Demand Forecasting:**

The Demand forecasting process of an organization can be effective only when it is conducted systematically and scientifically.

It involves a number of steps, which are shown in Figure-4.3:



**1. Setting the Objective:** Refers to first and foremost step of the demand forecasting process. An organization needs to clearly state the purpose of demand forecasting before initiating it.

**Setting objective of demand forecasting involves the following:**

- a. Deciding the time period of forecasting whether an organization should opt for short-term forecasting or long-term forecasting
- b. Deciding whether to forecast the overall demand for a product in the market or only- for the organizations own products
- c. Deciding whether to forecast the demand for the whole market or for the segment of the market
- d. Deciding whether to forecast the market share of the organization

**2. Determining Time Period:** Involves deciding the time perspective for demand forecasting. Demand can be forecasted for a long period or short period. In the short run, determinants of demand may not change significantly or may remain constant, whereas in the long run, there is a significant change in the determinants of demand. Therefore, an organization determines the time period on the basis of its set objectives.

**3. Selecting a Method for Demand Forecasting:** Constitutes one of the most important steps of the demand forecasting process Demand can be forecasted by using various methods. The method of demand forecasting differs from organization to organization depending on the purpose of forecasting, time frame, and data requirement and its availability. Selecting the suitable method is necessary for saving time and cost and ensuring the reliability of the data.

**4. Collecting Data:** Requires gathering primary or secondary data. Primary' data refers to the data that is collected by researchers through observation, interviews, and questionnaires for a particular research. On the other hand, secondary data refers to the data that is collected in the past; but can be utilized in the present scenario/research work.

**5. Estimating Results:** Involves making an estimate of the forecasted demand for predetermined years. The results should be easily interpreted and presented in a usable form. The results should be easy to understand by the readers or management of the organization.

## 4.5 Methods of Demand Forecasting

**1. Survey Method:** This is the direct method of asking the users about their preferences. Based upon the choice of respondent, it can be either consumer survey or sales force survey. Depending upon number of persons surveyed, it can be census or sample survey. In case of industrial buyers, where the number is less it is possible to survey all of them by conducting census survey. For short term projections this method is well suited. Buyers' intentions are surveyed by directly approaching them and getting their opinions. The questionnaire used for this purpose needs to be complete as well as interesting to evoke customer interest.

**Consumers' survey may assume three forms.**

- i] Complete enumeration survey.
- ii] Sample survey.
- iii] End-use method.

- i. **Complete enumeration survey:-** This survey covers all consumers hence resembles Census Data Collection. Information regarding the prospective demand for the product under consideration is obtained from all past, present and possible consumers. The method provides unbiased authentic information as all buyers are covered. But the process involves high costs to cover every buyer and the to analyze huge data obtained.

- ii. **Sample Survey :-** As against all in the above method, only few consumers are contacted in this sample survey. Care is exercised to ensure that, this sample group of respondents represents the entire population of consumers. Information collected from this group is used to prepare the forecast. The method is cost effective and provides quick results as the number of buyers and data collected from them is manageable.
- iii. **End-use method:-** A given product may have different use for different consumers. Milk is used by a set of consumers to prepare sweetmeats, by others to make chocolates, third to make butter, milk powder. In this method data is collected from each segment of users and then consolidated into a forecast. The method is easy to manage, if number of end users is limited, and buyers provide their inputs well ahead of their respective production schedules. Joel Dean, however, criticizes survey method by stating that consumers are often inconsistent and there are formidable barriers to learning the buying intentions of the household consumers.

2. **Sales Force Composite Method/Collective Opinion Method:** In this method, the sales men are required to estimate expected sales in their respective territories in a given period. The individual sales force forecasts are combined to produce the total company forecast. This method is used based on the assumption that sales persons are closest to the customers and have direct contact with the customers.

3. **Executive Judgment/ Jury of Executive Opinion Method:** It involves combining and averaging the sales projections of executives in different departments to come up with a forecast. If they are experienced and knowledgeable about the factors that influence the sales, and if they are current on market developments, the approach can work.

4. **Delphi Method:** It consists of an attempt to arrive at a consensus in an uncertain area by questioning a group of experts repeatedly until the responses appear to converge along a single line (consensus). The participants are supplied the responses to previous questions from others in the group by the coordinator. Coordinator provides each expert with the responses of the others including their reasons, each expert is given the opportunity to react to the information or considerations advanced by others. Delphi Method was originally developed at Rand Corporation in the late 1940s by Olaf Helmer, Dalkey and Gordon and has been successfully used in the area of technological forecasting i.e., predicting technical change.

5. **Time Series Analysis:** Time series analysis is based on extrapolation, which is the process of projecting a past trend or relationship into the future in the belief that history will repeat itself.

**Components of Time Series Analysis:**

1. Cycle, which comprises the wave like movement of sales which react to periodic events or swings in economic activity.
  2. Trend, which is found by fitting a straight or curved line through past sales. This process is known as trend fitting.
  3. Erratic events, which include strikes or any major disaster that is unpredictable and needs to be removed from past data.
  4. Season, which is the consistent pattern of sales movement during the year, for example, Christmas for the retail trade.
6. **Barometric Techniques:** This consists in discovering a set of series of some variables which exhibit a close association in their movement over a period or time. For example, it shows the movement of agricultural income (AY series) and the sale of tractors (ST series). The movement of AY is similar to that of ST, but the movement in ST takes place after a year's time lag compared to the movement in AY.
7. **Correlation and Regression:** These involve the use of econometric methods to determine the nature and degree of association between/among a set of variables.



Statistical analysis and mathematical functions to determine the relationship between a dependent variable (say, sales) and one or more independent variables (like price, income, advertisement etc.).



Give your opinion on Methods on Demand Forecasting.

8. **Index numbers:** The index numbers offer a device to measure changes in a group of related variables over a number of years. We select a Base Year which is given the value of 100 and then express all subsequent changes as movement of this number.
9. **Econometric Models:** The econometric models used in forecasting take the form of an equation or system of equation which seems best to express the most probable interrelationship between a set of economic variables according to economic theory and statistical analysis. Models can be qualitatively or quantitatively formulated. Like in earlier methods the assumption is that the relationship established in the past will continue to prevail in future.
10. **Input-output analysis:** The input-output analysis provides perhaps the most complete of all the complex inter-relationships within an economic system. The input-output analysis, for example, will show how an increase or decrease in demand for cars affects increase in demand for steel, tyres or glass.
 

There is no unique method for forecasting the demand for any product. The forecaster has to use any one, or combination, of the methods discussed above after due consideration of

  - a. *The objective;*
  - b. *Data availability;*
  - c. *Urgency;*
  - d. *Available resources ; and*
  - e. *The nature of the commodity.*

### Forecasting Methods used during the Product Lifecycle

Each stage needs an appropriate method. For development and introduction stage; market trial survey, Delphi or an in-house survey of experts are recommended methods. Time Series or Regression analysis are methods best suited for Rapid Growth stage in the product lifecycle. These two methods along with Econometric models are used for Steady Growth stage where there is slowing down of demand.

### Criteria for selecting a good forecasting method

Accuracy and reliability are prime requirements followed by data availability. The method selected needs to be economical and flexible, especially when economists are faced with a number of uncontrollable variables. The period by which products hit the market is long, hence forecasts must stand the test of durability. The process requires coverage of large correspondents and collected data, simplicity of the method helps in obtaining meaningful data in a short time.

### Limitations of Demand Forecasting:

- a. Even though the opinion surveys are simple and straight forward, there is an element of subjectivity involved.
- b. As surveys are expensive and time consuming, there is a tendency to limit the size of sample consumers. This leads to data being not representative and therefore misleading.
- c. When Time Series method is used results are biased as cycles have different intensities and timings.

- d. Though scientific methods are adopted, there is difference between field experiments and laboratory experiments.
- e. Despite limitations associated with forecasting, we all agree that forecasting by an appropriate technique is essential. No businessman can afford to do without it. Good forecasting constitutes the core of business management.

### Summary

A forecast is an estimation or prediction about situations which are most likely to occur in near or distant future. The firm must plan for the future. Planning for the future involves forecasting. The firm has to forecast the future level of demand for its products under different possible circumstances; such as prices, competition, promotional activities and general economic activities. Forecasting does play a key role in managerial decisions and hence forecasting is emphasized in the study of managerial economics. The objective of business forecasting is to minimize risk and the margin of uncertainty.

### Keywords

**Demand Estimation:** Demand estimation is a prediction focusing on future consumer behavior. It predicts demand for a business's products or services by applying a set of variables.

**Demand Forecasting:** Demand forecasting is the process of making estimations about future customer demand over a defined period, using historical data and other information.

**Trend Projection;** The trend projection method is based on the assumption that the factors liable for the past trends in the variables to be projected shall continue to play their role in the future in the same manner and to the same extent as they did in the past while determining the variable's magnitude and direction.

**Sample Survey:** A sample survey is a survey which is carried out using a sampling method, i.e. in which a portion only, and not the whole population is surveyed.

**Delphi Method:** The Delphi method is a process used to arrive at a group opinion or decision by surveying a panel of experts.

### Self Assessment

1. ----- is the process of current values of demand for various values of prices and other determining variables.
  - A. Demand Estimation
  - B. Demand analysis
  - C. Demand function
  - D. Demand forecasting
2. Criteria for good demand forecasting includes;
  - A. Plausibility
  - B. Simplicity
  - C. Economy
  - D. All the above.
3. Tools and techniques for demand estimation includes;
  - A. Consumer surveys.
  - B. consumer clinics and focus groups
  - C. Market Experiment
  - D. All of the above
4. . \_\_\_\_\_ forecasting is more important from managerial view point as it helps the management in decision making with regard to the firms demand and production.
  - A. Macro level
  - B. Industry level
  - C. Firm level
  - D. None of these

5. Purposes of Short term Demand forecasting includes
  - A. Making a suitable production policy.
  - B. To reduce the cost of purchasing raw materials and to control inventory.
  - C. Deciding suitable price policy
  - D. All the above
6. Which of the following is not correct about demand forecasting?
  - A. Predicts future demand for a product or service.
  - B. Based on the past demand for the product or service.
  - C. It is not based on scientific methods.
  - D. Helps in the managerial decision making.
7. Which of the following is a qualitative method of forecasting?
  - A. Expert opinion.
  - B. Historical data.
  - C. Exponential smoothing.
  - D. Moving average.
8. Seasonality is demand that shows which of the following patterns?
  - A. Repetitive pattern over some time interval.
  - B. General movement up or down over time.
  - C. Repetitive pattern based on economic conditions.
  - D. Repetitive pattern based on promotional activity.
9. Which of the following is not a forecasting technique?
  - A. Judgmental
  - B. Time series
  - C. Time horizon
  - D. Associative
10. Which of the following is not true for forecasting?
  - A. Forecasts are rarely perfect
  - B. The underlying casual system will remain same in the future
  - C. Forecast for group of items is accurate than individual item
  - D. Short range forecasts are less accurate than long range forecasts
11. In which of the following forecasting technique, subjective inputs obtained from various sources are analyzed?
  - A. Judgmental forecast
  - B. Time series forecast
  - C. Associative model
  - D. All of the above
12. Survey method of demand forecasting includes
  - A. Opinion survey
  - B. Expert opinion
  - C. Delphi method
  - D. All the above
13. Method of demand forecasting is also called "economic model building"
  - A. Opinion survey
  - B. Complete enumeration
  - C. Correlation and regression
  - D. Delphi method

### Answer for Self Assessment

- |       |       |       |      |       |
|-------|-------|-------|------|-------|
| 1. A  | 2. D  | 3. D  | 4. C | 5. D  |
| 6. C  | 7. A  | 8. A  | 9. C | 10. D |
| 11. A | 12. D | 13. C |      |       |

### **Review Questions**

- Q 1. What do you mean by forecasting in Economics? Explain its importance in current market situation
- Q 2. Write an explain the factors that affect demand forecasting.
- Q 3. Explain the various methods of demand forecasting in an economy.
- Q.4 How can you forecast demand for a new product?
- Q. 5 what are the five basic steps of demand forecasting?
- Q.6. what forecasting methods would be used in which industries (industrial, consumer, service)?
- Q.7 which forecasting techniques are used the most, have most familiarity, and are most satisfying to corporate users?
- Q.8 what are the three main approaches (classifications) to forecasting and how would we organize the techniques under each approach?



### **Further Readings**

1. Microeconomics – Frank Kowell, Oxford University Press, 2007.
2. Microeconomics – Robert S. Pindik, Daniel L. Rubinfeld and Prem L. Mehta, Pearson Education, 2009, PBK, 7th Edition.
3. Microeconomics – David Basenco and Ronald Brutigame, Wiley India, 2011, PBK, 4th Edition.

## Unit 05: Utility Analysis

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Objectives

Introduction

- 5.1 Cardinal Utility Analysis
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Summary

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### Objectives

After this lecture, you would be able to

- understand the concept of utility.
- apply practical aspect of law of diminishing marginal utility analysis.
- understand the how consumer maximize his satisfaction by expanding his income on different commodity
- apply practical aspect of utility analysis in consumer behavior.
- describe the purpose, use, and shape of indifference curves
- explain the consumer equilibrium using indifference curves and a budget constraint

### Introduction

To begin, we need a description of the goods and services that a consumer may consume and his monthly income. How a rational consumer would make consumption decisions? In economics we say commodity to goods and services. If his income meets his desire and brings satisfaction in his life. To understand this, in economics three theories have been established:

(1) Cardinal Utility Analysis

(2) Ordinal Utility Analysis or Indifference Curve Analysis

(3) Revealed Preference Analysis.

***What is Utility?***

Utility refers to the total satisfaction received from consuming a product or service. In clear terms want-satisfying capacity of a product is called Utility. Any goods or service may have good or bad utility. For example, a cigarette smoker feels satisfaction with every puff; no doubt it is dangerous to health.

**5.1 Cardinal Utility Analysis**

In the 19th century, the neo-classical economists like Duipit, Gossen, Walras, Menger and Jevons put forward cardinal utility analysis criticizing the classical thought propagated by Adam Smith, Ricardo and others. While in 20th Century, Marshall and Pigou further elaborated Cardinal Utility Analysis. According to this analysis utility can be measured in cardinal numbers such as 1, 2, 3, 4 etc. Cardinal numbers either can be added or subtracted. Fisher has used this term "Util" as measure of utility. Thus in terms of cardinal utility analysis it can be said that one gets from a cup of tea 10 units, 5 units from a cup of coffee.

***Cardinal Utility and Ordinal utility theory***

*According to Cardinal utility theory, utility can be measured in cardinal numbers such as 1,2,3,4 etc and these numbers either can be added or subtracted. While Ordinal utility theory holds that the utility of a particular goods or service cannot be measured using a numerical scale bearing economic meaning in and of itself. Ordinal utility implies merely quality and ranking of the level of satisfaction experienced*

**5.2 Total and Marginal Utility**

According to the Utility measurement there may be two concepts: (1) Total Utility and (2) Marginal Utility

**1. Total Utility**

It is the aggregation of utilities obtained from the consumption of two different units of a commodity. In other words, total utility is the measurement of satisfaction derived from consuming quantity of some goods. It is the function of the quantity of a commodity consumed and is expressed as

$$TU_x = f(Q_x)$$

[The total value of this is read as -X (TU<sub>x</sub>), X- commodity quantity (Q<sub>x</sub>) is a function of (f).]

In the words of Leftwitch, "Total Utility refers to the entire amount of satisfaction obtained from consuming various quantities of a commodity." Assume that you eat 5 Rasagullas at a sitting. The aggregation of the utilities obtained from the 5 Rasagullas will be called Total Utility.

**2. Marginal Utility**

The concept of Marginal utility was put forward by the eminent economist named Jevons. The other name for Marginal utility is additional utility. The marginal utility is the gain (or loss) from an increase (or decrease) in the consumption of that goods or service. Assuming that by the consumption of the 1 chapatti you get 15 units of utility while consuming the 2nd one your total units goes upto 25. This means that the consumption of the 2nd chapatti added only 10 units to the total utility. Thus the marginal utility of the second chapatti is only 10 units.

According to Lipsey, "Marginal utility is the addition made to the total utility by consuming one more unit of commodity."

$$MU_{nth} = TU_n - TU_{n-1} \text{ Or } MU = \Delta TU / \Delta Q$$

(Here  $MU_{nth}$  = nth marginal utility of unit;  $TU_n$  = n the total value of units;  $TU_{n-1}$  = n - 1 the total utility of the unit  $\Delta TU$  = total utility;  $\Delta Q$  = change in the amount of object) Marginal Utility can be (1) positive (2) Zero and (3) Negative.

- (i) *Positive Marginal Utility:* Positive marginal utility is the change in total utility by the consumption of an additional unit of commodity. Suppose to satisfy your hunger you eat chapattis, from the first one you get 8 units and while from the second one you get 6 units. Altogether you have got  $8 + 6 = 14$  units. Thus, by taking the additional units of chapattis, total utility goes on increasing. The marginal utility which you derived from the second chapattis is known as positive marginal utility.
- (ii) *Zero marginal utility:* When the consumption of extra units of items has no change on the total utility, it means that the marginal utility of the additional unit is Zero. At this level the consumption utility will be maximum. So as far as the satisfaction of the consumer is concerned, it will be his saturated point. Suppose 4 chapattis of bread yield total utility of 20 units and the consumption of 5th chapatti does not make any change in the total utility and the utility remains 20, that means the marginal utility of the 5th one is Zero.
- (iii) *Negative marginal utility:* When the consumption of every extra unit decreases the utility derived from it, then it is known as negative marginal utility. After receiving the saturation point, after taking 5 chapattis, if the consumer is forced to take the number 6 chapatti, he may suffer from indigestion. Therefore, the total utility of the 6 chapattis may come down to 18 units, which signifies that the marginal utility is negative 2 i.e  $(18 - 20) = -2$ . Hence -2 is the negative marginal utility.

How Total Utility is different from Marginal Utility?

Total Utility is the aggregation of utilities obtained from the consumption of two different units of a commodity. While the marginal utility is the gain from an increase in the consumption of that goods or service.

$$TU = S MU$$

$$MU_{nth} = TU_n - TU_{n-1}$$



Marginal utility is the change in total utility by the consumption of an additional unit of commodity.

### Difference and Relation between Total Utility and Marginal Utility

A neo-classical economist, Jevons was the first person to highlight the relationship between Total Utility and Marginal Utility and its differences also. Difference and Relation between Total Utility and Marginal Utility may be explained with the help of the below Table 5.1 and Fig. 5.1.

Quantity	Total Utility	Marginal Utility	Description
1	8	$8 - 8 = 0$	Positive marginal Utility Total Utility is increasing
2	14	$14 - 8 = 6$	
3	18	$18 - 14 = 4$	
4	20	$20 - 18 = 2$	
5	20	$20 - 20 = 0$	Zero marginal Utility Total Utility is Maximum
6	18	$18 - 20 = -2$	Negative Marginal Utility Total Utility is decreasing

From the Table 5.1 we can see that Total utility is the sum total of the marginal utilities corresponding to various units of a commodity consumed.

$$(i) \quad TU = \sum MU$$

(Here TU = Total Utility;  $\sum$  = Summation; MU = Marginal Utility Or Total Utility = Addition of marginal Utilities)

$$\begin{aligned} TU_6 &= MU_{(1st)} + MU_{(2nd)} + MU_{(3rd)} + MU_{(4th)} + MU_{(5th)} + MU_{(6th)} \\ &= 8 + 6 + 4 + 2 + 0 + (-2) = 18 \end{aligned}$$

On the flip side, Marginal Utility refers to the change in the total utility corresponding to a unit change in the consumption of a commodity.

$$(ii) \quad MU = \Delta TU / \Delta Q \text{ or } MU_{nth} = TU_n - TU_{n-1}$$

(Here  $MU_{nth}$  =  $n$ th Marginal Utility of the unit;  $TU_n$  = Total utility of all the  $n$  units consumed;  $TU_{n-1}$  = Total Utility of  $n-1$  units)

MU= Marginal Utility;  $\Delta TU$ = Change in total utility;  $\Delta Q$ = Change in the consumption of the commodity.

For Example:

$$MU \text{ of 4th Unit} = TU \text{ of 4th unit} - TU \text{ of 3rd unit} = 20 - 18 = 2$$

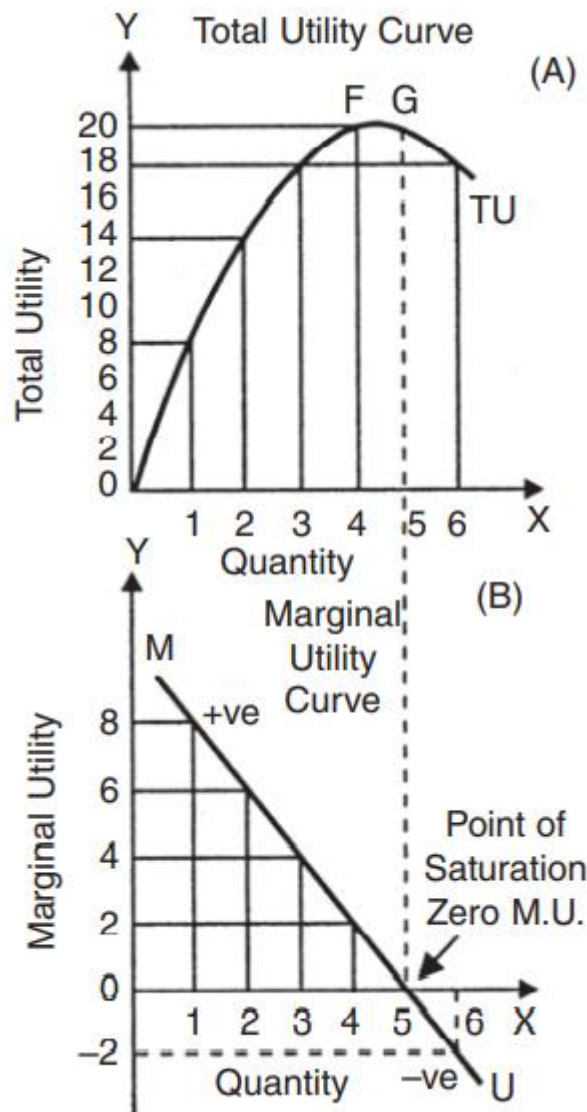
$$\text{Or } \Delta TU / \Delta Q = TU \text{ of 4th Unit} - TU \text{ of 3rd Unit} / 4 - 3 = 20-18 / 1 = 2 / 1 = 2$$

- (iii) Marginal Utility tends to diminish as more of the commodity is consumed. However, total utility increases with every additional unit of the commodity consumed till the point when the marginal utility becomes zero.
- (iv) Total utility remains positive while the marginal utility remains Negative or Zero.
- (v) Total utility becomes maximum while marginal utility is Zero.
- (vi) Marginal Utility determines the rate of change in total utility

The relationship between Total Utility and Marginal Utility can be expressed diagrammatically Fig. 5.1. In part 'A' and 'B' of Fig. 5.1 units of the commodities are shown on OX-axis and utility on OY-axis. In Fig. 5.1 (A) curve TU represents Total Utility. It is moving upto point 'F', which indicates that the total utility has been rising upto the consumption of 4th unit. From the point F to G the total utility is constant, which indicates that the consumption of the 5th unit has not made any addition to the total utility. Both these points signify maximum height of total utility curve. Point 'G' represents the maximum total utility at the 5th unit which is the point of saturation. After point 'G' the TU curve moves downward thereby at the 6th unit Marginal utility becomes negative and total utility begins to fall.

Fig: 5.1





In Fig. 5.1(B) MU curve represents Marginal Utility. It moves downward from left to right, which signifies that marginal unit of successive units, goes on vanishing. Upto the fourth unit of the commodity, marginal utility goes on vanishing while Total utility goes on increasing. Hence it is proved that up to the fourth unit of the commodity marginal utility is positive. At the fifth unit where MU touches OX-axis, Marginal utility is Zero. In such a case the total utility is maximum. After the fifth unit the MU curve intersects OX-axis and moves downwards. This suggests that the sixth unit yields negative Marginal utility and, in this situation, the total utility begins to diminish.

### Significance of the Difference between Total Utility and Marginal Utility

The difference between Total Utility and Marginal Utility has the following practical significance:

1. *Paradox of Value or the Diamond-Water Paradox:* Many economists have assumed that the price of a commodity was equal to its total utility. Thus the commodity, which gives more total utility should have more value and vice versa. But it is not so in actual life. One obtains more total utility from water than the diamonds, yet the price of water is much lesser than diamonds and this situation is known as Paradox of Value or the Diamond-Water Paradox. Adam Smith has developed the theory of the Diamond-Water Paradox as water is more important for the existence of life, yet it is cheaper. Diamond is only aesthetic but is very expensive. The neo-classical economist Jevons has explained this paradox with the help of the difference between Total Utility and Marginal Utility. He criticized Adam Smith by saying that he has forgotten that water is cheaper as it is found in abundance, so its Total Utility soon reaches to the point of saturation.

While the marginal utility soon reaches to Zero. Consequently, the price of water is almost Zero. While on the flip side the availability of diamond is very rare, so there total utility is far from the point of saturation. As a result the marginal utility of diamond remains high and positive. The high marginal utility corresponds with a relatively high demand price, so it is notoriously expensive.

A consumer pays price for a commodity, is not equal to its total utility but is equal to its Marginal utility. When the consumption of commodity increases, the marginal utility decreases. So the consumer wants to pay less for every units of commodity as compared to its first unit of commodity.

**2.Consumer's Surplus:** Sometimes a consumer is ready to pay much higher price for a commodity than its actual price. The difference between what consumers are willing to pay for goods or services relative to its market price is known as consumer surplus. The consumer is ready to pay the price which is equal to the total utility that he received from all of the commodities but in actual he pays the price equal to the marginal utility of the marginal unit of the commodity. Here marginal unit is referred to the additional unit that the consumer is ready to buy. Apart from this each unit preceding the marginal unit (also known as intra marginal unit) would give the consumer more utility than the marginal utility. The aggregation of marginal utilities of these units is known as Total utility. As the price is equal to marginal utility, the amount of the money paid by the consumer is equal to the marginal utility multiplied by number of the units bought. Of course, there will be a difference between the total amount of consumers would be willing to pay to consume the quantity of goods Notes transacted on the market and the amount actually have to pay for those goods. This difference is called Consumer Surplus. The concept of Consumer Surplus is based on the difference between Total Utility and Marginal Utility.

### 5.3 Law of Diminishing Marginal Utility

The Law of Diminishing Marginal Utility is the foundation stone of utility analysis. We experience this in our day to day life. If you are set to buy pen at any given time, then the number of pens with you goes on increasing while the marginal utility from each successive pen will go on decreasing. It is the reality of man's life which is referred in economics as law of diminishing marginal utility states that other things being equal, the marginal utility of goods diminishes as more of it is consumed in a given time period.

In the 19th century, few economists like Bentham, Gossen, Menger, and Walrus attributed this law. According to Jevons this law is based on Weber-Fechner's Psychological law. His Psychological law states that with increase in the quantity of the commodity the significance of the additional unit goes on diminishing. Prof. Boulding called it, "Law of Eventually diminishing marginal utility". It is also known as Gossen's First law.

1. *According to Marshall,* "The additional benefit which a person derives from a given stock of a thing diminishes with every increase in the stock that he already has."
2. *According to Samuelson,* "The law of diminishing marginal utility states that ceteris paribus as the amount of goods consumed increases, the marginal utility of that goods diminishes."

It is clear from the above definition that at given time when we continue to consume additional units of a commodity, the marginal utility from each successive unit of that commodity, other things being equal, go on diminishing in relation to the proceeding unit. It is this diminishing tendency of the marginal utility, which has been sainted in law of diminishing marginal utility.



Total utility never reach the point of saturation.

### Basic Assumptions

The three main assumptions of this law are the following:

1. Every unit of the commodity being used in the same quality and size, for example, a cup of tea or a glass of water.
2. There is a continuous consumption of the commodity.
3. Marginal utility of the every commodity is independent

### Explanation

This Law can be explained with the help of Table 5.2 and Fig. 5.2.

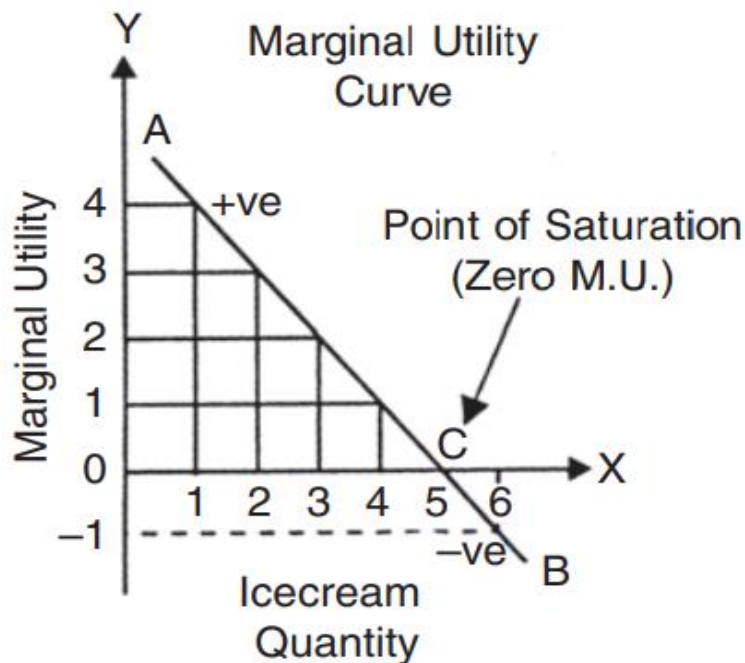
Ice Cream Consumed	Marginal Utility
First	4
Second	3
Third	2
Fourth	1
Fifth	0
Sixth	-1

The above table shows that first cup of ice cream yields 4 units of marginal utility. This will satisfy your want to some extent and the intensity of the want will come down. While the second cup of ice cream will yield less marginal than the first one, again third cup of ice cream will yield less marginal utility than second and this way fifth cup of ice cream will yield Zero marginal utility. If one is forced to take the sixth one then the marginal utility becomes negative and one may suffer from indigestion.

It is proved from the above table that if more and more units of ice cream are consumed then the MU from the each successive unit will diminish.

In Fig. 5.2. below, units of ice-cream are shown in OX axis while marginal utility is shown in OY axis. AB is the Marginal Utility curve. It slopes downward from left to right indicating that first cup of ice cream has yield 4 units, second cup of ice cream has yield 3 units, third cup of ice cream has yield 2 units, fourth cup of ice cream has yield 1 unit, fifth cup of ice cream has yield 0 unit. So AB touches OX-Axis at point 'C' which represents the fifth cup of ice cream while sixth cup of ice cream has given negative (-1) unit. Here AB curve goes below OX-Axis.

Fig. 5.2



### 5.4 Exceptions of the Law

According to some economists following are the exceptions to the law of diminishing marginal utility. It means that the law does not apply under the following situations. But a thorough study reveals that the exceptions are more clear than real.

1. *Curious and Rare Things*: It is said that this law does not apply to curious and rare things. The persons who collect old and rare coins, postage stamps as increasing marginal utility as the stock of these rare articles goes on increasing. They are always keen to obtain more and more units of such things. But this exception is not true. Whereas after collecting number of stamps of the same kind the marginal utility diminishes.
2. *Misers*: It seems law does not apply to misers who want to acquire more and more of wealth. Their desire for money seem to be insatiable. But according to Meyers even this exception is not true. The amount of money a miser spends on food and clothing but he cannot spend on Gold and silver. It proves that a miser who has large stock of bullions (Gold and silver) , the utility of the gold and silver gets diminished and that of food and clothing whose stock is limited, increases.
3. *Good Book or Poem*: It is said that by reading a good book or listening to a melodious song and a beautiful poem again and again one gets more utility than before. So good books and poems are considered exceptions to this law. But it is not true. It is possible that up to a certain limit reading a good book or listening to a song again and again may increase the marginal utility but reading a good book or listening to a song at a given period of time may bring a sense of bored feeling in mind, which may lead to diminish the marginal utility.
4. *Drunkards*: It can be said that when a drunkard takes a liquor and intoxicant then as he takes more and more pegs of liquor his desire to have more of it goes on increasing. So a drunkard is regarded as an exception to this law. However, even in case of drunkard, a stage comes when he loses his sense and starts suffering pointing to negative impact of the successive drinking the law ultimately holds goods.
5. *Initial units*: When the initial units of a commodity are used in less than appropriate quantity, then the marginal utility from the additional units goes on increasing. According to Benham to heat up furnace we use coal piece, the marginal utility of the additional coal increases because the furnace requires adequate initial supply of coal. But this exception is also not correct. As we make adequate quantity of initial supply of coal then every additional unit of coal will yield less and less marginal utility.

In concise **Prof. Taussig** has rightly said that the tendency of law of diminishing marginal utility is so widely prevalent that it would not be wrong to call it as universal law.

### Derivation of Consumer's Demand Curve Through the Law of Diminishing Marginal Utility

The price that the consumer pays is equal to the marginal utility. According to law of diminishing marginal utility, as a consumer goes on buying more and more units of commodity its marginal utility goes on diminishing. As such the consumer will buy more and more units of commodity when its price goes down. Even marginal utility is expressed in terms of money, in that situation the positive part of the marginal utility is the demand curve. In the words of Lipsey, "When the consumption of all but one product is held constant, the marginal utility schedule for the variable product is the product's demand curve."

When the marginal utility is shown on OY-axis then the curve obtained will be the marginal utility , in case price is shown in OX-axis then the curve obtain will be called marginal utility curve as indicated in the Fig.5.3(A) and 5.3(B).

Fig.5.3

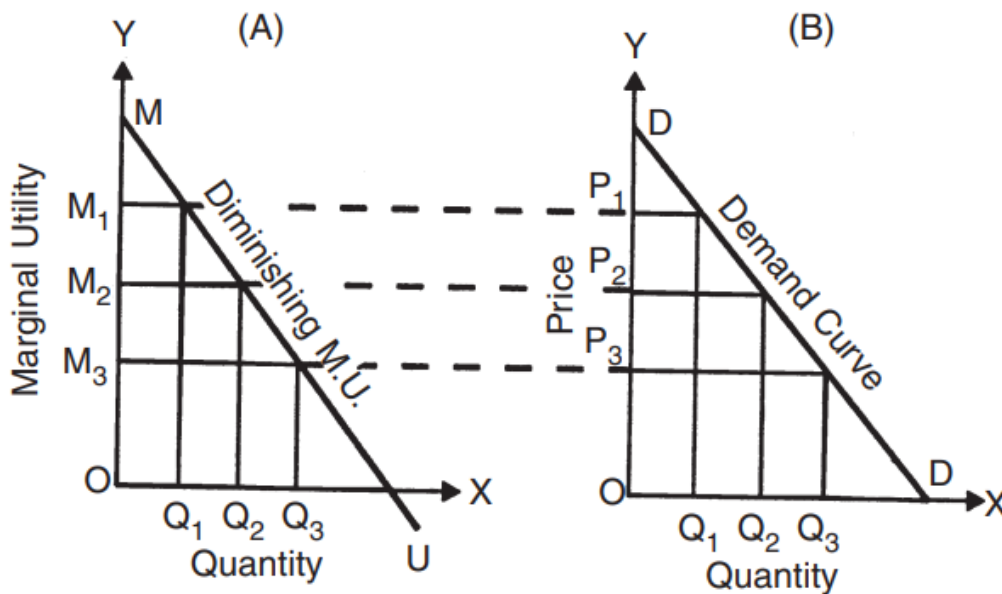


Figure 5.3(A) represents marginal utility curve and Fig. 5.3(B) represents demand curve, DD (demand curve) has been drawn with the help of marginal utility curve.

### Law of Equi-Marginal Utility is the second law of marginal utility analysis.

This law points out how a consumer gets maximum satisfaction out of his given expenditure on different goods. In 19th century, this law concerning the expenditure of a consumer was first propounded by a French engineer, Gossen. So this law is also known as "Second law of Gossen". Dr. Marshall has called it "Law of Equi-Marginal utility". The law states that in order to get the maximum satisfaction a consumer should spend the limited income on different commodities in such a way that the last rupee spent on each commodity yield him equal marginal utility. Economists have given different names to this law. Lewfwich calls it "The General Principle for Maximisation of Consumer's Satisfaction". In simple words, it is also known as Law of Maximum Satisfaction because a consumer by spending his income in accordance with this law consumer gets maximum satisfaction. Prof. Hibdon has called it "law of rational consumer". A rational consumer using his rationality will spend his income strictly according to this law, so it is also known as "Law of Substitution". A consumer will go on substituting the goods yielding higher marginal utility for the goods yielding lower marginal utility till the time the marginal utility of both the goods become equal. Lord Robbin called it "Law of Economics" because it is applied to all the sections of study of the economics such as production, consumption, exchange distribution and public finance.

If a person has a thing which he can put to several uses he will distribute it among these uses in such a way that it has the same marginal utility in all.

– Marshall

The law of equi-marginal utility states that to maximise utility, consumers must allocate their limited income, among goods in such a way that marginal utilities per dollar of demand from the last unit consumed are equal among all goods.

– McConnell

A consumer gets maximum satisfaction when the ratio of marginal utilities of all commodities and their prices is equal.

– Samuelson

$$MU_1/P_1 = MU_2/P_2 = MU_3/P_3$$

If prices of the commodities are equal, the maximum satisfaction to the consumer can be indicated in the following equation.

$$MU_1 = MU_2 = MU_3$$

In the above equation  $MU_1 = MU_2 = MU_3$  refers to the marginal utility of the first, second and third commodity and  $P_1, P_2, P_3$  refer to the price of the first, second and third commodity.

### Assumptions

Law of Equi-Marginal Utility is based on the following assumptions –

- (1) Utility can be measured in the Cardinal number system.
- (2) Consumer is rational that is he wants maximum satisfaction from his income.
- (3) There is no change in the income of consumer.
- (4) Marginal Utility of money remains constant.
- (5) There is no change in the price of commodity and its substitutes.
- (6) Every unit of the commodity being used is of same quality and size.
- (7) Law of diminish marginal utility is applicable here.

### Explanation

The law can be explained with the help of the Table 3 and Fig. 3.4. Assume that an income of a person is 5.00 only. He wants to spend on two commodities say mango and milk. Also assume that the price of these two commodities is 1 per Kilo/Litre. The marginal utilities of different unities of mangoes and milk are shown in below Table 5.3

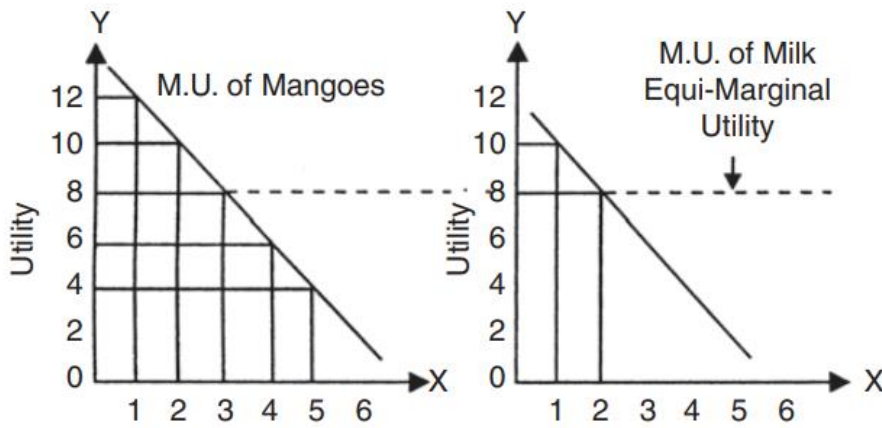
Rupee Spent	M.U. of Mangoes	M.U. of Milk
First	12	10
Second	10	8
Third	8	6
Fourth	6	4
Fifth	4	2

Assume that the consumer spends his income in terms of one-rupee unit. The first rupee spent on mangoes yields him 12 units worth of marginal utility and the first rupee spent on milk yields him 10 units worth of marginal utility. Hence he will spend first rupee on mangoes. Out of 2nd and 3rd rupee he will spend one in mangoes and milk. Thus to get the total satisfaction the consumer will spend 3 on mangoes and 2 on milk out of his total income. Third rupees spend on mangoes yield him 8 units while 2nd rupee spend on milk will yield him 8 units worth of marginal utility. Thus the last units of money spend on both the commodities give the consumer the equal marginal utility. This mode of distribution would yield the consumer the maximum satisfaction. Utilities from mangoes are 30 units (12 + 10 + 8) utility from milk is 18 (10 + 8). The total utility is 48 (30 + 18). If the consumer spends his income in other manner, then he will get less total utility.

Assume that the consumer spends ₹ 4 i.e one rupee more on mangoes and ₹ 1 less in milk. By spending ₹ 1 more in mangoes the consumer will get 6 units of the utility while spending ₹ 1 less in milk. The consumer will loss 8 units of the utility.

In this mode of distribution of income the consumer by spending ₹4 one mango gets 36 (12 + 10 + 8 + 6) units and by spending only ₹1 on milk the consumer will get 10 units of utility. If the consumer spends his earning in this manner then he will able to get total utility of 36 + 10 = 46 units.

Fig: 5.4

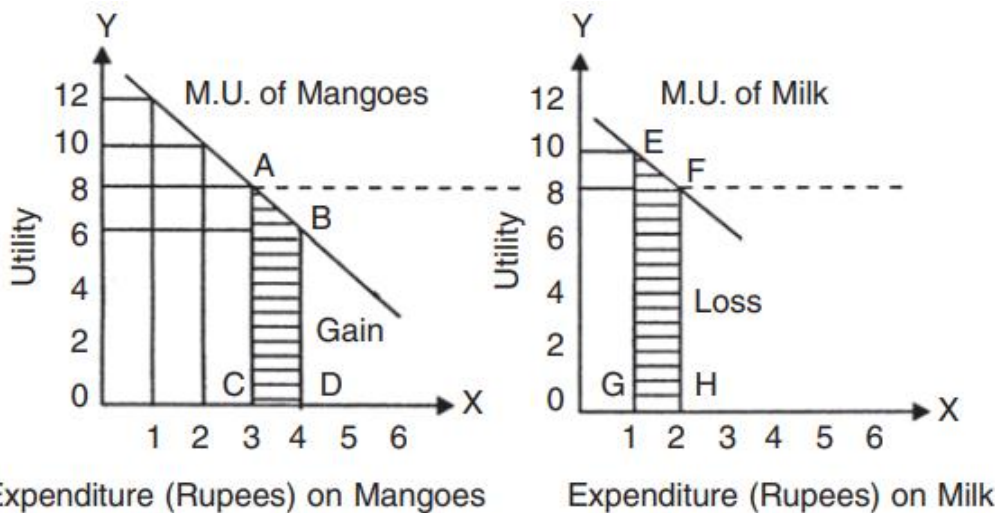


(A) Expenditure (Rupees) on Mangoes      (B) Expenditure (Rupees) on Milk

This total utility is less by 2 units as compared to the total utility (48) derived from the previous distribution of income. Thus other distributions of income will yield the consumer as much satisfaction as the one in which the last unit of rupees spent on different commodities gives equal marginal utility. In the Fig. 5.4(A) and 5.4(B) units of rupees are shown in OX-axis and Marginal Utility in the OY-axis. In Fig. 5.4(A) the marginal utility of the mangoes is shown while in Fig. 5.4(B) the marginal utility of the milk is shown. The figure indicates that if the income of the consumer is ₹ 5 then he spent ₹ 3 on mangoes and ₹ 2 on Milk as the third rupee he spends on the mangoes and the second rupee he spends on the Milk gave him the equal marginal utility i.e 8 units. Dotted line in the figure represents equal marginal utility derived from the last unit of rupee spend on the two commodities –mangoes and milk. By distributing his income on these two commodities in this manner the consumer gets total utility of 48 units. It is the maximum total utility that the consumer is getting out of his expenditure of ₹ 5. And this manner of spending has given the consumer a sense of total satisfaction.

If the consumer spends his income on these two commodities mango and milk in other manner then his total utility will be less than the maximum. The below Fig. 5.5 explains the same.

Fig. 5.5



Expenditure (Rupees) on Mangoes      Expenditure (Rupees) on Milk

It is proved from the Fig. 5.5 that by spending ₹ 1 more on mango, the consumer gains 6 units of Notes marginal utility as shown by ABCD area. Similarly, by spending ₹ 1 less on milk the consumer loses 8 units of marginal utility as shown by EFGH area. By this distribution of income the consumer will get 2 units of the total utility less. The consumer now gets only 46 units of the total utility while the earlier spending manner will give him 48 units of the total utility.

### Importance of the Law

Importance of the Law is of great importance in economics. Robbins regards it as the basis of economics. According to Marshall, "The application of the principle of equi-marginal utility extends over almost every field of economic enquiry."

For Example –

1. *Consumption*: Every consumer wants to get maximum satisfaction from his limited means. As suggested by this law if a consumer spends his income on different commodities in such a way that last unit of money spent on commodities yields him equal marginal utility then it will give him maximum satisfaction.
2. *Production*: Every producer aims at earning maximum profit. In order to achieve its satisfaction a producer has to utilize different factors of production such as land, labor, capital, etc. in such a manner that the marginal factor of each factor is equal. A producer must go on substituting various factors until marginal productivity of each factor is equal. A producer can succeed in his aim of getting maximum satisfaction only when he adjusts his limited resources.
3. *Exchange*: Exchange means replacement of goods giving less utility with goods giving more utility. Acting upon the law every person will go on substituting goods giving more utility for the ones giving less utility, till the marginal utility of all becomes equal. Exchange will stop at this point. Money should be also exchanged for other goods and services up to the mark where the marginal utilities of the goods or the services are equal to the marginal utility of the money to be spent on them.
4. *Distribution*: It refers to the distribution of national income among the factors of production that are land labour, capital etc. it is done in such a way that in the long run every factor gets share out of national income according to its marginal utility. In order to have such distribution factors are to be mutually replaced in a manner that the marginal productivity of each factor is equal to its remuneration, and the marginal productivity of the different factors becomes equal to each other.
5. *Public Finance*: The law also has importance in this sphere of public finance, that revenue and expenditure of the state. At the time of levying taxes finance minister takes its help. He levies the tax in such a way that the marginal sacrifice of each tax payer is equal. Then only it has least burden on the tax payers. In order to achieve this objective a finance minister may substitute one tax for others. Similarly, at the time of spending public fund it is ensured that the marginal benefit of each type of expenditure should be equal. When the marginal social sacrifice made by the people in the form of payment of the taxes is equal to the marginal social benefit derived by them out of the public expenditure, then the country can enjoy maximum social advantage.
6. *Distribution of income between saving and consumption*: According to this law, income should be distributed between consumption and saving that the last unit of money spent on present consumption should yield the same utility as the last unit of money kept in the form of saving. Such a distribution is called optimum allocation.
7. *Optimum distribution of commodities*: Optimum distribution of the commodities is possible with this law in a free market economy. Optimum distribution of commodities refers to that distribution, a slight change whereof may diminish the total utility enjoyed by society as a whole. Optimum distribution becomes possible when a commodity is distributed among different persons in such a way that marginal utility derived from each person becomes equal.
8. *Distribution of assets*: Distribution of assets helps people distribute their assets in different forms. Suppose a person has cash of ₹ 1 lakh . He wants to invest in different forms bank deposit, bond, stock shares, housing etc. According to this law, investment should be made in different, forms of assets in such a way that last unit of money invested in each form should yield equal marginal utility. Thus he will derive almost equal psychological benefit from all forms of assets and thereby enjoys maximum satisfaction.





Give your opinion on importance of the law

### Criticisms of the Law

1. *Consumers are not Fully Rational:* The assumption that consumers are not fully rational is not correct. Some consumers are idle by nature, and so to satisfy their habits and customs, they sometimes buy goods yielding less utility. Eventually, they do not get maximum satisfaction.
2. *Consumer is not Calculating:* The law is based on wrong assumption that while spending his income Notes a consumer constantly calculates the utility derived by him out of each rupee spent. Another wrong assumption of this law is that consumer goes on comparing the marginal utilities of the last rupee spent on different commodities. In actual life one hardly comes across such a calculating consumer. So the application of this law is practically difficult.
3. *Non-availability of Goods:* If goods giving more utility are not available in the market, the consumption will have to consume goods yielding less utility. If there is non availability of cooking gas in the market then the consumer will go for other options either coal or kerosene oil. If the utility of the later, coal or kerosene oil is less then the consumer will not get the maximum satisfaction.
4. *Ignorance of the Consumer:* Consumer is ignorant about concerning consumption. He is ignorant about right price of goods, less expensive substitute of the goods and of the different uses of goods. Due to these factors, the consumer fails to spend his income in a manner that may yield him maximum satisfaction.
5. *Indivisibility of Goods:* The law is not applicable to those goods which cannot be divided into small parts, Things like car, Television set, scooter have to be bought at least in one unit. To equalize the marginal utility of different goods, if we are thinking to buy one unit of above goods, then we may not be able to buy the additional unit. So we can say that this law does not apply to invisible goods.
6. *No definite budget period:* Another limitation of this law is that the budget period of consumer is not definite. A consumer has to spend his income of different uses within a definite period of time which is also known as budget periods and that budget period can be a month or a year. Goods like TV Set, refrigerator are bought in one budget period, but they continue to yield utility over many budget periods. Marginal utility of those items such as TV set, refrigerator cannot be compared with those commodities which are bought and consumed in the same period.
7. *Cardinal measurement of utility is not possible:* Utility cannot be measured in cardinal number system. How can a consumer say he would get 12 units of utility from first mango and 10 units from second. Unless the marginal utility is estimated application of the law remains dubious.
8. *Change in the marginal utility of money:* The assumption that the marginal utility of the money remain constant is also not realistic in nature. In actual life marginal utility of money may increase or decrease. When a consumer buys more goods, he is left with less amount of money. As the marginal utility of the less money is higher, the consumer has to arrange his expenditure on different goods. Smaller the amount of money higher is its marginal utility. As a result of it, application of the law will become pretty difficult.
9. *Complementary goods:* The law does not apply to complimentary goods because they are used in fixed proportion. By using less of one commodity, use of the other cannot be increased. For example, one cannot use tape recorder without a cassette and a camera without a reel. One has to buy the both to bring its utility.

### 5.5 Indifference Curve

Indifference curve is that curve that represents those various combinations of two commodities that provides equal satisfaction to consumers. This means that all the points located on the indifference curve represent those combinations of two products that provide equal satisfaction to consumers.

As the combinations represented by all the points yield same satisfaction, the consumers, therefore, become indifferent in their choice i.e. gives equal importance to all combinations on the indifference curve.

H. L. Varian opines, "An indifference curve represents all combinations of two commodities that provide the same level of satisfaction to a person. That person is therefore, indifferent among the combinations represented by the points on the curve."

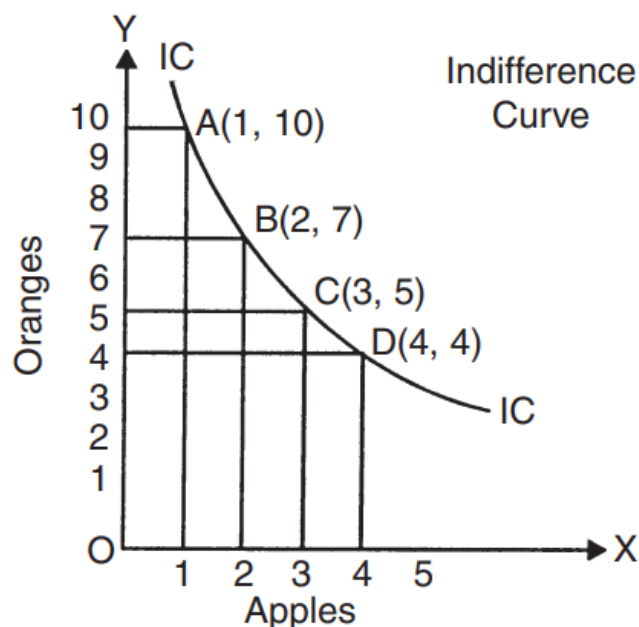
An indifference schedule refers to that schedule which indicates different combinations of two commodities which yield equal satisfaction. A consumer, therefore, gives equal importance to each of the combinations. In other words, he becomes indifferent towards them. In the words of Meyers, "An indifference schedule may be defined as a schedule of various combinations of goods that will be equally satisfactory to the individual concerned." The following (pg. 44) schedule indicates different combinations of apples and oranges that yield equal satisfaction to the consumer.

Combination of Orange and Apple	Apples	Oranges
A	1	10
B	2	7
C	3	5
D	4	4

The above schedule shows that the consumer gets equal satisfaction from all the four combinations A, B, C, D of apples and oranges. In combination A, the consumer has 1 apple plus 10 oranges, in combination B, he has 2 apples plus 7 oranges, in combination C, he has 3 apples plus 5 oranges and in combination D, he has 4 apples plus 4 oranges. The consumer in order to have more apples, sacrifices some quantity of oranges in such a way that there is no change in the level of satisfaction out of each combination.

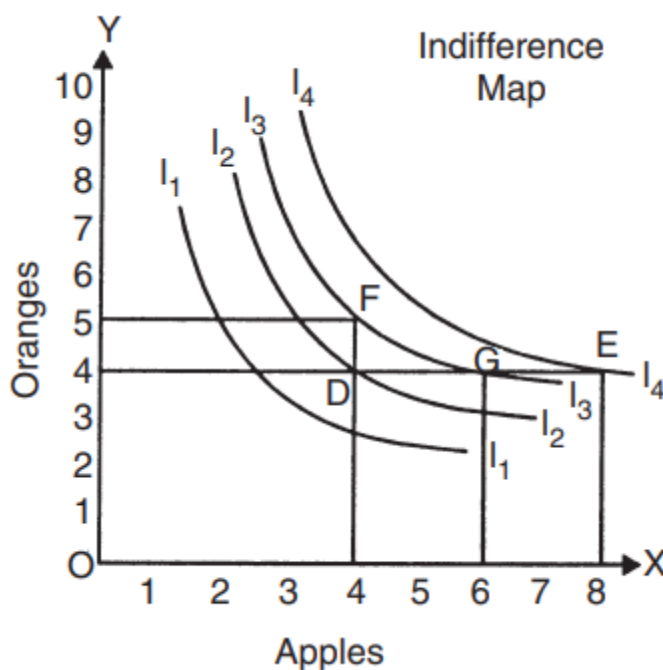
### Graphical Presentation of Indifference Curve

Indifference curve is graphical presentation of indifference schedule. Based on table 1, indifference curve is shown in Fig. 5.6. In this diagram, quantity of apple is shown on axis OX and quantity of orange is shown on axis OY. IC is an indifference curve. Different points A, B, C and D on it indicate those combinations of apples and oranges which yield equal satisfaction to the consumer. Therefore, it is also known as Iso-utility curve.



## 5.6 Indifference Map

An indifference curve indicates different combinations of two commodities which yield a given level of satisfaction to the consumer. In order to indicate higher or lower level of satisfaction of different combinations of different products, we have to make use of different indifference curves. When these indifference curves their groups are shown by a diagram, then it is called indifference map. Thus indifference map is that graph which represents a group of indifference curves each of which expresses a given level of satisfaction. In Fig. 5.7, indifference map is shown. In the diagram quantity of apples is shown on axis OX and quantity of oranges is shown on axis OY.  $I_1$ ,  $I_2$ ,  $I_3$  and  $I_4$  are different indifference curves. Each indifference curve is representing different level of satisfaction. As an indifference curve shifts to the right, the level of satisfaction goes on increasing. In this diagram  $I_4$  represents the combination yielding maximum satisfaction. Combination of  $I_3$  curve yields less satisfaction than combination of  $I_4$ .  $I_1$  curve represents the combination yielding least satisfaction. For instance, in Fig. 5.7 at point D of  $I_2$ , a consumer consumes 4 apples plus 4 oranges. If the consumer consumes 4 apples plus 5 oranges, naturally his level of satisfaction will be more and in this way he will shift to point F of  $I_3$ . Similarly if the consumer consumes 6 apples plus 4 oranges, his level moves to point G of  $I_3$ . So we can say that point F and G which lie on the indifference curve  $I_3$  yield more level of satisfaction than point D which lies of  $I_2$ . If consumer consumes 8 apples plus 4 oranges, his satisfaction will be more than at point G and he will move to point E of  $I_4$ . Thus, from the point of view of satisfaction  $I_4 > I_3 > I_2 > I_1$ . In other words, any indifference curve which will be right to another will be called higher indifference curve and will yield higher satisfaction. Any combination located on the higher indifference curve will be liked more than any combination of lower indifference curve.



## 5.7 Marginal Rate of Substitution

The marginal rate of substitution decides the slope of indifference curve. The stable marginal rate means stability of sloping or marginal rate is a line of indifference curve. The decrease marginal rate of substitution means falling of slope or convex indifference curve means convex to the main point. The study of indifference curve that when a consumer gets one more unit of X commodity, his satisfaction increases. If the consumer wants his level of satisfaction to be the same, means if he wants to remain on the same indifference curve, he will have to give up some units of commodity Y. In other words, in exchange of the satisfaction obtained from the additional apple, he will have to give up that quantity of oranges whose satisfaction is equal to the additional satisfaction obtained from an additional apple.

According to Bilas, "The marginal rate of substitution of product X for product Y ( $MRS_{xy}$ ) is defined as the amount of Y, the consumer is just willing to give up to get one more unit of product X and maintain the same level of satisfaction."

$$MRS_{xy} = \text{Loss of Y} / \text{Gain of X} = (-) \Delta Y / \Delta X$$

Where  $MRS_{xy}$  is marginal rate of substitution of X for Y;  $\Delta Y$ , changes in commodity,  $\Delta X$  = changes in commodity -X

### Diminishing Marginal Rate of Substitution

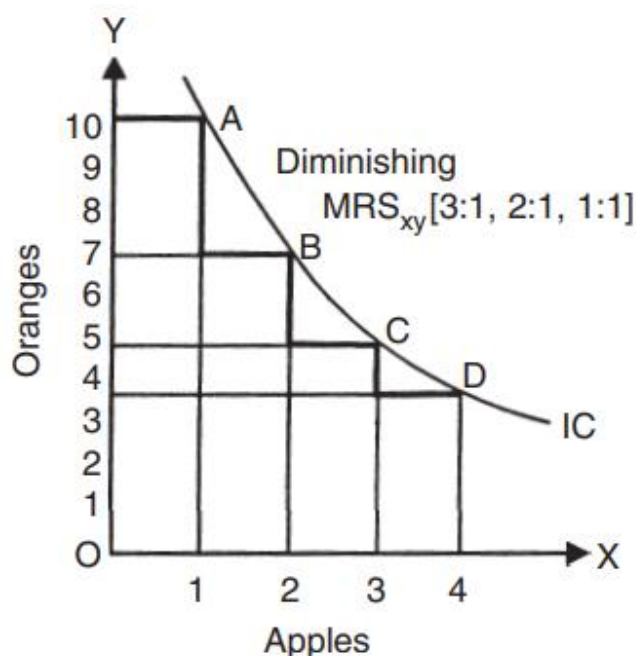
Diminishing marginal rate of substitution refers to the situation when stock of any product increases with the consumer to maintain the same level of satisfaction; he will substitute the product for another product at diminishing rate. In this condition, indifference curve is convex to the point of origin. This is a basic assumption of indifference curve; it is shown in Fig. 5.8. This is also a common characteristic and it is explained as a law below.

This law is explained in Table 5.5 and Fig. 5.8

Table 5.5: Diminishing Marginal Rate of Substitution			
Combination	Apples	Oranges	Marginal Rate of Substitution
A	1	10	-
B	2	7	3:1
C	3	5	2:1
D	4	4	1:1

Figure. 5.8 shows that when consumer moves from point A to point B, then he sacrifices 3 oranges in order to get one additional unit of apple. In this condition, consumer's marginal rate of substitution of apples for oranges is 3:1. Similarly, when he moves from B to C, then in exchange of 1 additional unit of apple, he is ready to sacrifice 2 oranges it means his marginal rate of substitution is 2:1. It is evident from the example that as the consumer increases the utility of apples; he sacrifices less oranges to get every additional unit of apple it means the substitution rate is 3:1, 2:1, 1:1. Since it is really possible, so it is called law of diminishing marginal rate of substitution

Fig. 5.8



## Why does the Marginal Rate of Substitution Diminish?

Law of diminishing marginal rate of substitution in actual, is a wide form of law of decreasing marginal utility. According to law of diminishing marginal utility, when a consumer increases the consumption of any product then the marginal utility, received from the product, decreases and in contrast, when he decreases the consumption of any product, the marginal utility increases. Figure 5.8 shows the consumer consumes 1 apple and 10 oranges at point A. At point B, the consumer consumes 7 oranges and 2 apples means, he sacrifices 3 oranges for 1 apple. According to the law of diminishing marginal utility, marginal utility of increasing numbers of apples is decreasing and marginal utility of decreasing numbers of oranges is increasing. As a result, the consumer will be ready to sacrifice less quantity of oranges respectively in exchange of every additional unit of apple. In other words, MRS of apples for oranges is decreasing causes of applicability of this law are same as that of law of diminishing marginal utility it means (i) satisfaction of particular need (ii) goods are perfectly substituted and (iii) goods have alternative uses. This law is not applicable in (i) Perfect Substitutes (ii) Perfect Complementary Goods.

## Assumptions of Indifference Curve Analysis

Indifference Curve Analysis is based on the following assumptions:

1. *Rational Consumer*: It is assumed that the behaviour of consumer will be rational. We assume that consumer has complete information about the circumstances related to consumption decisions. Consumer has information about every good and service, their prices and his monetary income. Based on this information, consumer can decide which combination is better, and which of the combinations provide equal satisfaction. Every consumer will try to get maximum satisfaction out of his fixed income.
2. *Ordinal Utility*: Indifference curve analysis is based on the assumption of ordinal utility. It is called ordinal utility because it is expressed in the form of ordinal numbers. Ordinal numbers are those numbers which express the ranks in services, like first, second and third etc. According to this, consumer can express his preferences in ranks for different combination of goods. They are not required to express the utility of any goods in the form of cardinal numbers. A consumer expresses by comparing the utility in the form of 'more' or 'less', and not in the form of numbers 2, 4, 6, 8 etc.
3. *Diminishing Marginal Rate of Substitution*: According to Baumol, "Indifference curve analysis assumes that marginal rate of substitution diminishes." It means, as the stock of a commodity increases with the consumer, he substitutes it for the other commodity at a diminishing rate.
4. *Non-Satiety*: Consumer does not reach the level of satiety. Consumer prefers more quantity of a commodity in comparison to less quantity, i.e., 5 sweets instead of 2. If consumer prefers the more quantity of a particular commodity in comparison to less, then he must have that much amount of goods that further increase in goods' quantity will not increase the satisfaction level.
5. *Consistency in Selection*: There is consistency in consumer's behaviour. It means that if at any given time a consumer prefers 'A' combination of goods to 'B' combination, then at another time also he will not prefer combination 'B' over combination 'A'.

$$\text{If } A > B, \text{ then } B > /A$$

(It reads : If A is greater than (>) B, then B cannot be greater than (> /) A).

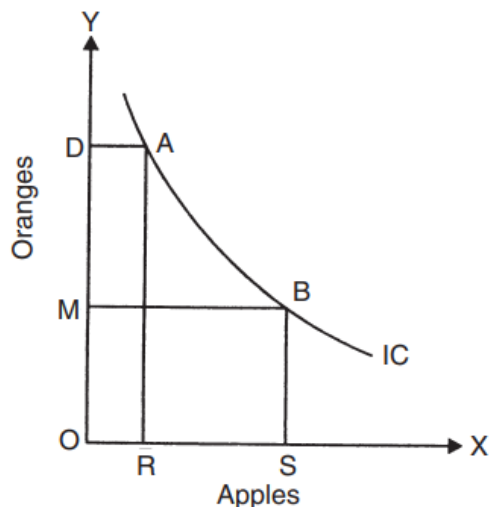
6. *Transitivity*: This analysis also assumes transitivity with regard to indifference and preference. It means if a consumer prefers 'A' combination to 'B' combination and 'B' combination to 'C' combination then he will definitely prefer 'A' combination to 'C' combination. Likewise, if a consumer is indifferent towards 'A' and 'B' and he is also indifferent towards 'B' and 'C', then he will also be indifferent towards 'A' and 'C'.

## Properties of Indifference Curves

The main properties of indifferent curve are as follows:

1. *An indifference Curve generally slopes downwards from left to right*: An indifference curve slopes downwards left to right, i.e., negative. This property of indifference curve is based on assumption that if a consumer uses more quantity of one commodity, he will use

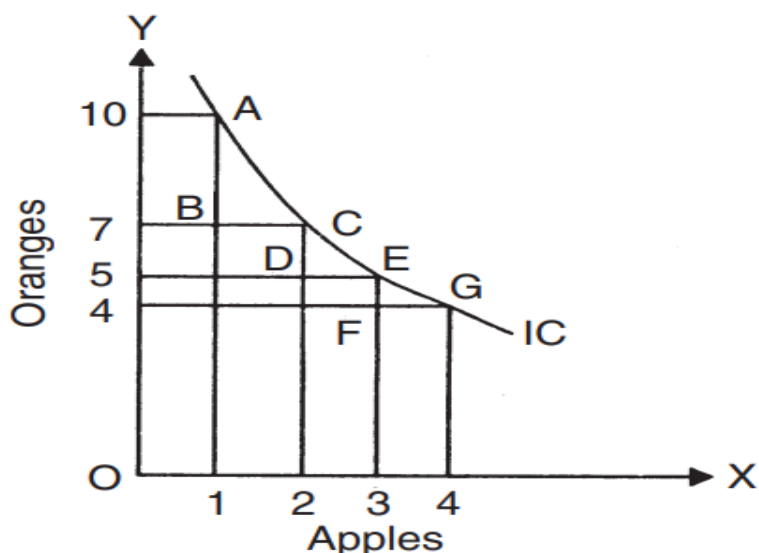
less quantity of others, then only the satisfaction from different combinations of goods will be equal. In Fig. 5.9 IC curve shows the left to right downward sloping indifference curve. As it is shown by IC curve, then consumer can have equal satisfaction with combination 'A' and 'B', because in case of combination 'A', if quantity of oranges is more than in combination 'B', then quantity of apples is less than in combination 'B' consequently, slope of indifference curve is negative as like IC curve, i.e., sloping downward from left to right, convey to the point of origin.



- Convex to the point of origin: Indifference curve is generally convex to the point of origin (i.e., sloping downward). By convex curve it represents bowing inward to the point of origin. In other words, slope of indifferent curve goes flatter as we shift forward along with curve. Slope of indifference curve is known as rate of marginal substitution, because it presents the rate at which consumer substitutes one commodity (like apple) with the other commodity (like orange) to maintain same level of satisfaction. In other words, this property of indifference curve is based on the law of diminishing marginal rate of substitution. The convex property of indifference curve is due to the diminishing marginal rate of substitution.

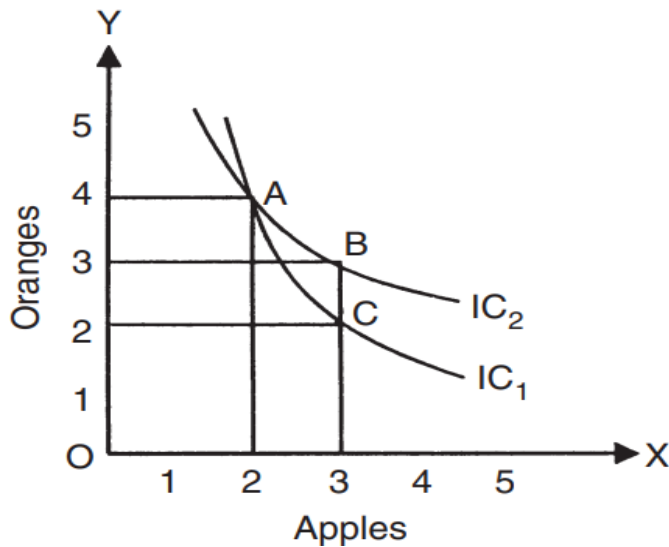
In Fig. 5.10, the indifference curve is Convex to the point of origin 'O'. It signifies that marginal rate of substitution of apples for oranges is diminishing. It means as the consumer gets more and more apples he will tend to give up less quantity of oranges. The consumer gives up 3 oranges (AB) for getting one additional apple, 2 oranges (CD) for getting another apple and 1 orange (EF) for getting yet another apple. This situation conforms to real life. Consequently, indifference curve is convex to the point of origin.

Fig. 5.10



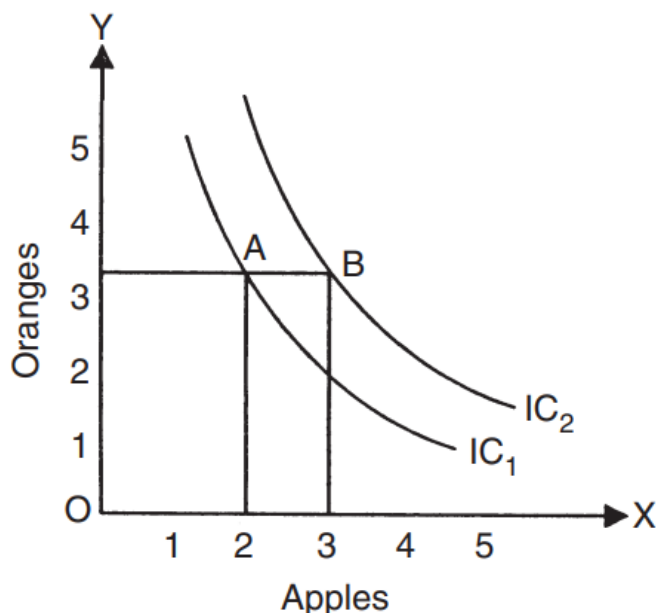
3. *Indifference curve never touch or intersect each other:* Each indifference curve represents different level of satisfaction, so they neither touch nor intersect each other. In Fig. 5.11 two indifference curves  $IC_1$  and  $IC_2$  have been shown intersecting each other at point A, but it is not possible at all. Points 'A' and 'C' on indifference curve  $IC_1$  represent combination yielding equal satisfaction, that is satisfaction from 'A' combination = satisfaction from 'C' combination. Likewise 'A' and 'B' on indifference curve  $IC_2$  represent combination yielding equal satisfaction that is satisfaction from 'A' combination = satisfaction from 'B' combination. It indicates that the satisfaction from 'B' combination is equal to satisfaction from 'C' combination, but it is not possible because in 'B' combination quantity of oranges is more than in 'C' combination, although quantity of apples in both combinations is equal.

Fig. 5.11



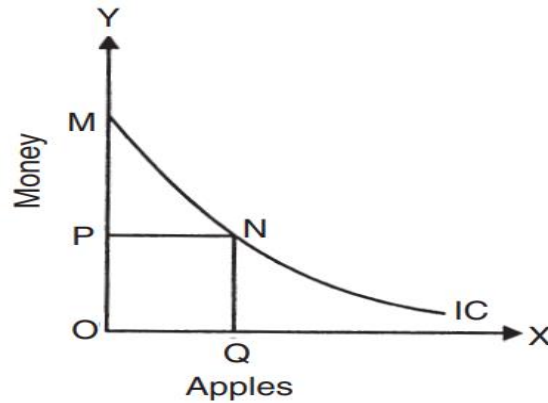
4. *Higher indifference curve indicates higher satisfaction:* It is the property of indifference curve that in indifference map, the higher indifference curve represents greater satisfaction in comparison to the lower indifference curve. This property can be clarified with the help of Fig. 5.12. In the figure  $IC_2$  represents higher and  $IC_1$  represents lower indifference curve. Point 'B' on  $IC_2$  represents more units of apples than point 'A' on  $IC_1$  curve, although the quantity of orange is same. Hence point 'B' is on  $IC_1$ . It is evident therefore, that higher the indifference curve, greater the satisfaction it will represent.

Fig. 5.12



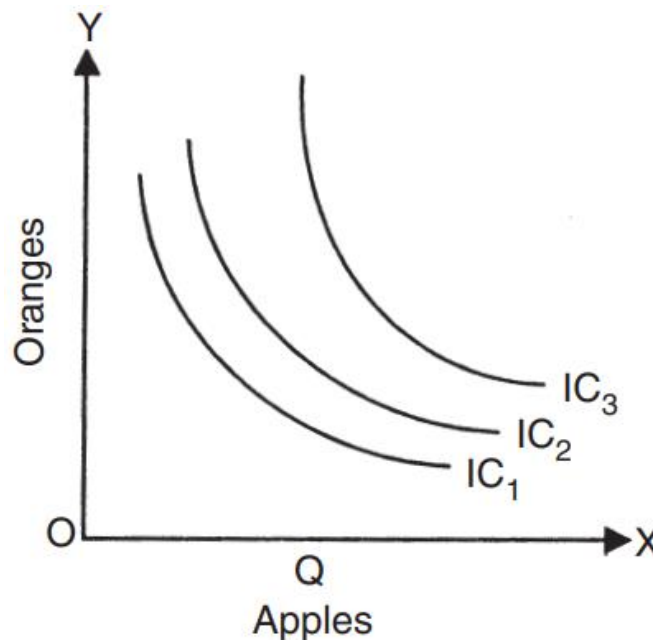
5. *Indifference curve should generally not touch X-axis or Y-axis:* It is assumed that consumer buys the combination of goods, and then indifference curve touches neither X-axis nor Y-axis. If indifference curve touches either of the axes then it means consumer wants only one commodity and his demand for the second commodity is zero. It is only possible when out of two commodities, one commodity represents money. An indifference curve may touch Y-axis if it represents money. As shown in Fig. 5.13 indifference curves IC touches OY-axis at point 'M'. It means the consumer wants to keep OM quantity of money and does not want to buy any unit of apples. In opposite at point 'N' consumer likes to have a combination of OP quantity of money and OQ quantity of apples. This combination will yield him same satisfaction as by keeping only money i.e., by OM amount of money.

Fig. 5.13



6. *Indifference curve need not be parallel to each other:* As shown in Fig. 5.14, indifference curves may or may not be parallel to each other. It depends on the marginal rate of substitution of two curves shown in the indifference map. The marginal rate of substitution of different points on two curves diminishes at constant rate, then these curves will be parallel to each other, otherwise they will not be parallel.

Fig. 5.14



### 5.8 Budget Line or Price Line

Indifference curve itself cannot simply predict the behaviour of the consumer because it leaves two important information and those are income of the consumer and price of the product. Information about income and price is shown by a different line in indifference figure, that line is known as budget line or price line. Study of Budget line is essential to know about consumer's equilibrium



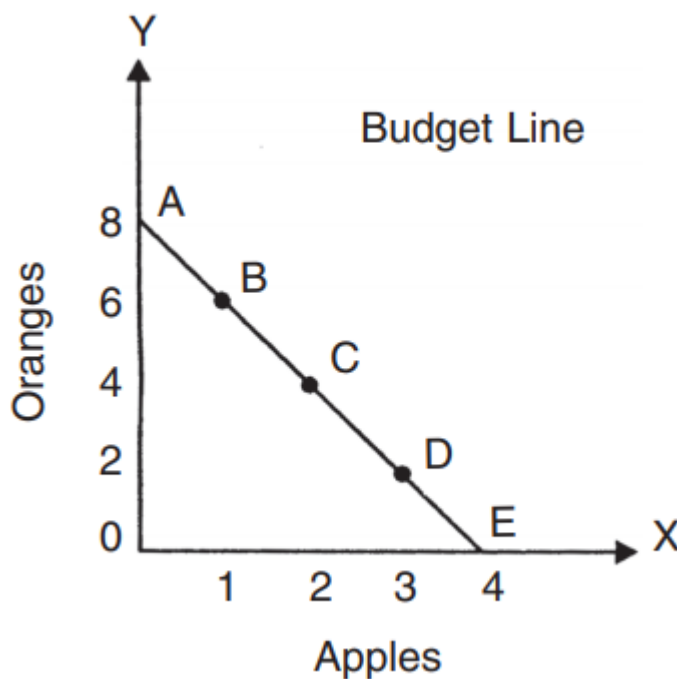
situation through indifference curve analysis. This line is also known as price line, consumption possibility curve or line of combinations.

According to Hibbdon, "The budget line is that line which shows all the different combinations of two commodities that a consumer can purchase, given his money, income and the price of two commodities." Explanation Suppose income of the consumer is 4.00, he wishes to spend all his money on apples and oranges. Price of oranges is 0.50 per orange and price of apple is 1.00 per apple. Combinations of these two commodities which the consumer can buy with his definite income and definite price of apples and oranges are shown in table 5.6 and Fig. 5.15.

Combination	Income (In ₹ )	Apple (Price ₹ 1.00)	Orange (Price ₹ 0.50)
A	4.00	0+	8
B	4.00	1+	6
C	4.00	2+	4
D	4.00	3+	2
E	4.00	4+	0

**Slope of Budget Line =  $P_a/P_o$ ;** where  $P_a$  = Price of apples,  $P_o$  = Price of oranges

Fig. 5.15



According to Lipsey, "The slope of the budget line is the negative of the ratio of two prices with the price of the goods that is placed on the horizontal OX axis appearing in the numerator."

### 5.9 Consumer's Equilibrium

Every consumer wants to buy maximum satisfaction with his fixed expenditure. A consumer can know with the help of indifference curve that how can he get maximum satisfaction with spending his income in various products. When consumer gets his maximum satisfaction with his limited

income then it is called Consumer's Equilibrium. Thus consumer equilibrium describes that the consumer wants to buy maximum satisfaction on expenditure on fixed products and services with his fixed income and not want to change this at all. In the word of Kautsvyani, "The consumer is in equilibrium when he maximizes his satisfaction given his income and the market prices."

### Two Basic Conditions of Consumer's Equilibrium

The consumer's equilibrium finds where the tangency is between budget line and convex indifference curve.

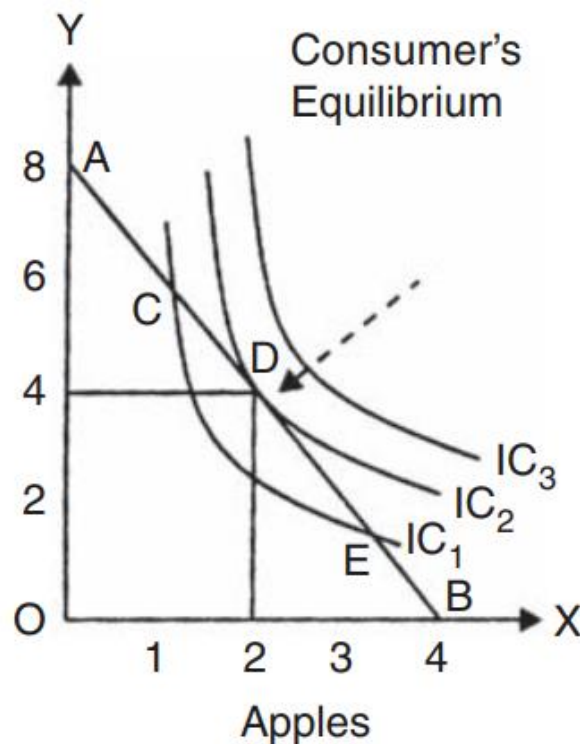
As per Kautsvyani, "The two terms for consumer's equilibrium are":

(i) **Budget line or price line should be tangent to indifference curve means for X, the marginal change ratio should average to its price of Y i.e.  $MRS_{xy} = P_x/P_y$ .**

(ii) **Indifference Curve must be Convex to the origin.**

(a) *Budget line or price line should be tangent to indifference Curve:* In Fig. 5.16, AB is budget or price line. IC<sub>1</sub>, IC<sub>2</sub> and IC<sub>3</sub> are indifference curves. A consumer can buy any combination

Fig. 5.16



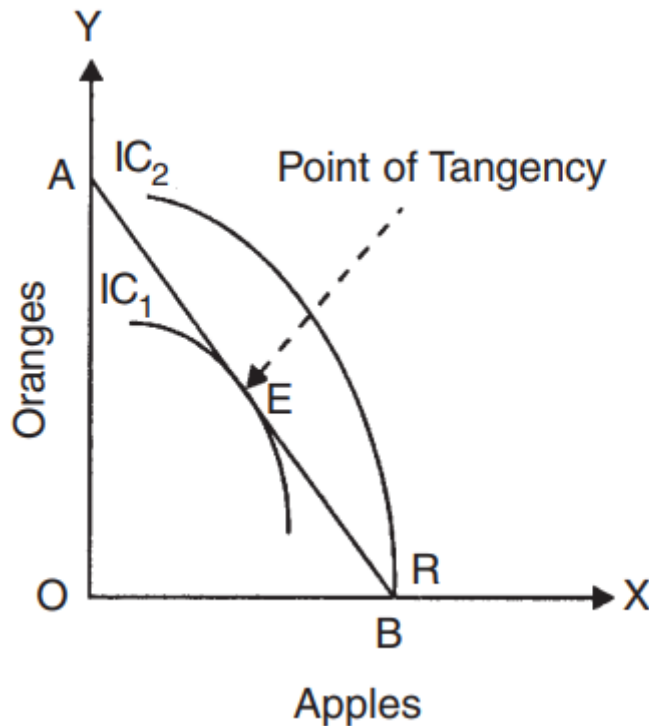
A, B, C, D and E of apples and oranges on AB price line. He cannot buy any combination on Notes IC3 because it is far from AB price line. He can only buy those products, which are on line AB but also on above most line of indifference curve. Here this curve is IC<sub>2</sub>. The consumer would be in equilibrium on combination D (4 oranges + 2 apples) from combination A, B, C, D and E because on this point, the budget line (AB) is the tangent line of above most indifference curve IC<sub>2</sub>. There is no doubt that consumer can buy the combination of C or E. But this will not give him maximum satisfaction because it is in lowermost indifference curve IC<sub>1</sub>. This means that the point of tangency of budget line and indifference curve is consumer's equilibrium point. In the words of Watson, "When consumer is in equilibrium, his highest attainable indifference curve is tangent to budget line." The slope of indifference curve and budget line is equal on equilibrium point D. The slope of indifference curve X is marginal substitution rate ( $MRS_{xy}$ ) for product Y and the slope of price line is the average of  $P_x$  of product X and  $P_y$  of product Y.

In equilibrium state –

$$\text{Slope of indifference curve} = \text{Slope of budget or Price Line or } MRS_{xy} = P_x/P_y$$

(b) Indifference curve must be convex to the origin: The second term for equilibrium is indifference curve should be upward to its original point. It means that marginal moving rate for the product X to product Y should be downward. If indifference curve is Concave and not Convex on equilibrium point then this is not equilibrium state. This statement is defined by Hicks by Fig. 5.17

Fig. 5.17



AB is the price line in Fig. 5.17. IC<sub>1</sub> is indifference curve. Price line AB is tangent line for indifference curve IC<sub>1</sub> to point E. So the average of cost of products and marginal moving rate are equal on point E but point E is not a fixed stable point. The marginal moving rate is increasing on this point rather than decreasing. The indifference curve is concave to the root point O on point E, so it does not follow the second rule of equilibrium. It does not mean that to move left or right from the point E, consumer will go to the uppermost indifference curve. So the equilibrium will not constant on point E. Tangent line E has not defined the maximum satisfaction on given curve. Actually, the tangent point E would be the lowest satisfaction point on lowermost indifference curve, while the uppermost marginal curve would be in a point of budget line (as R point is shown on diagram). To move left or right on budget line AB, can touch the indifference curve until consumer not touches the point R on indifference curve IC<sub>2</sub>. This point represents the status of corner equilibrium. In other words, if indifference curve is concave then the equilibrium state will be at the end which represents that only one product is used. The consumer only buys apples not oranges in the corner equilibrium point E. So the consumer will get maximum satisfaction when indifference curve touches not only the budget line but also upward on the root point.

### Effect of Change in Commodity Price on Consumer's Equilibrium

The effect of a product price due to its demanded quantity is called Price Effect. It can be classified into two parts (i) Income Effect and (ii) Substitution Effect.

$$\text{Price Effect} = \text{Income Effect and Substitution Effect}$$

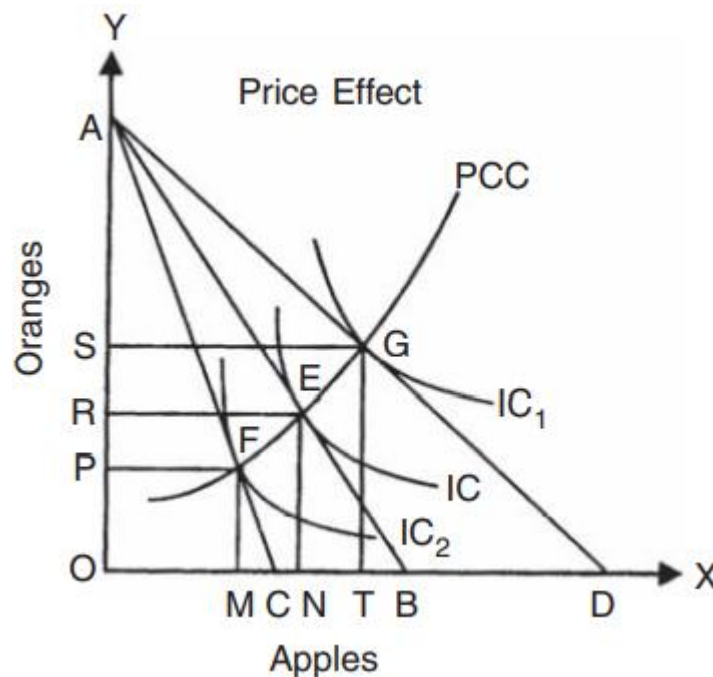
### Price Effect

The price effect may be defined as the change in the consumption of goods, when the price of either of the two goods changes while the price of the other goods and the income of the consumer remain constant.

In the words of Richards G. Lipsey, "The price effect shows how much satisfaction of the consumer varies due to change in the consumption of two goods as the price of one changes, the price of the other and money income remains constant."

Assume that the income of consumer remains constant to ₹ 4.00 and the cost of an orange remains constant to ₹ 0.50 per unit but the price of apple changes. Thus the change of price of apple changes the equilibrium of consumer and that is called Price Effect. This can be described with the Fig. 5.18. Let's assume IC is original indifference curve and AB is original price line and consumer is in equilibrium on point E. When the income of consumer and the price of oranges are stable and the price of apple downs from ₹ 1.00 to ₹ 0.50, then there is a new price line AD. This AD price line touches

Fig. 5.18



the uppermost indifference curve  $IC_1$  to point G. Point G is new equilibrium point. In another words, the demand of apples will increase from  $ON$  to  $OT$ , means the demand will increase by  $NT$ , which would be called Price Effect due to Fall of Price. On the other hand, if the price of apple increases by ₹ 2.00 per unit with another thing remains constant, then price line will go downward to  $AC$ . This indifference curve  $IC_2$  will touch new equilibrium point F. This shows that the demand of apple will decrease from  $ON$  to  $OM$ , means the demand will decrease by  $MN$  which shows the price effect due to rise in the price. After mixing the various equilibrium points E, F and G, the new curve is called Price Consumption Curve (PCC).

### Income Effect

The income effect is effect to change the demand of quantity of a product which starts due to increasing of product's price and the original income of consumer. We should assume the effect of income effect from price effect that the price of product Y does not change in respect to the price of product X.

### Substitution Effect

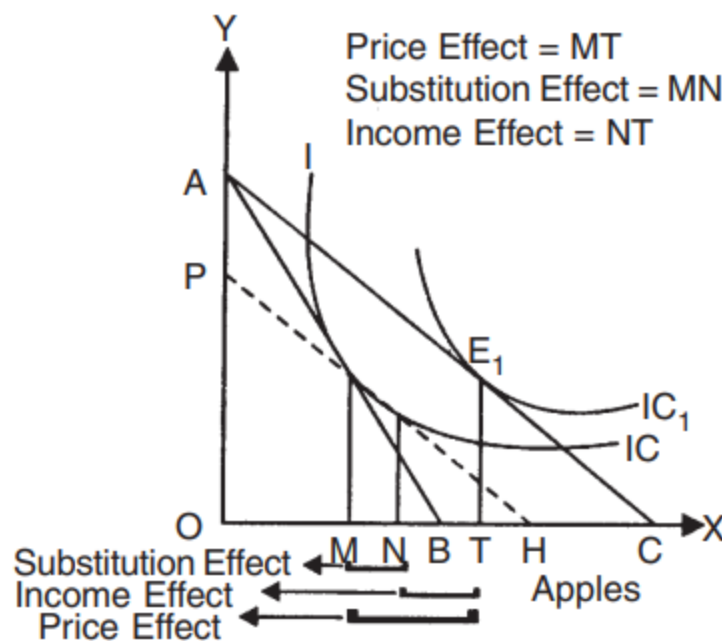
The meaning of substitution effect is the changes of the demand of a product, i.e, if price affects a product and it costs more or less against another product. The cheap products are always substitution for the costly products. To extract the substitution effect from the price effect, it should

assume that the real income of consumer always remains constant. If it does not do so then it would be very difficult to get effect of substitution effect from income effect.

### Price Effect, Substitution Effect and Income Effect

Let's assume AB is primary budget line and IC is primary indifference curve. The consumer is in equilibrium on point E. When the price of apples decreases and the income as well as the price of orange remains constant then the new budget line starts from AB to AC. The new budget line touches indifference curve  $IC_1$  to point  $E_1$  which is the new equilibrium for consumer. The movement of point E to  $E_1$  represents the price effect of apples. The consumption of apples defines the price effect difference from OT to OM and is equal to MT. The price fall of apples indicates the increase of real income of consumer. If the income of consumer decreases until he stood on primary indifference curve, or his real income remains constant, then new budget line would be PH and the new equilibrium point would be  $E_2$ .

Fig. 5.19



Price effect = MT; Substitution effect = MN; Income effect = NT

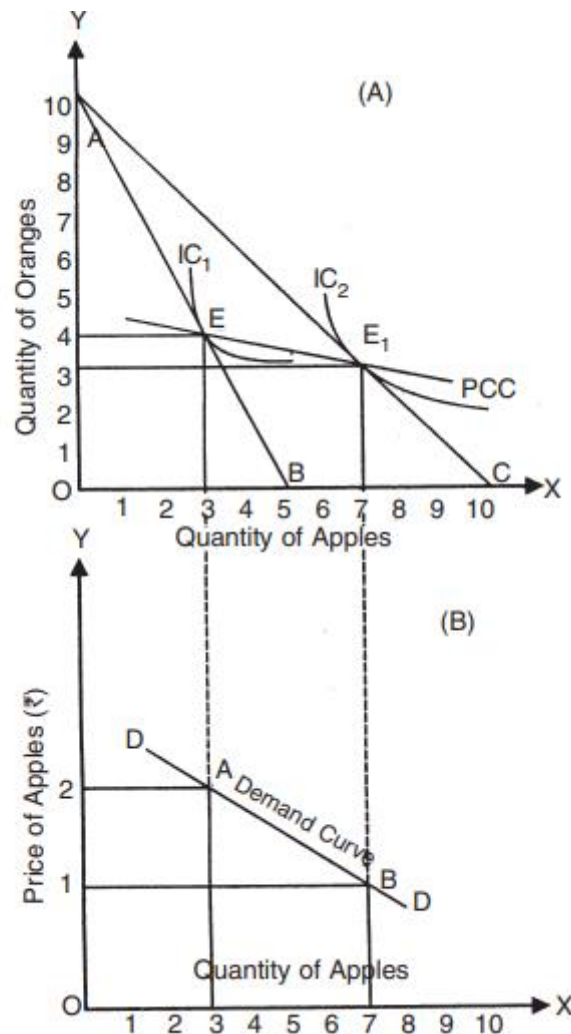
So MT (Price Effect) = MN (Substitution Effect) = NT (Income Effect)

1. *Substitution Effect*: This represents the movement from initial equilibrium point E to  $E_2$  because the point is in parallel to indifference curve IC.
2. *Income Effect*: It is represented by point NT (from point  $E_1$  to point  $E_2$ ). The main reason to buy point  $E_2$  is however, the income of consumer is stable but he gives priority to lesser value of apples rather than costly oranges. The movement from equilibrium point E to new equilibrium point  $E_2$  represents the effect of the prices of oranges and apples. The effect occurs on apples as MN and this is called Substitution Effect.

### Derivation of Demand Curve Through Indifference Curve Analysis or Through Price Consumption Curve

The demand curve which represents the theory of demand states that there is mismatch between the quantity of product and price of product if all circumstances remain stable. If price falls then the demand rises and vice versa. In indifference curve analysis, the price consumption curve is shown by the demand curve or theory of demand. Price Consumption Curve presents the quantity of product X on every price. Thus this curve represents the initial base for creating the consumption curve of consumer.

In Fig. 5.20 (A), the quantity of apple is on axis OX and quantity of orange is on axis OY. In Fig 5.20 (B), the quantity of apple is on axis OX and the price of apple is on axis OY. Let's assume that the price of orange is ₹ 1.00 per unit and the price of apple is ₹ 2.00 per unit and let's assume that the income of consumer is 10.00 and all income spend on both apple and orange. The primary budget line is AB and indifference curve is  $IC_1$  on the given consumer income and the cost of apples and oranges.



The equilibrium state of consumer is E where budget line AB touches the indifference curve  $IC_1$ . This means that on the price of ₹ 2.00 per unit of apple, consumer is ready to buy 3 units. If the price of apple falls by ₹ 1.00 and the price of oranges and the income are stable, then the budget line will slopped from AB to AC. This new budget line AC will touch new indifference curve  $IC_2$  on point  $E_1$ . From point  $E_1$  we can study that when the cost of apple is ₹ 1.00 then consumer demands for 7 apples in equilibrium state. By mixing E and  $E_1$ , we can get PCC, by which we can get the demand curve for apples.

in table 5.6 and Fig. 5.20.

### Summary

Law of Equi-marginal utility explains how a consumer gets maximum satisfaction out of the expenditure on different goods. This law was first propounded in 19th century by a French engineer Gossen. Therefore it also known as "Second Law of Gossen". Dr Marshall called it "Law of Equi-Marginal Utility." The law states that in order to get the maximum satisfaction, a customer should spend his given income on different commodities in such a way that the last rupee spent on each commodities yield him equal marginal utility. Economists have called it differently. General goods are those which substitution effect is negative but income effect is positive. In fact, the

substitution effect is always negative. It means the demand of product increases if the cost of product lessens and the demand is less when it costs more. The meaning of positive income effect is the increasing of real income by falling of product pricing and thus the demand increases. In other words, income effect always represents the relation between real income and demanded quantity but hints the negativity relation between pricing and demanded quantity.

### Keywords

- Marginal Utility: Extra Utility ·
- Assumptions: Opinion ·
- Consumer: One who consumes goods ·
- Law: Regulation
- Indifference Schedule: Indifference Column
- Marginal Substitution: Stability of slope
- Income Effect: The changes in income

### Review Questions

1. What is utility? Explain.
2. What are the differences between total utility and the marginal utility?
3. What are the laws of equi-marginal utility?
4. What is indifference curve? Describe it.
5. What do you mean by Marginal Substitution Rate?
6. What is the budget line? Explain it.
7. Explain the Price Consumption Curve.

### Self Assessment

#### Fill in the blanks:

1. Utility refers to the total ..... received from consuming a goods or service.
2. Fisher has used the term ..... as measure of utility.
3. Marginal utility is also known as ..... utility

#### Multiple choice questions:

4. .... has developed the theory of the Diamond-Water Paradox.  
(a) Adam Smith      (b) Samuelsson      (c) Marshall      (d) Boulding
5. A price for a commodity, is not equal to its total utility but is equal to its ..... utility.  
(a) marginal      (b) total      (c) difference      (d) additional
6. The Law of Diminishing Marginal Utility is the ..... of utility analysis.  
(a) foundation stone      (b) saving      (c) income      (d) price
7. Marginal utility of the every commodity is .....  
(a) dependent      (b) big      (c) independent      (d) small

#### State whether the following statements are True/False:

8. Law of Equi-Marginal Utility has great importance in geography.
9. Every producer aims at earning maximum profit.
10. Distribution means the distribution of national income among the factors of production.
11. Every consumer wants to get the maximum satisfaction from a limited income.
12. Consumer is ignorant about many things concerning consumption.

#### Fill in the blanks:

13. Indifference means ..... from one point to another on a curve itself
14. Preference means shifting from lower ..... curve to higher indifference curve.

15. Higher indifference curve represents higher level of .....

**Multiple choice questions:**

16. Marginal rate of substitution determines the ..... of indifference curve.  
 (a) meaning (b) slope (c) satisfaction (d) aim
17. Constant Marginal Substitution means the slope is .....  
 (a) unpredicted (b) constant (c) curve (d) straight
18. Diminishing marginal substitution means the indifference curve will be .....  
 (a) convex (b) curve (c) constant (d) unpredicted
19. Marginal rate of substitution of perfect substitute goods is .....  
 (a) not equal (b) curve (c) constant (d) equal

**Answers: Self-Assessment**

- |                 |                  |               |          |
|-----------------|------------------|---------------|----------|
| 1. Satisfaction | 2. Util          | 3. Additional | 4. (a)   |
| 5. (a)          | 6. (a)           | 7. (c)        | 8. False |
| 9. True         | 10. True         | 11. True      | 12. True |
| 13. Movement    | 14. Indifference | 15. Income    | 16.. (b) |
| 17. (b)         | 18. (a)          | 19. (d)       |          |

**Further Readings**



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2. Microeconomics – Robert S. Pindik, Daniel L. Rubinfeld and Prem L. Mehta, Pearson Education, 2009, PBK, 7th Edition.
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## UNIT 06: The Revealed Preference Theory

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Summary

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### Objectives

After this lecture, you would be able to

- Describe the Revealed Preference Theory and Consumer Surplus
- Analyze the consumer's equilibrium under Revealed Preference Theory and Consumer Surplus
- To evaluate the theory of demand and Dynamic Models of Demand
- To explain the dynamic models of demand and choice & uncertainty of demand

### Introduction

The derivation of demand curve from Prof. Samuelson is theoretical numerical analysis which is introspective to the numerical analysis of Hicks and Allen. It is the third root of the logical theory of demand. Hicks states, "Direct consistency test under strong ordering." This theory analyzes the behaviour of consumer for a combination of two products in market behaviour.

#### 6.1 Choice Reveals Preference

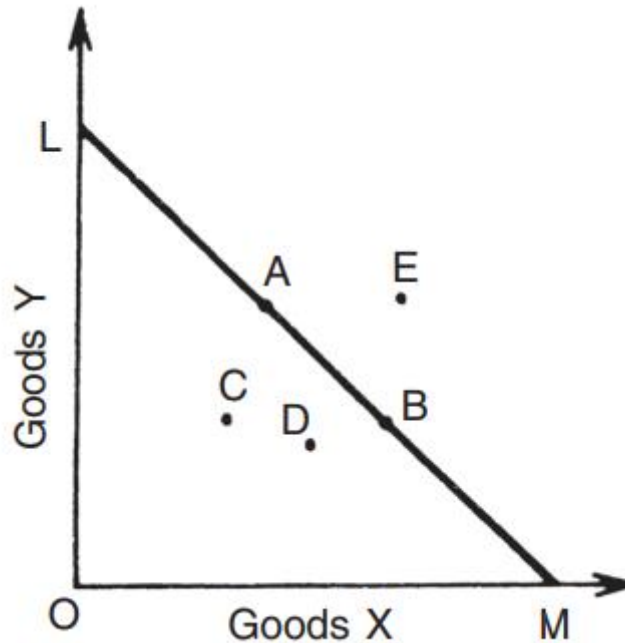
The derivation of demand theory of Prof. Samuelson is based on imagination which tells that choice reveals preference.

Under this theory, a consumer will buy a combination of two products because either he likes this rather than other combinations or it is cheaper than others. Suppose that a consumer buys combination A rather than B, C or D combination. This is because he reveals preferences towards A. This can be done due to two reasons. First that the combination of A is cheaper than combinations of B, C or D; or the consumer really likes combination A from other combinations even it is costlier than others. In this situation, it can be said that A has revealed preferences than B, C and D or B, C and D are revealed inferior than A.

Figure 6.1 indicates that X and Y both are the price of products and on given income of consumer, LM is the price line of consumer. Triangle OLM is the choice region of consumer which gives the

various combinations of X and Y on his given income LM. Means consumer can choose the combinations of A and B or below this line, the combination of C and D on the line LM of triangle OLM. If he choose combination A, than he reveals his preferences than combination B. The combination of C and D is inferior than A because it is below in his price income line but the combination E is more costly for consumer because it is above his price income line LM. So the combination A is revealed preferred.

Figure 6.1



According to Hicks, when a consumer reveals his preference for a valid combination as per market behaviour, then he do this as a strong ordering when this situation is shown on OLM triangle in all preference situations. So when consumer represents his valid preference for combination A on triangle OLM then he refuses all the combinations like B, C and D. So the selection of A is strong ordered.

## 6.2 Revision of Law of Demand

Prof. Samuelson established his law of demand directly from his imagination theory without the use of any curves or barrier of recognition.

Its Assumptions The law of demand of Samuelson is based on these assumptions:

1. The taste of consumer does not change.
2. The selection of a combination reveals the preference of that combination for the consumer.
3. The consumer selects a combination on a given price income line means there must be change in price whatever he buys.
4. He always gives preference for the combination of more items rather than the combination of fewer items.
5. The selection of consumer is based on strong ordering.
6. This works on consistency behaviour of consumer. If in a situation he gives preference to A rather than B, then he cannot give preference to A on B in another situation. According to Hicks, this is two-term consistency for which a rule must be followed on a simple line

curve- (a) If A is situated on the left side of B then B must be on the right side of A, (b) If A is situated on the right side of B then B must be on the left side of B.

7. This law is based on transitivity. The transitivity directs three terms consistency. If he reveals preference for A rather than B and B over C, then consumer would must reveal preference for A rather than C. If consumer wants to select on the given possible combinations then it must be workable for the theory of choice of preference.
8. The demand of income elasticity is positive means if the income increases then the demand of produce increases and vice versa.

### 6.3 Consumer's Surplus:

We know that a consumer wishes to pay equal to marginal utility of the commodity. (Means wants to pay that sum of amount which is equal to the marginal utility of the goods.) We also know that marginal utility of the commodity tends to decrease as more and more of it is purchased. So, for this reason the demand curve of the commodity slopes from left to right. In fact, the marginal utility curve (showing inverse relation between quantity of the commodity and the marginal utility) is a synonym of demand curve showing inverse relation between price and quantity of the commodity as the price of the commodity is equated with marginal utility of that commodity. For each successive unit the consumer in tends pays less every time equating price with the diminishing marginal utility of the commodity. However, each unit of the commodity cannot be purchased at different prices. Implying that for certain units he must intend to pay more what he actually pays. The sum total of the difference between what he actually intends to pay and what he actually pays, is what is called consumer's surplus. The below table 6.1 explains the consumer surplus of a consumer

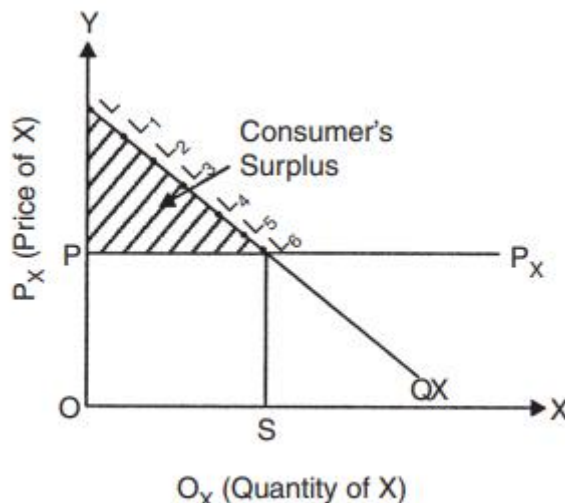
X Unit	MU <sub>X</sub>	P <sub>X</sub> or price the consumer is ready to pay (₹)	Actual price	Consumer surplus (intended price-actual price)
1st	100	10	4	10 - 4 = 6
2nd	80	8	4	8 - 4 = 4
3rd	60	6	4	6 - 4 = 2
4th	40	4	4	4 - 4 = 0

Consumer surplus is 6 + 4 + 2 = 12.

(Note: the marginal utility of the money is 10 units and is constant.)

The Fig. 6.1 shows that the consumer intends to pay for every successive units of a commodity. He intends to pay L, L<sub>1</sub> ..... L<sub>6</sub> which means that in accordance to consumer rationality he pays equal to the marginal utility of the commodity. As the marginal utility tend to decrease with every unit of commodity, consumer demands more unit of the commodity at low price. If the total purchase is OS, then the consumer intends price is equal to area OSL<sub>6</sub> L (OSL<sub>6</sub> L area is the area which is obtained by adding up price for each unit that the consumer intends to pay). The total actual price the consumer has to pay is OS × OP = OSL<sub>6</sub> P.

Fig. 6.2



Accordingly,

$$\begin{aligned} \text{Consumer surplus} &= \text{OSL}_6 \text{ L (Total Intend Price)} - \text{OSL}_6 \text{ P area (Total Actual Price)} \\ &= \text{PL}_6 \text{ L area} \end{aligned}$$

In other words consumer surplus =  $\text{OSL}_6 \text{ L} - \text{OSL}_6 \text{ P} = \text{PL}_6 \text{ L}$

### Fundamental Theorem or Demand Theorem

With these assumptions, Samuelson has given the Fundamental Theorem which is also called demand theorem and as per his words, "The demand of product (general or combined) is increased when price income increases, the demand will sure low when the price ups for this product." It means that when the demand of income elasticity is positive then the demand of price elasticity would be negative. This can be shown by ups and downs in price of a product.

#### (a) Rise in Price

First, we would analyze the rise in price of a product X.

To prove this theorem we separate this into two stages. In the first stage, we would take a consumer who spends his all income in two products X and Y. In Fig. 6.2, LM is his original price income line where he selects the combination of R. Triangle OLM is the region of selection for consumer where he gets various combinations of X and Y on price income line LM. Consumer gives preference by selecting R on or in triangle OLM.

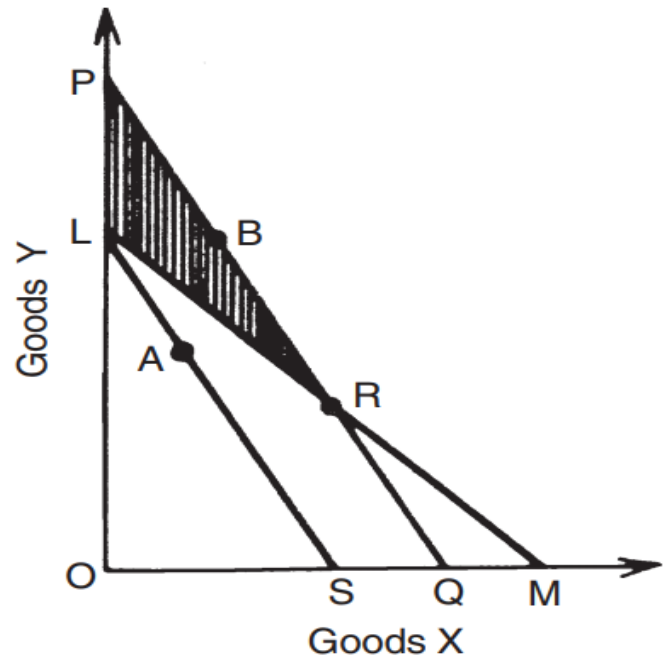


Fig. 6.3

Suppose that the price of X increases by keeping the price of Y, constant and then LS would be his new price income line. Now suppose that he selects a new combination A which

indicates that due to the price rise of X, the consumer will buy less of product X. The real income of consumer is down by increasing the price of product X, so LP is given to him in the form of product Y. Thus PQ is now his new price income line which is parallel to LS and crosses from point R. Samuelson tells this Overcompensation Effect. Now the selection region for consumer is triangle OPQ. Because R was preferable choice from all the points on original price income line LM, so none of the points will match with the behaviour of consumer on RQ of PQ line below to point R. So he cannot take more quantity of X if the price of X ups. So the consumer will choose R or B on the shaded region LRP on price income line PQ of PR. If he selects the combination R then he would buy the quantity of X and Y before the price hike of X. On other hand, if he selects the combination B then he would buy more quantity of Y than X.

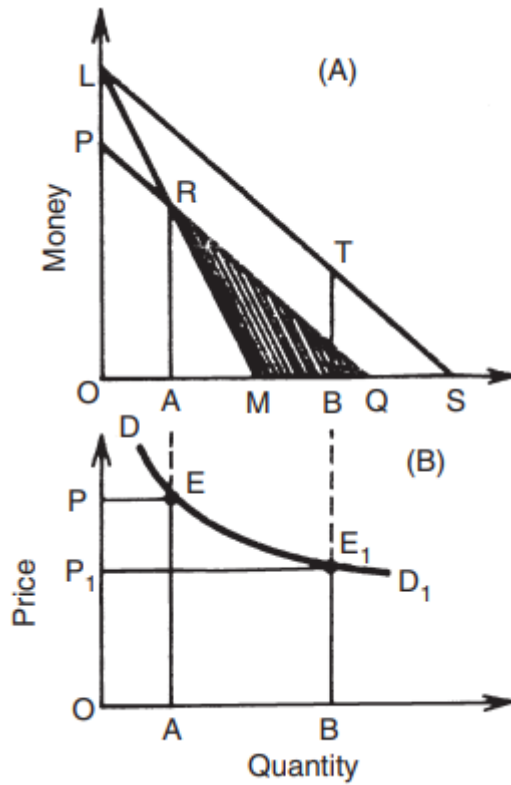
In second stage, if the LP packet is taken away from the consumer then he would be in the left side of R on point A on LS line where he would buy lesser quantity of X, if the income elasticity of demand is positive because the demand is less for X due to price rise (when consumer is on point A) and hence it proves that when income elasticity is positive then price elasticity is negative.

#### (b) Fall in Price

The theory of demand can be proved when the fall of price happens with product X. This can be described in these words as, "Any product (general or combined) whose demand decreases only when income is low, must be high on demand when only its price gets low." This is described in Fig. 6.3. LM is the original price income line where consumer gives preferences on point R. His price line goes to LS if the price of product X gets low but price of product Y is stable. Suppose that in this point, consumer reveals preference for combination A, which indicates that he buys more

quantity of product X. The movement from point R to A has price effect due to price fall of product X and X demands high now.

Fig. 6.4



Suppose that the quantity LP of Y has been taken off from consumer which is due to increment in his real income and price of X has fallen. Now PQ is his new price line which is parallel to LS and crosses to point R. New triangle OPQ is his selection region. Since consumer was showing his desire on point R of line LM, so all the points of line RP of PQ will not match with his selection. This is because he will get the less quantity of product X on line RP, but it is not possible if price of X declines. So the consumer will reject all the combinations of above R. He would select B or R on line RQ on PQ of shaded region MRQ.

If he selects the combination R then he would buy the same quantity of X and Y which he was about to buy before price hike of X. And if he selects the combination B then he would buy more quantity of X than Y. There is the movement effect in pricing of X from point R to B. If the LP has return to the consumer then he would be in A on line LS after price fall, where he would buy less quantity of X because of price fall. The movement of consumer to point B to A is income effect. Thus the theory of demand again proved that positive income elasticity means negative price elasticity of demand.

This must be underlined that the movement effect of Samuelson is different from indifference curve analysis. In indifference curve analysis, the consumer moves from a point to another on the same curve and his real income is stable. But in reveal preference theory this indifference curve does not happen and the movement effect is the movement of price income line by changing of real price.



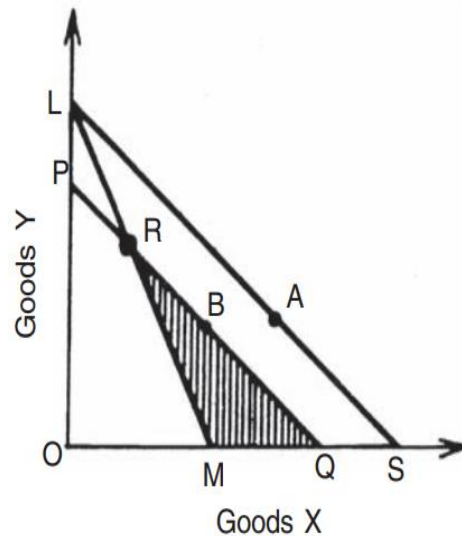
The demand of product (general or combined) is increased when price income increases, the demand will sure low when the price ups for this product.

### 6.4 Derivation of the Demand Curve from Revealed Preference

The demand curve can be derived by the imagination of revealed preference. It is shown in Fig. 6.4. In panel (A), price is in vertical axis while product X is in parallel axis. LM is the original price income line where consumer reveals his preference on point R and buys the quantity OA of product

X. Suppose that the price of X falls. As a result, his new price income line is LS. On this line the consumer reveals his preference on point T and buys more OB quantity of product X. The movement from point R to T is Price Effect for price falls of X and so its demand increased from OA to OB.

Fig. 6.5



Now that amount has been taken back from consumer which is equal to LP and because of the price fall of X. Thus, PQ is his new price income line which is parallel to line LS and crosses from point R. The new triangle OPQ is his selection region. Since consumer was revealing his preference on point R of original price income line LM, so none of the points are matched with his selection from above the point R on RP of PQ line. Because of this he cannot buy more quantity of X due to price fall. So he will reject all the combinations above R or he will select R or any similar combination from shaded triangle MRQ. If we return the money PL to him, he will again on point T of price line LS where he buys more quantity of X i.e. OB. In panel (B), the movement from point R to T has shown by drawing demand curve. Since we have taken price on vertical axis on panel (A), so to calculate the price of product X, we divide the total price income of consumer with the brought quantity of X. When the price of X is  $OL/OM (= OP)$ , then demanded quantity is OA. When the price of X gets low  $OL/OS (= OP_1)$  then demanded quantity is OB. In Fig. 6.4 panel (B), we take price on vertical axis and the units of product X in parallel axis and draw a line of this price quantity combination on E and E1, and by adding this with a simple line, we get DD1 demand curve. This curve indicates that when price falls from OP to  $OP_1$ , then consumer buys more quantity of X i.e., AB.

### 6.5 Superiority of Revealed Preference Theory

The revealed preference theory is more superior than the analytical numerical theory of Hicks which is more related to the theory of consumer behaviour.

1. This does not study any psychological internal information of consumer behaviour. But it gives the analysis by analyzing the consumer behavior in market. According to Samuelson, this theory has removed the demand theory from the last leftovers of psychological analysis. So the revealed preference theory is more scientific and real than earlier demand theorems.
2. This theory is left to get in touch from the continuity of both used and indifference curve. An indifference curve is a curve, on which consumer can select any combinations of the products. But Samuelson believes that this is a discontinuity because consumer can only get single combination. By applying Samuelson's theory, Hicks has applied strong and weak ordering in spite of continuity and assumption in his Revision of Demand Theory.
3. The Revision of Demand Theory of Hicks is based on this theory that the consumer is prudent to fulfill his satisfaction by his given income. The Demand Theorem of Samuelson is good because it does not assume that the consumer always wants to get maximum satisfaction and does not apply the bogus theory like decreased marginal theory of Marshall and decreased marginal relocation theory of Hicks.

4. In the first stage of Samuelson's Demand Theorem, as the substituting effect of Slutsky and the over compensation effects of Hicks, it gives more real analysis and data. When the price of product X decreases this theorem relocates the consumer to his up price income status and vice versa. This is revolution of Hicks income compensation change. Then, Hicks has left the income compensation theory and took Samuelson's thought as over compensation effect as 'Cost Difference' in his book Revision of Demand Theory. Thus, in the second stage Samuelson's theorem describes the income effect of Hicks in very simple manner. Hicks agrees with this theorem by himself when he said, "To present an open option to indifferent method, this theory is a new and very important theorem by Samuelson."
5. This theorem gives a base to welfare economics by consistent election of analysis.



Give your opinion about Revealed Preference Demand Theory.

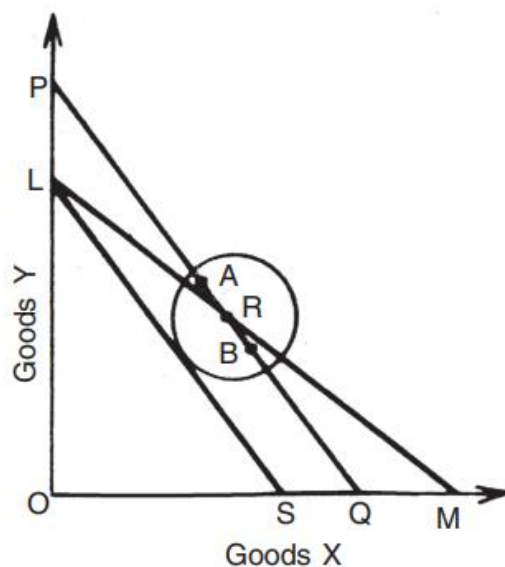
## 6.6 Defects of the Revealed Preference Theory

There are lots of defects in Samuelson's revealed preference theory:

**First,** it clearly ignores the indifferent behaviour of consumer. It is quite correct that if a consumer selects a combination of product on point R then he does not represent his indifferent behaviour on price income line or in any single price product. But it is possible there may be some more points on R as Fig. 6.5 like A and B which is shown in circle and consumer is always unconcerned about it. If we accept the criticisms of Armstrong then the base theorem of Samuelson can end. Suppose that the price of X increases and the new budget line of consumer is now LS. Now give him some amount that he can buy original combination point R on line PQ. Let's assume in this new price income condition, he selects point B below R. This is because Armstrong thinks that the consumer is unconcerned towards the nearer already selected points. But to select B in PQ price income condition means consumer buys more quantity of X when its price increases. Thus the base theorem of Samuelsson ends because if price of X increases, the demand is more rather than short.

**Second,** according to Hicks since revealed preference theory is based on strong ordering, so it cannot be assumed that all the points present in or out of triangle (OLM in our Fig. 5.8) describe the good solutions. The strong ordering of a two dimensional continuum is not possible. So there is no option to assume that the product comes in various units, so Fig. 6.5 can only be drawn in squared paper and powerful options can only stable in the corner angles. Point R would also present in square angle.

Fig. 6.6



*Third*, the base theorem of Samuelson is conditional and not simple. This is based on the condition that negative income elasticity is present within positive income elasticity. Since the income effect is created by income and substitution effect, so in analysis point of view, the income effect cannot be separated from substitution effect. If income effect is not positive then demand of price elasticity would be indefinite. On the other hand, if income elasticity of demand is positive, then we cannot establish the substitution effect due to changes in price. So the income effect and substitution effect cannot differentiate in Samuelson's theorem.

*Fourth*, the revealed preference theory of Samuelson has not given the solution of Giffen's paradox because it only studies on positive income elasticity of demand while Giffen's paradox is related to negative income elasticity. As per the demand theory of Marshall, the theorem of Samuelson is also not differentiating between these two. The positive income effect of substitution effected Giffen's product while on the other hand, powerful substitution effected positive effect. Thus the theorem of Samuelson is inferior and less working than the price effect of Hicks and Allen

*Fifth*, the assumption that consumer selects only one combination on given price income condition is wrong. It means consumer selects little from both the products. But it is almost impossible that a person buys some parts of products.

*Sixth*, this assumption is also criticized that selection reveals preference. The consumer always thinks before buying. But since a consumer not always thinks and buys the product, so buying of product cannot indicate that the consumer reveals preference. So this theorem is not based on the market behaviour of consumer but this is an unreal practice like all other economical theorems.

*Seventh*, the revealed preference theorem applies only in particular consumer. By this theorem, all other things are constant; the negative sloped demand curve can be drawn for all the consumers. But this technique does not help to draw the market demand schedule. Because if the price of X falls in market, it can affect all other products and which can change the real income factor. However, for this product X, the demand curve is sloped downward for the entire consumer, but in a specific region of price, to redistribute the real income, the demand curve sloped upwards too. The theory of Hicks and Allen is better than revealed preference theory because it can draw both demand curves of consumer and market from price consumption curve.

*Eight*, according to T. Mazumdar, the revealed preference theory is impossible for those conditions where individual selector is unable to use diplomacy.

*Lastly*, the revealed preference theory is unable to analyze the behaviour of consumer in selecting dangerous or indefinite selections. If there are three conditions A, B and C then consumer gives preferences to A rather than B and C rather than A. A is definite from it but possibility of B or C is 50-50. In this situation, to give more preference to C than A is not based on an observed behaviour.

## **6.7 The Pragmatic Approach to Demand Theory**

The conventional consumer behaviour and the advanced theories provide the economists a theoretical basis for their models, but they cannot be used direct for the complex problems of the real world. But still, they provide the starting point of the function of market figures. That is why the economists have studied functions of demand through both the views, static as well as dynamic. Accepting the basic rules of demand, they have predicated the multivariate demand functions, in which the demand of a product is not only the function of its price but also the function of various other variables. These variables include prices of other products, income of the consumer, consumer interests etc. These functions have concentrated the supremacy on consumer market demand and not on personal consumer demands. Then some demand functions study the different groups of products like eatable products, demand for services etc. This is called The Pragmatic Approach to Demand Theory. We shall analyze certain some demand functions below.

### **The Constant Elasticity of Demand Function**

In many statistical studies, Constant Elasticity of Demand Function is used. It is based on general believes of the relation between demand and its determinants like price of the product, price of related goods, income of the consumer etc. It is assumed that income of the consumer and price of



related goods are constant. Based on this, in demand function, the relation between price-quantity can be differentiated. As far as the shape of demand function (curve) is concerned, the curve is fitted based upon statistical figures. But this curve is deceptive as it never shows accurate results and rather is based on approximations.

The general form of Demand Function is,

$$Q_x = a \cdot P_b \times P_o^c Y^d e^{f_t} \quad \dots(1)$$

where,  $Q_x$  = Quantity of demanded product x

a = constant

$p_x$  = price of x

b = price function of demand

$p_o$  = price of other unrelated goods

c = cross elasticity

y = income of the consumer

d = income function of demand

e = basis of natural logarithms

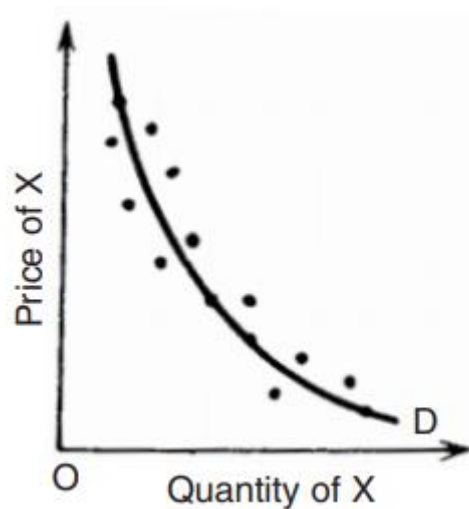
$f_t$  = trend factor for interest

The equation (1) is known as Constant Elasticity of Demand Function because the variables of demand b, c and d are assumed to be constant.

### Graphic Presentation

Constant Elasticity of Demand Function is presented graphically in Fig. 6.7 which has been created by fixing a fictional set with data. In this way D curve represents the Constant Elasticity of Demand Function.

Fig. 6.7



### 1. The Dynamic Demand Functions

In demand theory, another development is the dynamic demand functions which are known as Distributed lag models of demand.

In dynamic demand function, after income and demanded quantity the value is included in different forms of variable. It is based upon stock adjustment principle which says that the present demand decisions are influenced by past behaviour. It is believed that the present demand depends upon past income and levels of demand. For a permanent consumer the past purchase is the stock of the product, which clearly influences its present and future purchases (like fans, sewing machines, etc.). But for non-permanent consumer, the products like, eatables, beverages, cigarette, etc. depicts a 'habit' which in present is accepted by purchasing and consuming and because of which the levels of the purchase in present and in future affects the demand structure. Then, the levels of demand or income

of very near present have a greater influence on present consumption structure as compared to far off levels. For example, compared to the income earned before 5-10 years has less effect on us as compared to the influence of last year's income.

Distribution and urinary distribution of income model can be presented as follows:

$$Q_t = f (P_t, P_{t-1} \dots\dots Q_{t-1}, Q_{t-2} \dots\dots Y_t, Y_{t-1} \dots\dots)$$

- Where,
- $Q_t$  = quantity of the purchased product
  - $P_t$  = present price of the product
  - $P_{t-1}$  = price in period 1
  - $Q_{t-1}$  and  $Q_{t-2}$  = quantity purchased in period 1 and 2
  - $Y_t$  = present income of the consumer
  - $Y_{t-1}$  = income of the consumer in period 1

This function shows that price determining present demand, is influenced by demand and income of past levels. (1) Demand Function for Consumer Durables: The above demand function is based upon the Stock Adjustment Rule of Nerlove and when it is applied to the consumer durables the following forms come into being,  $Q_t = aY_t + bQ_{t-1}$  ... (1) Where,  $Q_t$  = present purchase  $Y_t$  = present income  $Q_{t-1}$  = quantity purchased in the last period and a and b are the parameters. This function can be derived by the following way. The level of desired product is  $Q_t$  which is determined by present income  $Y_t$ .  $Q_t = cY_t$  ... (2) Where c is the parameter. But due to their limited income, inadequate savings, credit limitations, etc. the consumers cannot purchase the desired levels of durable foods too soon. That is why the consumers purchase a part of their desired levels in one period. If the purchased quantity in the last period has Realistic Change  $Q_t - Q_{t-1}$ , then this only a part k of the desired change,  $Q_t - Q_{t-1}$  therefore,  $Q_t - Q_{t-1} = k (Q_t - Q_{t-1})$  ... (3) Where  $Q_t - Q_{t-1}$  is the realistic change,  $Q_t - Q_{t-1}$  is the desired change, and k is the multiple of Stock Adjustments; and  $0 < k < 1$ . By substituting Equations (2) and (3), we get  $Q_t - Q_{t-1} = k(c Y_t - Q_{t-1})$

**Summary**

In this analysis, it shows that revealed indifference theory is not a correction of the substitution analysis of Hicks and Allen. It does not differentiate substitution effect from income effect, left Giffen's paradox and does not analyse the market demand. But to publish the consumer behaviour rather than one price product makes revealed preference theory is more real than substitution curve technique. Thus, this analysis of Samuelson is clear option of internal numerological theorem of Hicks and Allen.

**Keywords**

- Origin: Origination ·
- Zone: Place ·
- Revealed: Displayed

**Self Assessment**

1. The derivation of demand curve from Prof. Samuelson is theoretical ..... analysis.
2. The derivation of demand theory of Prof. Samuelson is based on .....
3. The tastes of consumer ..... change.
4. The income elasticity of demand is .....
  - A. positive
  - B. negative
  - C. low
  - D. more
5. Reveals Preference Theory is based upon .....
  - A. order
  - B. power

- C. more ordering  
D. point
6. The ..... of Samuelson is general and not conditional.  
A. theorem  
B. part  
C. theory  
D. law
7. Revealed Preference Theory is only based on personal .....  
A. consumer  
B. condition  
C. law  
D. theory
8. Selection indicates preference.
9. The theory of Hicks and Allen is better than revealed preference theory.
10. Revealed Preference Theory is real and scientific than earlier demand theories.

### **Answers for Self Assessment**

1. Numerological    2. Imagination    3. Change    4. A    5. C
6. A    7. A    8. True    9. True    10. True

### **Review Questions**

1. What do you mean by demand of theory?
2. What do you mean by decrease in price?
3. What do you mean by Revealed Preference Theory?
4. Describe the demerits of Revealed Preference Theory.



### **Further Readings**

1. Microeconomics: An Advance Treatise – S.P.S. Chauhan, PHI Learning.
2. Microeconomics: Behaviour, Institutions and Evolutions – Sample Bowels, Oxford University Press, 2004.
3. Microeconomics: Principles, Applications and Tools – Sanjay Basotiya, DND Publications, 2010

## Unit 07 : Production Function

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Summary

Keywords

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### Objectives

After this lecture, you would be able to

- understand the production process, methods and factors of Production.
- evaluate the concept and different laws of production in short Run and long run.
- understand the concept of Iso-quant curve and their properties.

- understand the mechanism of Marginal rate of technical substitution.
- To understand the how producers optimize the factors of production to maximize the output or minimize the cost
- To draw the expansion path by using isoquant curve and iso-cost line.
- understand the Euler's theorem that total product of a firm distributed among factors of production.
- analyze the contribution of factors of production in production process through the Cobb-Douglas production function
- To understand the constant elasticity of substitution and variable elasticity of substitution in production function
- To discuss about the Laws of returns to Scale in Terms of Isoquant Approach.

## Introduction

When a factor increases in production while other factors are stable then the ratio of factors gets changed. Let's assume that there are two factors of production—Land and Labour. Land is a fixed factor. Labour is a variable factor. Suppose you have two hectares of land. You grow tomato with the help of one worker. So the ratio of labour and land would be 1:2. If you increase the worker as 2 then this ratio would be 2:2. Means initially there is two hectares land for a worker and now it is per worker one hectare. Thus if there is the change of ratio of factors, the rates of quantity of production would change.

## 7.1 Production Function

Production is a process that create/adds value or utility It is the process in which the inputs are converted into outputs. The production function states the technical or physical relation between the factors for production and quantity of products.

As per Watson, "The relation between a firm's physical production (output) and the material factors of production (input) is referred to as production function."

In the words of Ferguson, "A production function is a schedule (or table or mathematical equation) showing the maximum amount of output that can be produced from any specified set of inputs, given by the existing technology."

Here it must be known that when the production function is described as a function relationship between physical inputs and physical outputs then the concept of production thought as Flow Concept. As a flow variable production refers to units of output per period of time. For example, if the scale of production increases from 500 to 550 units, it does not mean that the production was 500 units in previous month and it would be 550 units in coming month. But this indicates that the scale of production increased by 500 units to 550 units.

The production function can be described statistically as –

$$Q = \psi (f_1 \dots f_m)$$

$$Q = \text{Production}$$

$$f_1 - \dots - f_m = m \text{ (Quantities of } m \text{ different inputs)}$$

The production function, as described above, only represents by flow variables. The product and the input variables are represented by numbers in time period

## 7.2 Fixed and Variable Inputs or Factors of Production

A firm used various inputs for its production. To change the production quantity, it needs to change the inputs too. Some inputs can be changed temporarily. But possibility to change some inputs is in long period. On the basis of this method, the factors of production or inputs can be classified in the following two Notes parts –

- (i) **Fixed Inputs or Factors of Production:** The factors of production or fixed input cannot be changed temporarily. Some examples are – plants, buildings, administrative services, experienced worker etc.
- (ii) **Variable Inputs or Factors of Production:** The factors of production or variable inputs can be changed temporarily. Some examples are – raw material, workers etc.

The fixed and variable inputs can understand by an example. If a firm publishes 1000 books per day and it needs to increase the publishing by 2000 books per day, then what would the firm do? Definitely, it needs more factors. But some factors like building, printing press etc., cannot be changed in a limited period of time. So to increase the publishing of books, this firm will take help from the variable inputs like labour, raw material etc. Thus in this example, printing press and buildings are fixed inputs while labour and raw materials etc. would be variable inputs. It must be known that the fixing of factors and changing of factors depend upon the time period.

### 7.3 Time Period

This must be remembered that the fixed or variable inputs depend upon those time period on which the inputs need to be changed as per change of the quantity of production. The economists classified this time period in two different parts –

- (i) **Short Period or Short Run:** Short run is defined as that period of time in which at least one or more than one factor of production or inputs are fixed and others are variable. So the quantity of production can be increased by the change of variable inputs in short period of time. In other words, there are both fixed and variable inputs in short period. So if the producer wants to increase his production in short period, he needs to increase the raw material and worker with fixed machines and plants as well as machinery. And if he wants to decrease its production in short period then he just needs to decrease the raw materials as well as the worker. But he cannot demolish the building or plant; no matter even if, there is no use of these inputs.
- (ii) **Long Period or Long Run:** Long period or long run is defined as that period of time in which all factors of production or inputs are variable. There are no fixed factors in long run. All factors are variables. In other words, the meaning of long run is that given period of time when we can increase or decrease all the factors

### 7.4 Concepts of Output or Product

There are three main assumptions of production – (i) Total Product (ii) Average Product (iii) Marginal Product.

- (i) **Total Product (TP):** Total product of a variable factor is the maximum output produced by combining a given input of that factor with the fixed factor.

$$TR = AP \times L$$

or

$$TP = \sum MP$$

(Here TP = Total Production; AP = Average Production; L = Variable Factors of Input; MP = Marginal Production.)

- (ii) **Average Product (AP):** The average production means the average product of a variable factor is simply the total product of the factor divided by the total units of the variable factor. By this we can get average product of every units of variable factors.

$$AP = TP / L$$

(Here AP = Average Product; TP = Total Product; L = Variable factors like total units of worker)

- (iii) **Marginal Product (MP):** Marginal product of a variable factor is the change in total product resulting from the use of one more or one less unit of variable factor. In other words, the Marginal Production is the measurement of the changes of total production due to the changes of quantity of variable factors.

$$MP = \Delta TP / \Delta L$$

## 7.5 Laws of Production

The law of production describes those methods which show the increase in production by technical point of view. The production can increase by many methods. We have already read while analyzing the nature of production function that the production can be increased by increasing variables in short run. So the process of changing the quantity of production when all the factors are stable and only the variable inputs are changed is called Return to a Factor. As opposite the production can be increased by increasing all the factors in long run. Return to the scale means the process to change the production by changing all factors and inputs. So, there are two laws of production:

### 7.6 Returns to a Factor: Law of Variable Proportions

If the use of variable inputs with the fixed inputs in a short run then it uses Law of Variable Proportions. The law of variable proportion is the law which represents the changes in total production by using various averages of fixed and variable inputs and factors.

When a factor of production is increased but all other factors are fixed, then it changes the averages of factors. Suppose that the factors of production are two – Land and Worker. Land is a fixed factor. Worker is a variable factor. Suppose you have two hectares of land. You grow tomato with the help of one worker. So the ratio of labour and land would be 1:2. If you increase the worker as 2 then this ratio would be 2:2. Means initially there is two hectares land for a worker and now it is per worker one hectare. Thus if there is the change of ratio of factors, the rates of quantity of production would change.

In economics, this nature is called Law of Variable Proportion. This law represents that the quantity of Notes product initially increases in an average if the factors of production are changed but later the change in quantity of product is flat average and at last it goes downward. The traditional economists called this law as Law of Diminishing Returns. They mainly studied this in terms of farming. According to them if many workers would work in a fixed region of farm, the return would be less. But actually it is a general concept, which works on farming, industry, and real estate, etc. types of any production activity. In modern time, it is called Law of Variable Proportions. It can also be said the Law of Diminishing Marginal Product, Diminishing Marginal Returns or Diminishing Returns.

According to Left witch – “The law of variable proportion states that if an input of one resource is increased by equal increments per unit of time while the inputs of other resources are held constant, total output will increase, but beyond some point the resulting output increases will become smaller and smaller.”

According to Calvo and Waugh, “The law of variable proportion states that if a variable quantity of one resource is applied to a fixed amount of other inputs, output per unit of variable input will increase but beyond some point the resulting increases will be less and less, with total output reaching a maximum before it finally begins to decline.”

#### Assumptions

The main assumptions of Law of Variable Proportions are following –

- (1) One factor of production is variable while others are fixed.
- (2) The all units of variable factors are equal or expertise.
- (3) There is no change in production technique.
- (4) The factors of production can be used in various averages. For example, one worker can be used to farm one hectare of land or 4 workers can be used to farm two hectares of land.



The Returns to Scale is called by change the process of production by changing all factors or numbers

## 7.7 Conditions of Applicability or Causes of Application

The main reasons of Law of Variable Proportions are following –

1. **Indivisibility of Factors:** The main reason of law of variable proportions is that there are some factors in production which are undivided. It means there must be use of a unit of fixed input for producing a given quantity of product. The factor of production like machine is less used in primary stage of production. The more number of workers are needed to use its full volume. So in primary stage rather than using the variable inputs, the fixed are used more frequently. By using more number of variable inputs, the process based division of labour can be possible. This amplifies the work of variable inputs. The correlation between fixed and variable inputs gets optimum. Thus the marginal production increases and the total product also increases in increased rate.
2. **Change in Factor Ratio:** The main reason of law of variable proportion is that one factor is variable while the other factors are fixed in production. When the variable factors are used with fixed factors then the average changes in factors are decreased. A product is a result of using all the factors in production. When a unit of variable input works less than units of fixed inputs, then the marginal return starts decreasing of variable inputs.

For example, 5 workers work in ten hectares of land. Due to these 5 workers the land is used maximally for farming. In this condition, the ratio of land and service is 2:1. But if the number of workers is increased to 10 then this ratio of land and service would be 1:1. This clarifies that one worker is less productive from one hectare of land against two hectares of land. So the marginal production will be low if the ratio of variable factor (worker) is less than the land (fixed factor).

3. **Imperfect Substitute:** According to Ms. Joan Robinson, the main reason of law of variable proportion is imperfect substitute of factors in production. A factor cannot replace another at all. If the replacement was possible then after using the optimum level of fixed factors, it could be increased by using variable factors. In this situation, the increase of production was possible in the first attempt. But this is not possible in the real life situation. So there is no replacement of one factor with another in production. So when the ratio of fixed and variable products is not matching then the marginal rate of product reduces for the changing factors.

## 7.8 Postponement of the Law

The postponement of law of variable Proportions can be following –

- (i) **Improvement in Technique of Production:** This law can be postponed by improving production techniques. In other words, using of improved techniques helps to increase the production and helps to decrease the production cost. By using this, law of variable proportion can be stopped.
- (ii) **If the factors of production are fully changeable,** means we can use one factor against another then this law can be stopped. In this situation, the factor cannot be fixed.

## 7.9 Returns to a Factor – A Detailed Study of Different Situations

By using variable factors with fixed factors, there are three different situations of production:

### Situation 1: Increasing Returns to a Factor

The returns to a factor is a state when total production increases in increasing ratio by using more numbers of variable factors used with fixed unit of fixed factors. In this condition, the marginal production of variable factors is increased.

In other words, the marginal rate of production is less. In the words of Benham, "Increasing returns to a factor states that as the proportion of one factor in a combination of factors is increased upto a point, the marginal productivity of the factor will increase."

According to John Robinson, "Law of increasing return states that when an increasing amount of a factor of production is employed, it generally brings about an improvement in organization. As a result of it, units of the factor concerned become more efficient and to increase production, it will not be necessary to increase the physical quantity of the factor in the same proportion."





The changing and fixing of factors depends upon time period.

Increasing Returns to a Factor can identify by Table 7.1 and Fig. 7.1

Table 7.1: Increasing Returns to a Factor			
Units of Labour	Units of Capital	Total Production	Marginal Production
1	1	4	4
2	1	10	$10 - 4 = 6$
3	1	18	$18 - 10 = 8$
4	1	28	$28 - 18 = 10$
5	1	40	$40 - 28 = 12$

Fig. 7.1

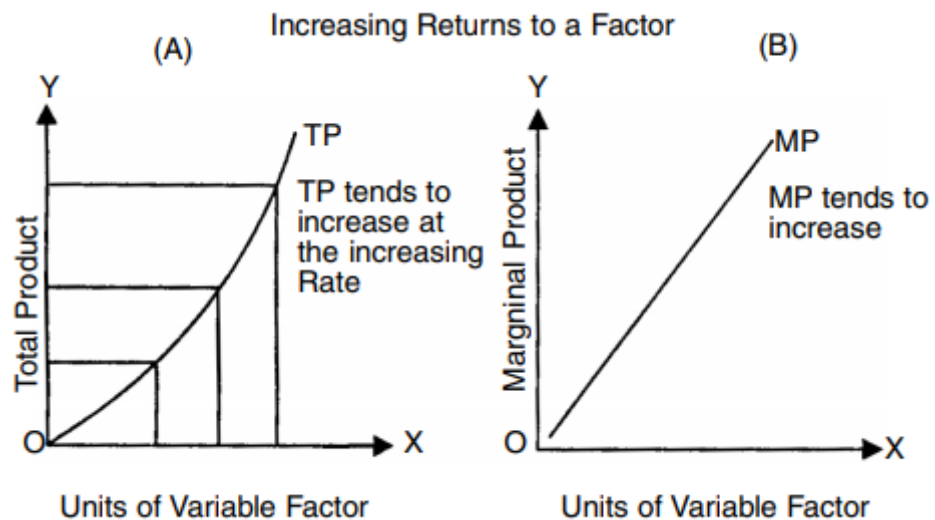


Figure 7.1 (A) states that the total production increases in increasing rate while Fig. 7.1 (B) indicates that the marginal production of variable factors is increasing.

### Causes of Increasing Returns to a Factor

The Causes of Increasing Returns to a Factor are follows –

- (i) **Under-Utilization of Fixed Factor:** The fixed factors of production like machine is used less in primary stage of production. For full use of this, there's needed more variable factors like labour. So the total production increases by using more numbers of variable factors in initial stage of production. In other words, the marginal production of variable factors is increased. For example, to make cloth, a small plant is used. The size of plant would stable in short run. To get maximum production, there is need of 5 workers in this plant. If there are only 1 or 2 workers work in this plant, then the full use of this plant would not happen. But when gradually the number of workers would increase by 5 then production will also increase to its optimum level. By this, the marginal production of every unit of worker would increase and thus, the total production will also increase.
- (ii) **Increase in Efficiency:** According to Adam Smith, Marshall and Robinson, using of law of variable proportions can increase the efficiency in various modes of production. The reason behind this is that the possibility of division of labour and speciality increases by increasing units of law of variable proportions. Efficiency gets its optimum by division of labour and this maximizes the production ratio. According to Robinson, if the factors of production get specialized means one factor only perform a single task then the expenditure of training, time and machinery would be very much less. Due to this saving, the law of increasing returns to factor will happen.

- (iii) Better Coordination between the Factors: The use of increased number of variable factors make better coordination between fixed and variable factors until the fixed factors of production are used. Due to this, the total production increases by increasing rate.

### Limitations

The fixed inputs get its minimum use in terms of variable inputs in the primary stage of production, so when the fixed factor gets its maximum use by using more quantity of variable factors, the law of increasing returns to factor amplifies. But this condition is not permanent. If increasing returns were operative without limitations indefinitely, the world could be fed from a kitchen garden or a flower pot simply by adding enough labour and capital to the fixed land. Due to this there would be no food problem in any parts of world. But the law of increasing returns cannot be applied after a limit. After a time, the marginal production cannot increase. The limit of increasing return is limit of a factor of production. There would be a condition when every unit of variable factor correlates with less units of fixed factor and production occurs. Due to this the marginal production gets less for extra units of variable factors.

### Situation 2: Constant Returns to a Factor

Constant returns to a factor means there is no increment in marginal production by using more units of variable factors. In this situation, marginal production stabilizes. And due to this, the total production increases in equal rate.

According to Hansen, "Constant returns to a factor occurs when additional applications of the variable factor increases output only at a constant rate."

The law of Constant Returns to a Factor can be described by Table 7.2 and Fig. 7.2

Units of Labour	Units of Capital	Total Production	Marginal Production
6	1	52	12
7	1	64	12
8	1	76	12
9	1	88	12
10	1	100	12

By Table 7.2 we can understand that the total production increased gradually as more labour is added with fixed units of capital means the marginal production is constant for variable factors.

Below Fig. 7.2 (A) indicates an uprising TP curve which suggests that total production is increasing by a constant rate. In Fig. 7.2 (B) the MP curve which is parallel to axis OX indicates that the marginal production of variable factors is constant.

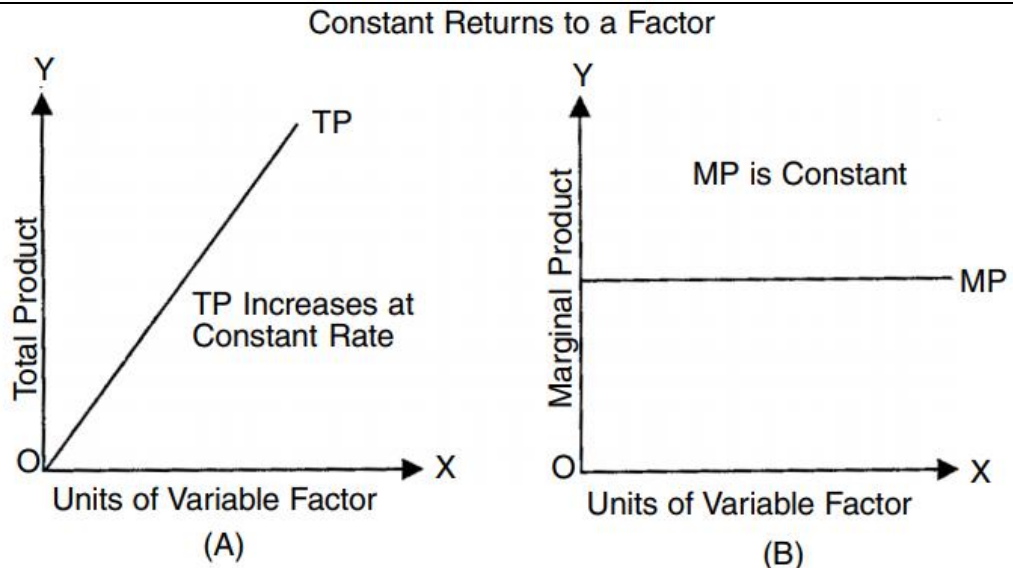


Fig. 7.2

### Causes of Constant Returns to a Factor

These are the following causes of constant returns to a factor:

- (i) **Optimum Utilization of the Fixed Factor:** When production gets increased by using variable factors then a time comes when the fixed factors have been utilized optimally. In this case, the marginal production is up to the variable factors and stable too.
- (ii) **Ideal Factor Ratio:** When the variable and fixed factors are used to their optimum level then it gives constant returns. In this situation, the marginal production of factors stabilizes in its maximum value.
- (iii) **Most Efficient Utilization of the Variable Factor:** When we use more units of variable factors along with fixed factors then a time comes when we can do maximum division of labour. By this, the variable factors like labour can be used in very efficient way and its marginal production gets stable in its maximum level.

### Situation 3: Diminishing Returns to a Factor or Law of Diminishing Returns

The Diminishing returns to a factor or law of diminishing returns is the situation when the total production increases in falling rate if fixed factors or the variable factors with fixed units are used. In this situation, the marginal production of variable factors gets low. In other words, the cost of marginal production is increased.

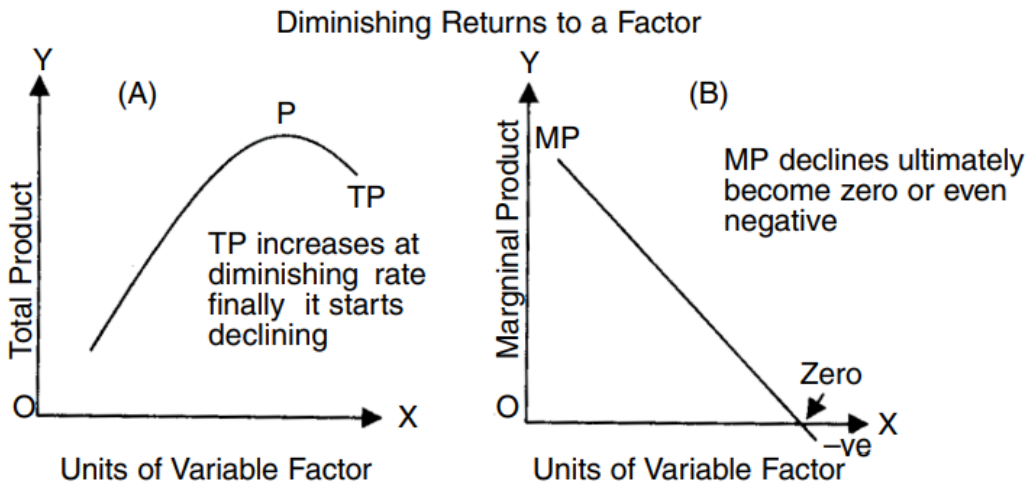
According to Marshall, "An increase in the amount of capital and labour applied in the cultivation of land causes, in general a less than proportionate increase in the amount of produce raised unless it happens to coincide with an improvement in the art of agriculture."

According to Boulding, "As we increase the quantity for any one input which is combined with fixed quantity of other inputs, the marginal physical productivity of the variable input must eventually decline." We will explain in Table 7.3 and Fig. 7.3 the diminishing returns to a factor below.

Units of Labour	Units of Capital	Total Production	Marginal Production
13	1	110	10
14	1	118	8
15	1	124	6
16	1	128	4
17	1	128	0
18	1	126	-2

By above table we can get that as the fixed capital uses with more units of labour, then the total production increases in its decreasing rate and it falls after 5th unit. The marginal rate of variable inputs means labour is decreased. It can be zero or negative after a period of time. The Fig. 7.3 (A) indicates that the total production is increasing in a decreased rate and it starts falling after point A. In Fig. 7.3 (B), the down MP curve indicates that the marginal production of variable inputs is decreasing. This law can be stopped by rectifying the production technique.

Fig. 7.3



### 7.10 Causes of Diminishing Returns to a Factor

These are the following causes of diminishing returns to a factor:

- (i) **Fixity of Factors:** The main cause to apply of this rule is that at least one factor of production is fixed. When this fixed factor is used with variable factors then the ratio of it declines with the variable factors. So when a unit of variable factors works with low constant fixed factor then the marginal production of variable factors gets decreased.
- (ii) **Imperfect Factor Substitutability:** According to Ms. Joan Robinson, the main reason of law of diminishing returns to a factor is imperfect substitute of factors in production. A factor cannot replace another at all. So when we do the optimum uses of fixed factors, then we cannot take another factor inspite of optimized fixed factor. This imbalances the variable and fixed factors and the marginal production gets decline for variable factors.
- (iii) **Poor Coordination between the Factors:** By increased using of variable factors with fixed factors, the ideal factor ratio decreases. This affects badly to the ratio of variable and fixed factors and the marginal production of variable factors gets down. This coordination is so poor that it affects the total production level. Due to this, the marginal production of variable factors can be zero or can be negative.

### Importance of the Law

The law of diminishing returns is a very important law of economics. The importance is indicated by the following –

1. **Basis of the Theory of Population:** The theory of population of Malthus is based on this law. According to Malthus, the increment of food is less than population. This is just because the law of diminishing factors gets involved in farming.
2. **Basis of the Theory of Rent:** The theory of rent of Ricardo is also based on this law. The first unit of production on land by labour and capital is more than the second unit. The difference of this unit of production is called rent.

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3. **Based on the Theory of Distribution:** The theory of distribution is also based in this law. As a factor of production uses in its maximum, the marginal productivity gets low and the income also declines.
4. **Based on Equilibrium Production:** A producer can know the quantity of equilibrium production by the help of this law. The equilibrium production happens on that point where the increased level of marginal production is equal to marginal income.

**7.11 Three Stages of Production**

Under this law of diminishing factors, the economists have given three stages of production. These are (i) Increased level of Returns, (ii) Equal level of returns and (iii) Negative level of returns. This is described by Table 7.4 and Fig. 7.4.

Units of Land (in hector)	Units of Labour	Total Production	Marginal Production	Stages
1	1	2	2	<b>First Stage:</b> MP increases, TP increases by increasing rate
1	2	5	3	
1	3	9	4	
1	4	12	3	<b>Second Stage:</b> MP Decreases, TP increases by decreasing rate
1	5	14	2	
1	6	15	1	
1	7	15	0	
1	8	14	-1	<b>Third Stage:</b> MP is negative, TP decrease

The Table 7.4 clarifies that as the inputs of variable factors increase in the **first stage**, the marginal production increases. Thus, TP increases in increasing rate.

**In second stage**, the marginal production decreases by inputs of variable factors. Thus, TP increases in decreasing rate.

**In third stage**, the marginal production gets negative by inputs of variable factors. Thus the total production gets declined. In Fig. 7.4, by using variable inputs of OL units, MP increases. This is the stage of increase level of returns. TP increased with increasing rate of MP from O to J. The MP Notes decreases in between the units L and K of variable factors. This is the stage of decrease level of returns. TP decreased with decreasing rate from J to T. When more than K units of variable factors work then the marginal production gets negative and thus TP is decreased. This is the stage of negative level of returns as shown in the right side of T point on TP curve. By this TP is declined. This is negative level of returns as shown in right side of T point of TP curve.

Fig. 7.4

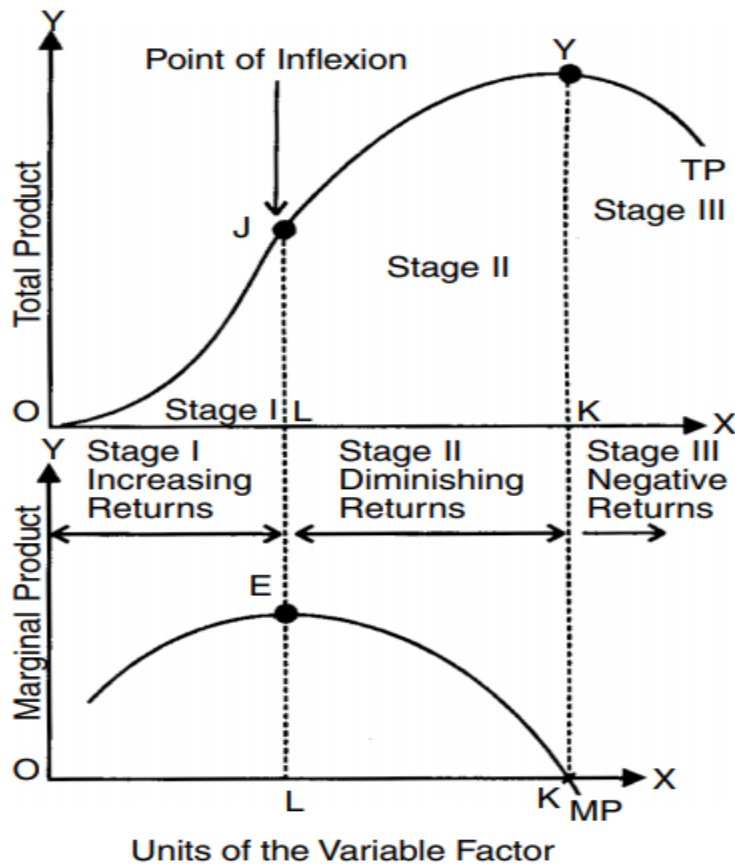


Fig 7.4

## 7.12 Returns to Scale

The returns to scale describes those behaviours of production which come by changing all the inputs in a similar way. This is a long term conception.

All the factors are variable in long run. No factors are fixed so we can change the production scale by changing same rate of changes in all the factors.

According to Koutsoyiannis, "The term returns to scale refers to the change in output as all factors change by the same proportion."

A production of a product can increase by increasing all factors in similar ratio or different ratios in long run. Generally, the law of return to scale is the increased production rate by increasing all factors in a similar ratio. This view in production is called Returns to Scale.

Suppose that primary production scale is –

$$P = f [L, K]$$

If both the factors of production like labour (L) and capital (K) are increased in similar proportion (m) then the total production would be  $P_1$ . So,

$$P_1 = f [mL, mK]$$

- (1) If  $P_1$  increases like the ratios of all the factors increased means  $P_1 / P = m$ , then it would be called Constant Returns to Scale.
- (2) If  $P_1$  changes in decrease ratios of all the factors means  $P_1 / P < m$  then it would be called Diminishing Returns to Scale.
- (3) If  $P_1$  changes in increasing view like the ratios of all the factors increased means  $P_1 / P > m$  then it would be call Increasing Returns to Scale.

This Returns to Scale can be described by Table 7.5

Units of Labour (1)	Units of Capital (2)	Percentage increase in Labour and Capital (3)	Total Production (4)	Percentage increase in Total Production (5)	Returns to Scale (6)
1	2	---	10	---	<b>Increasing</b>
2	4	100%	30	200%	
3	6	50%	60	100%	
4	8	33%	80	33%	<b>Constant</b>
5	10	25%	100	25%	
6	12	20%	110	10%	
7	14	16%	120	9%	<b>Decreasing</b>
8	16	14%	125	4%	

### 7.13 Diagrammatic presentation of Returns to Scale

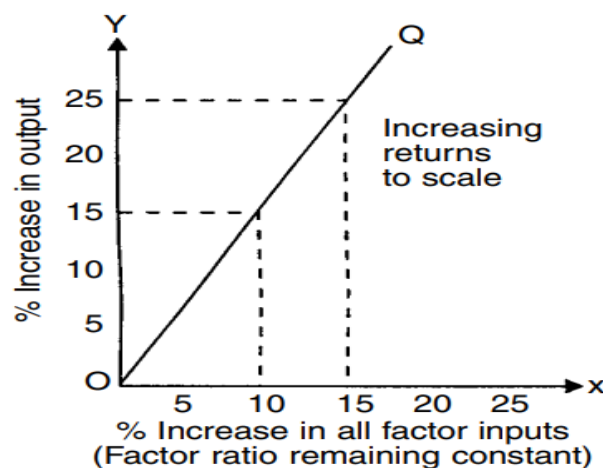
There are 3 different stages to returns to scale:

- (i) Increasing Returns to Scale
- (ii) Constant Returns to Scale
- (iii) Diminishing Returns to Scale

#### (i) *Increasing Returns to Scale*

Increasing Returns to Scale occurs when a given percentage increase in all factor inputs (in some constant ratio) causes proportionately greater increase in output. So if the increase of 10% to the production factors labour and capital and it increases the production by 15%, then it is called Increasing Returns to Scale. Figure 7.5 indicates that the increment of 10% in production factors increases the production by 15% and if increases more by 15% then the production increases by 25%. Thus the law of Increase Returns to Scale happens when average increment of production is more than the average in production factors.

Figure 7.5

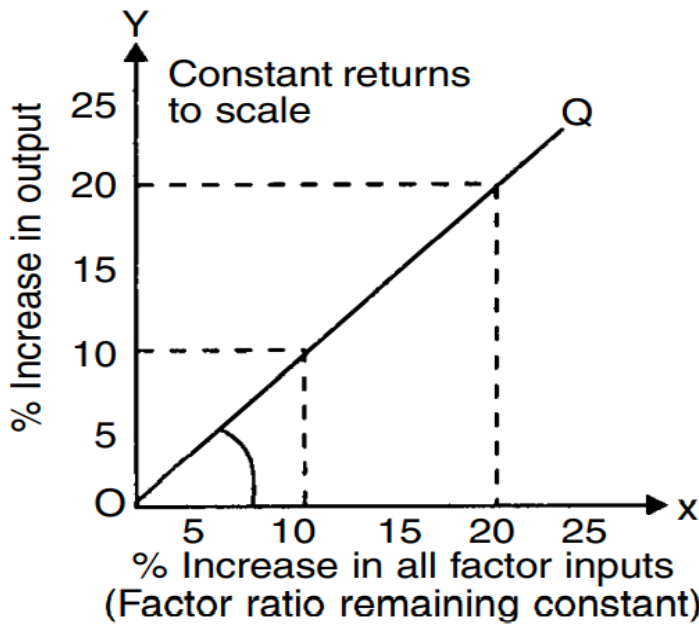


#### (ii) *Constant Returns to Scale*

Constant returns to scale occurs when a given percentage increase in all factor inputs (in some constant ratio) causes equal percentage increase in output. According to this law, suppose there is an increment of labour and capital by 10%, then the production will rise by 10%. In Fig. 7.6, OQ curve indicates constant returns to scale. The figure shows that the production percentage is up by

10% by increasing 10% to all the percentage of factors. Thus the production percentage increases by 20% if 20% increase in the percentage of production factors. This clarifies that the production percentage increases if the ratio of production factor increases. So, the OQ line shows constant returns to scale by making 45 degree angle to point O.

Fig. 7.6

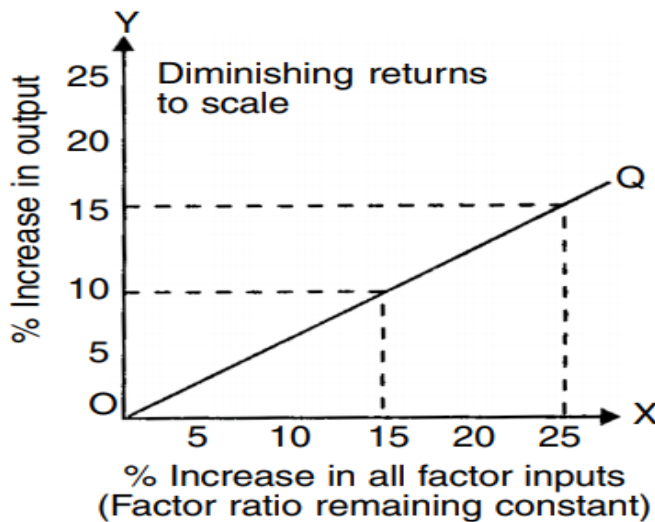


**(iii) Diminishing Returns to Scale**

Diminishing returns to scale occurs when given percentage increase in all factor inputs (in some constant ratio) causes proportionately less increase in output.

If the production is decreasing 10% by increasing 15% to its factors, it is called Diminishing Returns to Scale. Figure 7.7 indicates the diminishing returns to scale. OQ line indicates that the production is increasing 10% by increasing 15% of the factors and it increases 15% by increasing 25% of the factors. This indicates the decreasing of diminishing returns to scale.

Figure 7.7



**Self Assessment**

State whether the following statements are True/False:

- Equilibrium production occurs on that point where the increased marginal cost is equal to marginal income.



9. When marginal production increases then the total production increases in increasing rate. 10. When marginal production is less than average production then average production decreases.
11. When marginal production is positive then the total production increases.
12. The scale which produces constant scale of factors is known as Homogenous Production Function in terms of mathematical representation

### 7.14 Isoquant Curve

The Isoquant Curve is a technical relation showing how inputs are converted into outputs. It is also an efficiency relation showing the maximum amount of output with a given amount of inputs. In other words, if the quantity of factors and prices are given then it represents the minimization of cost or the combination of factors in its optimum level.

Isoquant or Isoproduct has been derived from two words, Iso = Equal and Quant = Quantity or Product = Output. So it means equal quantity or equal production. To produce a product, factors are required. These factors can be substituted to each other. For example, production of 100 watches can be produced by using 90 units of capital and 10 units of labour. So the production of 100 watches can also be made by using other combinations of labour and capital like 60 units of capital and 20 units of labour or 40 units of capital and 30 units of labour. If the combinations of two factors are represented into a curve to produce an equal amount, then this type of curve is called Isoquant or Iso-product curve. Isoquant curve is that curve which shows the different possible combinations of two factor inputs yielding the same amount of output. The Isoquant curves can also be called equal product curve or iso-product curve or marginal curve. The Isoquant curve is called marginal curve because it amplifies the marginal curve analysis of theory of consumption to theory of production.

According to Ferguson, "An Isoquant is a curve showing all possible combinations of inputs physically capable of producing a given level of output."

In the words of Peterson, "An Isoquant curve may be defined as a curve showing the possible combinations of two variable factors that can be used to produce the same total output."

### Assumptions

The main assumptions of Isoquant curve are –

1. **Two Factors of Production:** To draw these curves, in view of simplicity, it assumes that only two factors of production are used to produce a product. Both the factors are variable.
2. **Constant Technique:** It assumes that the production technique is constant or given.
3. **Divisible Factor:** It assumes that the factor of production is divisible or it can be used in small quantity.
4. **Possibility of Technical Substitution:** It must be assumed that there is possibility of technical substitution between two factors. Means the production calculation is Variable Proportion Type and not Fixed Proportion Type.
5. **Efficient Combination:** It also assumes that in given technique, the factor of production is used in its efficient combination

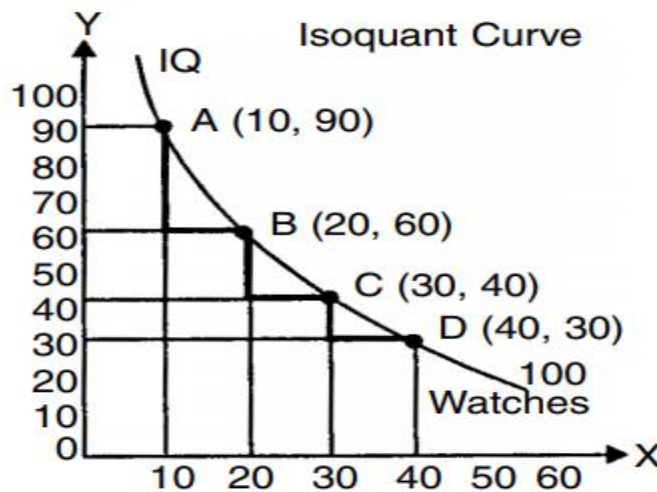
### Explanation

The Isoquant curve can be described by following table which represents various combinations of two factors (labour and capital) for production.

Table 7.6: Isoquant Schedule			
Combination	Product (Watch)	Capital (K)	Labour (L)
A	100	90	10
B	100	60	20
C	100	40	30
D	100	30	40

In the above table, the combination of capital and labour can be represented by figure or graph too. In figure 7.8 capital is shown on axis OY and labour is shown on axis OX. Point A represents that 100 units of watches can be produced by 90 units of capital and 10 units of labour. While point B indicates that this same quantity of watches can be produced by 60 units of capital and 20 units of labour. Thus the point C indicates that the production of 100 watches can occur by 40 units of capital and 30 units of labour. While point D represents that the same quantity of watches can be produced by 30 units of capital and 40 units of labour. Thus A, B, C and D represent various combinations of labour and capital which produce the similar quantity of watches (100). So the IQ curve which comes by adding the point A, B, C and D is called Equal Product Curve or Isoquant Curve. This Isoquant curve describes that to produce a fixed quantity of product, there are various combinations of factors.

Figure 7.8



### 7.15 Marginal Rate of Technical Substitution

The slope of Isoquant curve is substitution for a factor to another. It indicates that a factor can be substituted to another by making production stable. By Isoquant curve, we can get the data of technical substitution of a production (labour) in another product (capital). Because of this, the slope of Isoquant curve is also called Marginal Rate of Technical Substitution (MRTS). For factor X, the marginal rate of technical substitution rate for factor X is the rate where Y is substituted by X while keeping production constant. According to Lipsey, "The marginal rate of technical substitution may be defined as the rate at which one factor is substituted for another with output held constant."

If factor Y is capital and factor X is labour then for capital, the marginal rate of technical substitution rate of X is the rate where labour can be substituted by capital while keeping the production level stable. In Fig. 7.8, in point A, for example, the production of 100 units occurs by 90 units of capital and 10 units of labour in point B, 60 units of capital, 20 units of labour produce same output. The slope of Isoquant curve between A and B is 30 units of capital and 10 units of labour, it means that in point A, without changing the production level, for 30 units of capital, 10 units of labour can be substituted. MRTS can be described mathematically as –

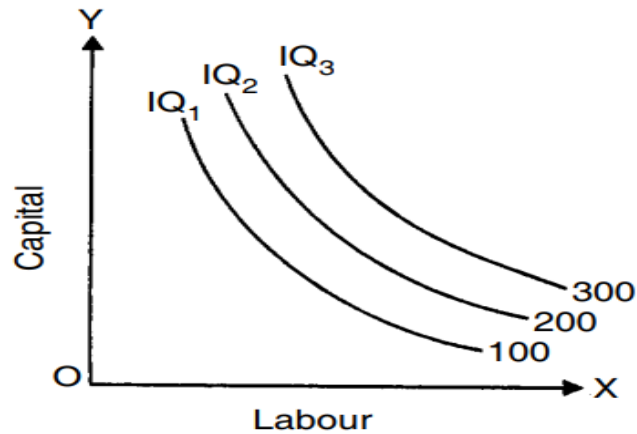
$$\text{MRTS} = \Delta K / \Delta L$$

(MRTS = Marginal Rate of Technical Substitution;  $\Delta K$  = Changes in Capital;  $\Delta L$  = Changes in labour).

### 7.16 Isoquant Map

The combination of aggregate Isoquant curve represented by a figure is called Isoquant Map as it is presented in Fig. 7.9. Isoquant map refers to the family of Isoquant curves placed in one diagram. It shows a set of isoquants, one for each level of output.

Fig. 7.9



As much as production level increases, the Isoquant curve will be far from its original point.  $IQ_1$ ,  $IQ_2$  and  $IQ_3$  represent the various levels of production. An Isoquant curve which is in right side of the other curve indicates high level of production. So the  $IQ_2$  curve is from  $IQ_1$  and  $IQ_3$  curve indicates more production than  $IQ_2$  curve. The high level of production will happen as much as the Isoquant curve is high. But every Isoquant curves represent the various quantities of variable factors.

### 7.17 Iso-cost Line

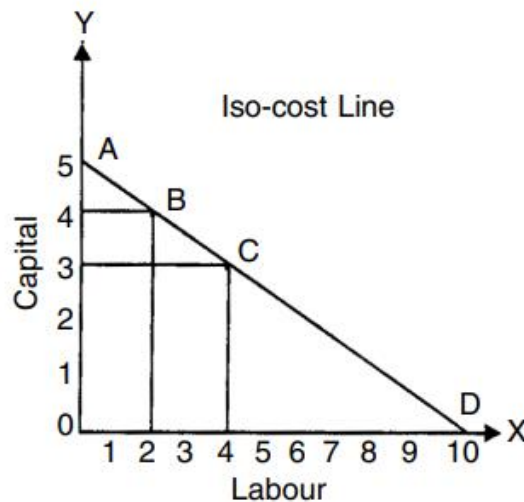
An iso-cost line is the line which represents those various combinations whose total cost is equal. In other words, this line represents the various combinations of two factors which a firm can get in equal cost. Iso-cost lines are various like isoquant curves, which represent various levels of production. iso-cost line may be defined as the line which shows different possible combinations of two factors that the producer can afford to buy his total expenditure to be incurred on these factors and price of the factors.

Explanation The assumption of iso-cost line can be described with Table 2 and Fig. 7.10. Suppose that producer has only 100 units to buy labour and capital. The cost per unit of labour is 10 and cost per unit of capital is 20.

Table 7.7: Alternative Factor Combination		
Total Expenditure (in ₹)	Labour $L_p = ₹ 10$	Capital $L_k = ₹ 20$
100	10	0
100	0	5
100	4	3
100	2	4

In Fig. 7.10, labour is shown on axis OX and capital is on axis OY. The points A, B, C and D represent various combinations of capital and labour, which can be bought at 100. Point A indicates the five units of capital and zero units of labour, while point D indicates ten units of labour and zero units of capital. Point B indicates four units of capital and two units of labour while point C indicates four units of labour and three units of capital.

Fig. 7.10



The sloping of iso-cost line is the average of pricing. To represent labour on axis OX and capital on OY, the sloping of any iso-cost line would be following –

$$\text{Slope of iso-cost Line} = \text{Cost of Labour/Cost of Capital}$$

### 7.18 Producer's Equilibrium or Least Cost Combination of Factors

The producer's equilibrium refers to a situation in which a producer maximizes his profits. In other words, a producer produces a constant quantity of product with the help of minimum combination of cost and factor. To use this minimum cost combination is also called optimum combination.

Optimum or minimum cost combination is the combination in which –

- The production which is got from fixed level of factors is maximum or
- The cost is minimum for production in fixed level

Conditions of Optimum Combinations of Factors or Least Cost Combinations

Following are the conditions of optimum combinations of factors or least cost combinations –

1. **The iso-cost line should be touching line for Isoquant curve on flat point.** The slope of Isoquant curve and iso-cost line is equal at touching point. The slope of iso-cost line is the rate price of factors. The slope of Isoquant curve is the marginal rate of factors. This is also called the Marginal Rate of Technical Substitution.
2. **Iso-cost curve is convex to the origin on touching point or MRTSLK is falling.**

Thus we can represent the conditions of Optimum combinations as follows –

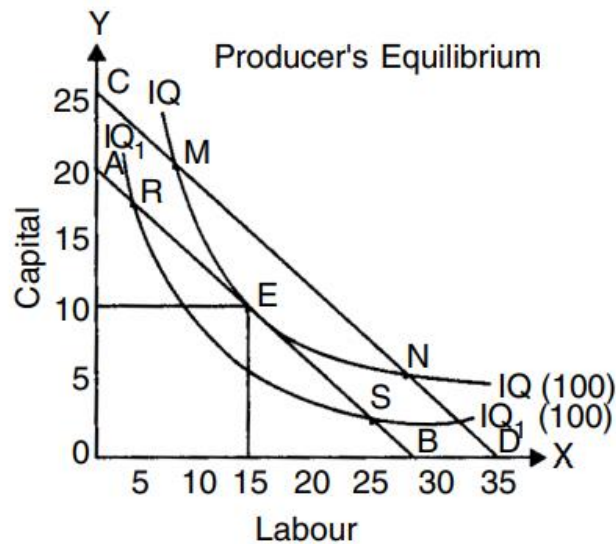
- (i) The slope of Isoquant curve = The slope of iso-cost Line

$$\text{MRTSLK} = \Delta K / \Delta L = MP_L / MP_K = P_L / P_K$$

- (ii) iso-cost curve should be convex to the origin on touching point or MRTSLK should be falling

The factors or equilibrium of production can be represented by Fig. 7.11. Suppose that a producer wants to produce pens with total investment of 1500. To produce pens, he needs labour and capital as two factors of production. The one unit of labour costs 50 while one unit of capital costs 75. He can produce with 30 units so labour plus without capital or 20 units of capital plus without labour. He would love to mix the optimum combination of both the factors. This optimum combination is represented by point E when he will use 10 units of capital and 15 units of labour ( $10 \times 75 + 15 \times 50 = 1,500$ ). The point E is touching point of Isoquant curve IQ and equal cost curve AB. The producer can move above and below the Isoquant curve IQ and equal cost curve AB.

Fig. 7.11



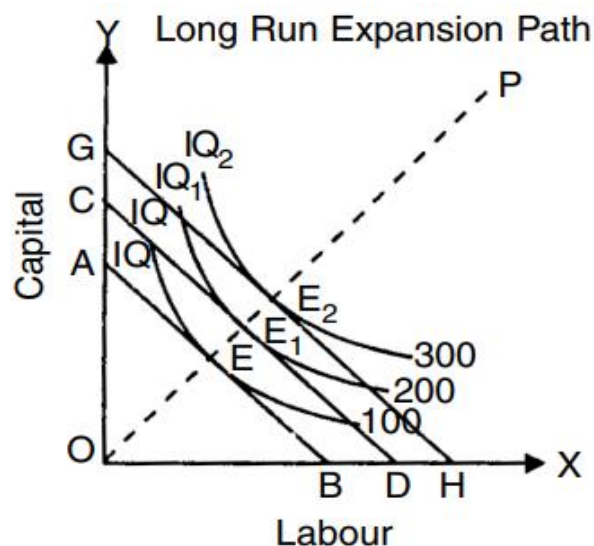
If he goes to point M or N of Isoquant curve IQ, then he would find himself on above equal cost line CD, it means he needs to pay more for producing initial amount of pen (100) rather than investing the fixed level of 1500. In other words, to produce 100 pens, the cost is minimum at point E. So the point E will represent the combination of minimum cost.

In contrast, if he wants to buy the combination of point R or S below Isoquant curve IQ<sub>1</sub> then he can only to produce 50 out of initial 100 pens on initial investment of 1500. In other words, point E represents more production from a fixed investment. So producer will be in equilibrium only at point E.

### 7.19 Expansion Path

If the capital of firm rises then it will want to increase his production. The quantity of production can rise when there is no increment in price of factors as well as cost due to rise of capital. The total production level is increased by increasing the capital of firm and firm can produce production in various levels by using various combinations of factors. The firm will use what point in the various levels of production can be identified by Expansion Path. Expansion Path refers to the locus of all such points that show least cost combination of factors corresponding to different levels of output. In other words, Expansion Path indicates that when the firm increases its production level then which optimum combination of factors is used. Since the expansion of firm depends upon the status of production, so expansion path is also called Scale Line.

Fig. 7.12



All the factors of production are variable in long run. So labour (L) and capital (K) can be changed. Suppose that both the factors are increased in the same way, then the expansion of firm, as shown in Fig. 7.12, will be a straight line OP. By increasing both labour and capital, the firm will be

diverted from E to E<sub>1</sub> and E<sub>2</sub>. The production by these points are 100, 200 and 300 respectively. Thus, Expansion Path is the locus of all points of optimum combinations of L and K corresponding to different levels of output.

**7.20 Product Exhaustion Theorem**

In the late 1930s considerable controversy surrounded the problem whether the factor prices, determined by the marginal productivity theory, would be such as to satisfy the basic 'accounting' identity

$$[\text{value of product}] = [\text{cost of labour}] + [\text{cost of capital}]$$

OR  $[P \cdot Q] = [w \cdot L] + [r \cdot K] \dots\dots\dots (1)$

This identity (equ. 1) requires that the factor shares add to unity. Dividing (1) by  $(P \cdot Q)$  we find

$$1 = \frac{w \cdot L}{P \cdot Q} + \frac{r \cdot K}{P \cdot Q}$$

OR

$$1 = [\text{share of labour}] + [\text{share of capital}]$$

The value of the product must be exhausted by the factor payments. The question is whether the marginal productivity theory determines factor prices at the levels required to fulfill the basic 'product =income' identity. The answer to this question is affirmative if the physical output is exhausted by paying each factor its marginal physical product, that is,

$$\bullet \quad Q = (MPP_L) \cdot L + (MPP_K) \cdot K \dots\dots\dots (2)$$

If we multiply through (equ.2) by P we obtain

$$P \cdot Q = (MPP_L \cdot P) \cdot L + (MPP_K \cdot P) \cdot K \dots\dots\dots (3)$$

where

$(MPP_L \cdot P)$  = value of the marginal product of labour

$(MPP_K \cdot P)$  = value of the marginal product of capital and

$PQ$  = value of output

From (3) we see that if the factors are paid a price equal to their VMP, The total factor payments will exhaust the total value of the product, that is, the marginal productivity theory leads to the correct 'adding-up' of the factor shares.

**7.21 Euler’s Product Exhaustion Theorem**

The mathematician Leonhard Euler proved that expression (2) holds for production functions which exhibit constant returns to scale (i.e. production functions which are linear homogeneous). Euler's theorem states that for a production function with constant returns to scale

$$Q = \frac{\delta Q}{\delta L} \cdot L + \frac{\delta Q}{\delta K} \cdot K$$

Where

$$\frac{\delta Q}{\delta L} = MPP_L \quad \text{and} \quad \frac{\delta Q}{\delta K} = MPP_K$$

Thus the marginal productivity theory satisfies the 'adding-up' condition

$$[\text{share of Labour}] + [\text{share of capital}] = 1$$

for the special case of constant returns to scale.

**Euler's theorem is based on the following assumptions:**

- First, it assumes a linear homogeneous production function of first degree which implies constant returns to scale
- Second, it assumes that the factors are complementary, i.e., if a variable factor increases, it increases the marginal productivity of the fixed factor.
- Third, it assumes that factors of production are perfectly divisible.
- Fourth, the relative shares of the factors are constant and independent of the level of the product.
- Fifth, there is a stationary, riskless economy where there are no profits.
- Sixth, there is perfect competition.
- Last, it is applicable only in the long-run.

**Diagrammatic Representation of Euler's Theorem**

To restate, Euler's theorem is

$$Q = \frac{\delta Q}{\delta L} \cdot L + \frac{\delta Q}{\delta K} \cdot K$$

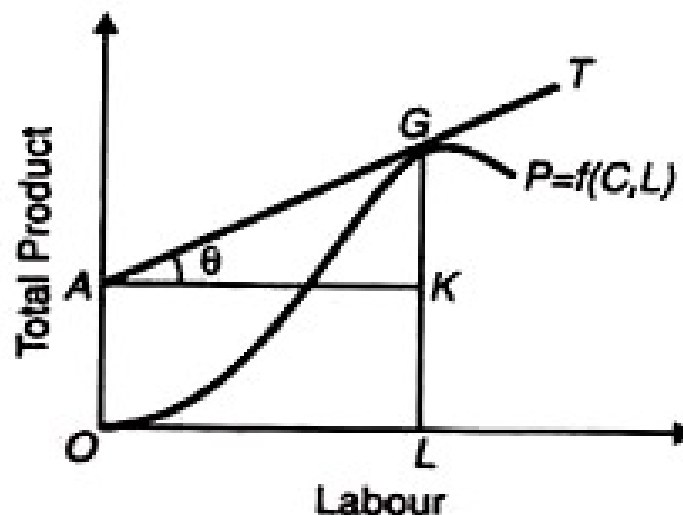
It is illustrated in Figure 7.13 where labour is taken on the horizontal axis and the total product on the vertical axis. The curve OP is the total product curve or the production function:

$$P = f(L, K).$$

The tangent T on the OP curve at point G represents constant returns to scale.

At point G the total product (GL) is fully exhausted (or distributed) between the two factors, capital (KL) and labour (GK).

Figure 7.13

**7.22 The Cobb-Douglas Production Function**

During 1900-1947, Charles Cobb and Paul Douglas formulated and tested the Cobb-Douglas production function through various statistical evidence.

The Cobb-Douglas functional form of production functions is widely used to represent the relationship of an output and two inputs. This one is the most popular estimated functions.

$$Q(L,K) = A L^\alpha K^\beta$$

where:

Q = total production (the monetary value of all goods produced in a year)

L = labor input (the total number of person-hours worked in a year)

K = capital input (the monetary worth of all machinery, equipment, and buildings)

A = total factor productivity (efficiency coefficient)

$\alpha$  and  $\beta$  are the output elasticity of labor and capital, respectively. These values are constants determined by available technology.

$$Q = F(L, K) = AL^\alpha K^\beta$$

A shows firm's general productivity level and  $\alpha$  and  $\beta$  affect relative productivities of labor and capital

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

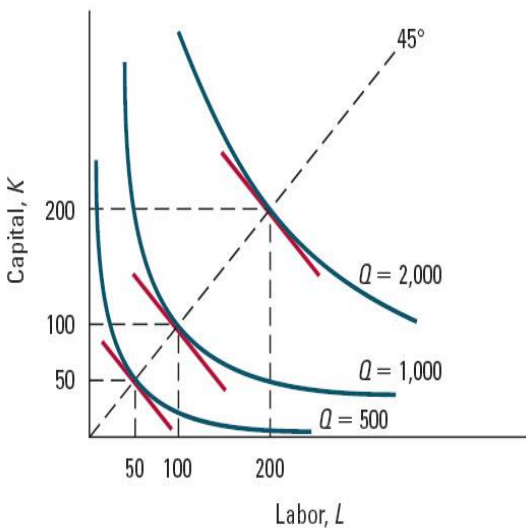
$$MP_K = \beta AL^\alpha K^{\beta-1}$$

Substitution between points:

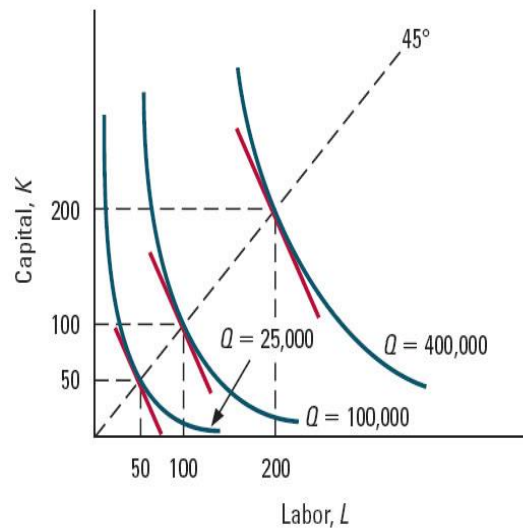
$$MRTS_{LK} = \left(\frac{\alpha}{\beta}\right)\left(\frac{K}{L}\right)$$

Figure 7.13

(a)  $A = 10, \alpha = \beta = 1/2$



(b)  $A = 10, \alpha = 3/2, \beta = 1/2$



### 7.23 Constant Elasticity Substitution (CES) Production Functions

The CES production function is expressed as

$$Q = A \left[ \alpha K^{-\beta} + (1 - \alpha) L^{-\beta} \right]^{-1/\beta}$$

Subject to ( $A > 0$ ,  $0 < \alpha < 1$ , and  $\beta > -1$ )

where L - labour, K = capital, and A,  $\alpha$  and  $\beta$  are the three parameters

1. A' is the **efficiency parameter** and shows the scale effect. It indicates state of technology and entrepreneurial organizational aspects of production. Higher Value of A higher output (given same inputs)
2.  $\alpha$  is the *capital intensity factor coefficient* and  $(1 - \alpha)$  is the *labour intensity of coefficient*. The value of  $\alpha$  indicates the relative contribution of capital input and labour input to total output.
3. Value of Elasticity of Substitution ( $\sigma$ ) depends upon the value of substitution parameter ' $\beta$ '



$$\beta = \left(1 - \frac{1}{\sigma}\right)$$

4. The parameter  $v$  represents degree of returns to scale.
5. Marginal Products of labour and capital are always positive if we assume constant return to scale.

### Properties of CES production function

1. The CES function is homogenous of degree one. If we increase the inputs  $C$  and  $L$  in the CES function by  $n$ -fold, output  $Q$  will also increase by  $n$ -fold. Thus like the Cobb-Douglas production function, the CES function displays constant returns to scale.
2. In the CES production function, the average and marginal products in the variables  $C$  and  $L$  are homogeneous of degree zero like all linearly homogeneous production functions.
3. From the above property, the slope of an isoquant, i.e., the MRTS of capital for labour can be shown to be convex to the origin.
4. The parameter ( $\theta$ ) in the CES production function determines the elasticity of substitution. In this function, the elasticity of substitution,

$$\sigma = 1 / (1 + \beta)$$

This shows that the elasticity of substitution is a constant whose magnitude depends on the value of the parameter  $\beta$ . If  $\alpha = 0$ , then  $\sigma = 1$ . If  $\beta = \infty$ , then  $\sigma = 0$ . If  $\beta = -0$ , then  $\sigma = \infty$ . This reveals that when  $\sigma = 1$ , the CES production function becomes the Cobb-Douglas production function. If  $\sigma < 1$ , then  $\sigma = -0$ ; and if  $\beta < \infty$ , then  $\sigma < 1$ . Thus the isoquants for the CES production function range from right angles to straight lines as the elasticity of substitution ranges from 0 to  $\infty$ .

5. As a outcome of the above, if  $L$  and  $C$  inputs are substitutable  $\infty$  for each other an increase in  $C$  will require less of  $L$  for a given output. As a result, the MP of  $L$  will increase. Thus, the MP of an input will increase when the other input is increased

### Merits of C.E.S. Production Function

1. CES function is more general.
2. CES function covers all types of returns.
3. CES function takes account of a number of parameters.
4. CES function takes account of raw materials among its inputs.
5. CES function is very easy to estimate.
6. CES function is free from unrealistic assumptions.

### Variable Elasticity of Substitution [VES] Production Function:

Recently attempts have been made by Bruno, Knox Lovell and Revankar to get a new production function. The resulting production function is the generalisation of CES which possesses the desirable properties of variable elasticity substitution.

A general production technology as

$$Y = F(K, L),$$

where  $Y$ ,  $K$ , and  $L$  stand for output, capital and labor, respectively.

According to Revankar (1971), we consider the following specification:

$$Y = AK^{\alpha v} [L + baK]^{(1-\alpha)v}$$

We assume that the production function exhibits constant returns to scale, i.e.,  $v = 1$ .

This production function can be written in intensive form,

$$y = f(k)$$

where  $y \equiv Y/L$  and  $k \equiv K/L$ , as

$$y = AK^a[1 + baK]^{1-a}$$

It follows that

$$f'(k) = a\frac{y}{k} + a(1-a)b\frac{y}{1+abk}$$

$$f''(k) = Aa(1-a)(1+abk)^{-a-1}k^{-1}$$

Hence, this function satisfies standard properties of a production function, namely

$$f(k) > 0, f'(k) > 0 \text{ and } f''(k) < 0 \quad \forall k > 0 \text{ as long as}$$

$$A > 0, 0 < a \leq 1, b > -1 \text{ and } k^{-1} \geq -b$$

Note that if  $b = 0$  then reduces to the Cobb-Douglas case. On the other hand if

$a = 1$  then it reduces to the Ak production function.

#### Properties of the VES

1. VES satisfies the requirements of a neo-classical production function.
2. VES function includes the fixed co-efficient models.
3. VES production function is more general.

### Summary

In the initial stage of production, the less use of variable inputs with respect to fixed inputs creates the less use of fixed inputs, so if the maximum use of variable inputs creates the maximum use of fixed inputs, then law of Increasing Returns of Scale applies. If increasing returns are operative without limitations, the world could be fed from a kitchen garden or a flower pot simply by adding enough labour and capital to the fixed land.

### Keywords

- **Production Function:** Quantity of Production
- **Short Period:** Short Period
- **Increasing Returns:** Increasing Production
- **Diminishing Returns:** Diminishing Production
- **Producer:** Person who produce
- **Iso product:** Similar production

### Self Assessment

1. The production function states the technical or physical relation between .....
2. The production function is the table (mathematical function), which represents the maximum .....
3. One fixed inputs in production means the ..... production in every time of frame.
4. The changes and stability of factors depends upon ..... of time.
  - A. period
  - B. movement
  - C. curve
  - D. boundary
5. Some variable inputs are Raw Material, ..... services etc.
  - A. workers
  - B. servicemen

C. labour

D. none of these

6. The variable factors of production are the factors by which the quantity can be changed in .....

A. long run

B. short run

C. middle run

D. none of these

7. The changes in variable factors in short run can increase the production .....

A. short

B. increment

C. marginal

D. none of these

8. Equilibrium production occurs on that point where the increased marginal cost is equal to marginal income.

9. When marginal production increases then the total production increases in increasing rate. 10. When marginal production is less than average production then average production decreases.

11. When marginal production is positive then the total production increases.

12. The scale which produces constant scale of factors is known as Homogenous Production Function in terms of mathematical representation

13. Iso-product curve is the curve which represents various combinations of factors of.....

14. The Isoquant curves can also be called equal product curve or iso-product curve or ..... curve.

15. The slope of Isoquant curve is .....

A. from up to down

B. from down to up

C. from right to left

D. from left to right

16. The Isoquant curve is ..... on its original point.

A. vertical

B. horizontal

C. convex

D. down

17. Two Isoquant curves represent ..... level of production.

A. two units

B. one unit

C. three units

D. four

18. In equilibrium point, the iso-cost line is ..... to Isoquant curve.

A. touching Point

B. original Point (

C. middle Point

D. upper Point

19. The diminishing returns to factor are due to ..... of factor.

A. losses

B. demerits

C. profit

D. increment

### Answer for Self Assessment

- |              |               |                |              |          |
|--------------|---------------|----------------|--------------|----------|
| 1. Technical | 2. Production | 3. Units       | 4. A         | 5. C     |
| 6. B         | 7. B          | 8. True        | 9. True      | 10. True |
| 11. False    | 12. True      | 13. production | 14. Marginal | 15. A    |
| 16. C        | 17. A         | 18. A          | 19. A        |          |

### Review Questions

1. What do you mean by Production Function? Describe.
2. Give causes of Increasing Returns of Factors.
3. Give the details of three stages of production.
4. What do you mean by increasing returns to scale? Clarify it.
5. What is Isoquant curve? Explain it.
6. What do you mean by iso-cost line?
7. What is substitutional theory? Describe it.
8. What is Production Path? Describe it.



### Further Readings

1. Microeconomics – David Basenco and Ronald Brutigame, Wiley India, 2011, PBK, 4th Edition.
2. Microeconomics: An Advanced Treatise – S. P. S. Chauhan, PHI Learning.
3. Microeconomics: Behaviour, Institutions and Evolution – Sampool Bowels, Oxford University Press, 2004

## Unit 08: Cost Analysis and Estimation

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Summary

Keywords

Self Assessment

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### Objectives

After this lecture, you would be able to

- identify the types of cost incurred in the process of production;
- understand the concept of cost in short-and long-run
- analyze the traditional and modern theories of cost
- evaluate the break-even analysis and scope of economies.
- Analyze the economies and diseconomies of scale and learning curves.

### Introduction

The decision of a firm to maximize its profits, depends on the cost of production and revenue. In this unit we will study the principles of cost. Generally, refers to a firm's production cost which is taken from the monetary costs, which is carried out in relation to the production of the commodity.

The colloquial language of the monetary expenditure on these inputs is called the cost of production. It must be done on the output of the monetary costs, the costs of a variety of perception. Costs related many assumptions are monetary costs, opportunity costs and social costs.

### 8.1 Cost of Production

**Production** or **product costs** refer to the **costs** incurred by a business from manufacturing a **product** or providing a service. **Production costs** can include a variety of expenses, such as labor, raw materials, consumable manufacturing supplies, and general overhead expenses. In Economics, cost of production has a special meaning. It is all of the payments or expenditures necessary to obtain the factors of production of land, labor, capital and management required to produce a commodity. It represents money costs which we want to incur in order to acquire the factors of production.

#### Elements of Cost of Production

- (a) Purchase of raw machinery,
- (b) Installation of plant and machinery,
- (c) Wages of labor,
- (d) Rent of Building,
- (e) Interest on capital,
- (f) Wear and tear of the machinery and building,
- (g) Advertisement expenses,
- (h) Insurance charges,
- (i) Payment of taxes,
- (j) In the cost of production, the imputed value of the factor of production owned by the firm itself is also added,
- (k) The normal profit of the entrepreneur is also included In the cost of production.

#### Types of Production Cost

**Real Cost:** The term “real cost of production” refers to the physical quantities of various factors used in producing a commodity. Real cost signifies the aggregate of real productive resources absorbed in the production of a commodity or a service. Marshall has described “real cost” as the production of a commodity generally requires many different kinds of labour and the use of capital in many forms.

**Opportunity Cost:** The opportunity cost is also known as ‘transfer cost’ or ‘alternate cost’. Prof. Lipsey has defined it as “the opportunity cost of using any factor is what is currently forgone by using it.” Whereas Mrs. Joan Robinson has defined opportunity cost in terms of transfer cost. According to her, ‘The price which is necessary to retain a given unit of factor in a certain industry may be called its transfer earning or transfer price.’”

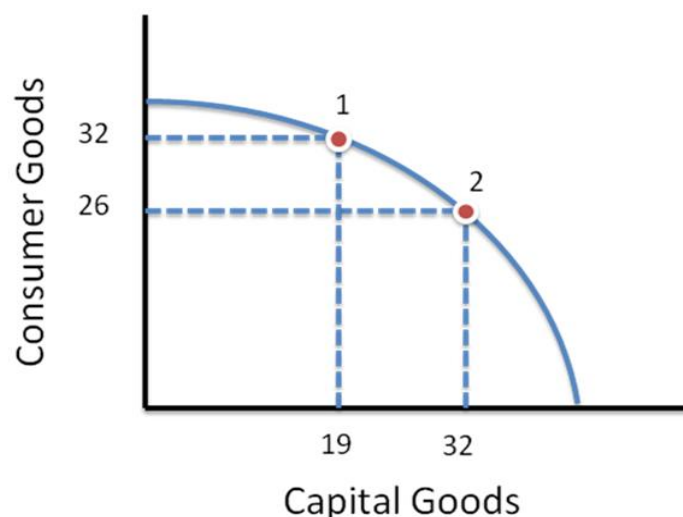


Fig 8.1

**Money Cost:** Money Cost is the monetary expenditure on inputs of various kinds. It is that total money expenses incurred by a firm in producing a commodity. Like wages and salaries of labour; cost of raw-material, expenditure on machines and equipment, etc.

**Explicit Costs:** This includes those payments which are made by the producer to those factors of production which do not belong to the producer himself. These costs are mostly in the nature of contractual payment made by the producer to outside resources.

**Implicit Costs:** These costs arise in the case of those factors which are possessed and supplied by the producer himself. Here we cannot assign exact money value but can term them in imputed values, e.g., a producer may contribute his own building or premises for running the business, his own capital and working also as Managing Director of the firm.

**Selling Costs:** Selling costs are the costs of marketing, advertisement and salesmanship. These costs are incurred to attract customers, expand market and capture more business and retain the existing business. These costs are the essential costs of the competitive economy.

**Private Costs:** The private cost is any cost that a person or firm pays in order to buy or produce goods and services. This includes the cost of labour, material, machinery and anything else that the person or firm pays for. The private cost does not take into account any negative effects or harm caused as a result of the production.

**Social Costs:** Social cost is the total cost to society. It includes private costs plus any external costs. Social cost is the total cost to society. It includes private costs plus any external costs.

**Incremental Costs:** Incremental costs denote the total additional costs associated with the marginal batch of output. These costs are the additions to costs resulting from a change in the nature and level of business activity. For example, change in product line or output level, adding or replacing a machine, changes in distribution channels, etc.

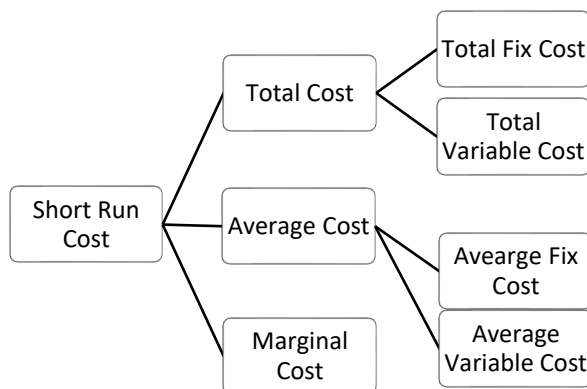
**Sunk Costs:** A sunk cost refers to money that has already been spent and which cannot be recovered. Sunk costs are the costs that are not affected or altered by a change in the level or nature of business activity. It cannot be altered, increased or decreased by varying the level of activity or the rate of output

**Shutdown Costs:** Shutdown costs are the costs that are incurred in the case of a closure of plant operations. If the operations are continued, these costs can be saved. These costs include all types of fixed costs, the costs of sheltering plant and equipment, lay-off expenses, employment and training of workers when the operation is restarted.

**Abandonment Costs:** Abandonment costs are the costs which are incurred because of retiring altogether a plant from use. These costs are related to the problem of disposal of assets. For example, the costs are related to the discontinuance of tram services in Delhi

### 8.2 Concepts of Cost in Short Run

Since short-term productivity costs close relationship, so a short-term productivity cost is related to each measurement. Which means like stable and variable resources, fixed and variable costs are exist. Similarly, the way on which total, average and aggregates of production are measured in the same total, average and aggregates of costs are measured. In short, cost and productivity are mutual.



### 8.3 Total Cost

To produce different levels of an object, the money which has to spend is called the total cost. In short term fixed and variable costs are divided into two categories, similarly, the firm's total production costs are divided into two categories. Total fixed costs and variable costs of fixed assets to total variable costs is the cost of resources. Thus, total cost is the sum of total fixed cost and variable cost.

$$TC = TFC + TVC$$

(Here, TC = Total Cost, TFC = Total Fix Costs, TVC = Total Variable Costs)

In the words of Browning, "Total cost (TC) is the sum of total fixed cost and total variable cost for each output level." The total cost required for the production of an object by means of the cost of all fixed and variable resources appear. The total cost is always increasing with output. The cause of this is that for increasing production always require more resources.

#### Total Fixed Cost

In short term, the cost of fixed assets is called total fixed costs. Fixed costs are the product of the units and the prices of fixed asset.

$$\text{Total Fixed Cost (TFC)} = \text{Units of Fixed Resource} \times \text{Price of Fixed Cost}$$

These costs do not change with the volume of production. If the output is zero, the cost will remain stable.

In the words of Ferguson, "Total fixed cost is the sum of the short run explicit fixed costs and the implicit costs incurred by an entrepreneur."

Some fixed costs do not change with the volume of production. If a firm stops production for sometime even it has to pay the total fixed cost. In a carpet rug factory more and more carpets can be made in a day. The manufacturing fixed cost of carpet is ₹ 100. In that factory even a single piece of carpet is not made in a day fixed cost will remain 100. If on the second day six carpets are made then also fixed cost will remain ₹ 100. This is also called supplementary cost or indirect cost or overhead cost or Historical costs or unavoidable costs. In fixed cost following expenditures are included. - (1) Rent (2) Depreciation (3) Manager, salaries of administration (4) Interest on fixed capital (5) Lessons fees (6) general benefit and (7) depreciation expense insurance etc. Fixed costs can be explained by Table 8.1 and Fig. 8.2. It is known from table - 1. with changes in quantity of production even if the quantity of production becomes zero then cost will remain rupees 10. If the quantity of production increasing becomes rupees two or four or six even then fixed cost will remain rupees 10.

Output	Fixed Cost (in ₹)
0	10
1	10
2	10
3	10
4	10
5	10
6	10
7	10
8	10

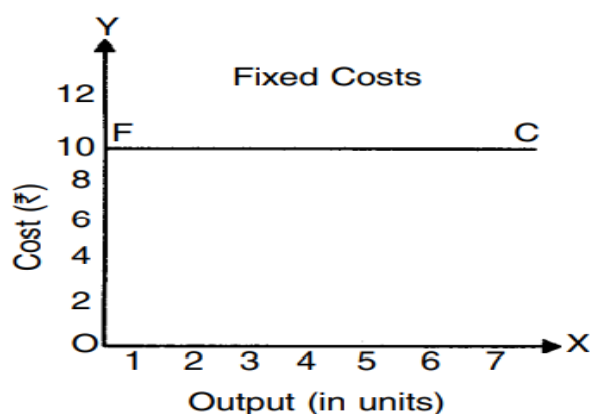


Fig. 8.2

In Fig. 8.2 on OY axis the units of production costs and on OX axis units of output are given. FC line is bound to reveal the costs. This line is parallel to OX axis. From this it is clear that cost will remain fix even the output is low or high. This FC line is touching OY axis at point F. From this it is clear that output is zero even then bound cost will remain rupees ten.

#### Total Variable Cost

The variable cost is the cost which is applied in input and output factors of production.



According to Ferguson, "Total variable cost is the sum of amounts spent for each of the variable inputs used."

Variable cost is one which varies at the level of output. This cost changes if production changes. If production gets low then this cost decreases and vice versa. If the production is zero, this cost is also zero. These costs are also called Prime Costs, Direct Costs or Avoidable Cost. These expenditures are included in variable cost – (1) Expanse on raw material, (2) Wage of direct labour, (3) Expenditure on electricity and (4) Expenditure on repairing.

The variable cost can be shown by Table 8.2 and Fig. 8.3

Output	Fixed Cost (in ₹)
0	0
1	10
2	18
3	24
4	28
5	32
6	38
7	46
8	62

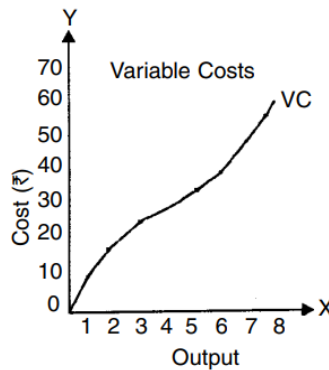


Fig. 8.3

Table 8.2 shows that as the production increases, the variable cost also increases. When production was zero then this cost was also zero.

In contrast, when production is increased by 1, then the variable cost is 10. When production is increased and comes at 6, then the variable cost is 38.

From the above table it is clear that the variable cost of every factor of production does not find the similar changes. The increment in variable cost is low until the four units of production. There is equal increment in fourth and fifth units. After that, the variable cost of every unit is increasing. The main reason behind this is to imply the Law of Production.

The variable cost can be represented by Fig. 8.3 too. In this figure the quantity of production is represented on axis OX and cost is on axis OY. VC is variable cost curve. This curve is like inverse S. This curve is going upwards. This proves that this is reflecting the variable factors of law. By this law, it is clear that in the early stage of production, as quantity of production increases, the variable cost also increases. This condition occurs till that point where the variable cost and the fixed cost mix. After this as the variable factors mix and use with fixed factors, the productivity of variable factors gets low and the average of variable cost increases.



The implicit cost of production is self costs as well as the factor cost.

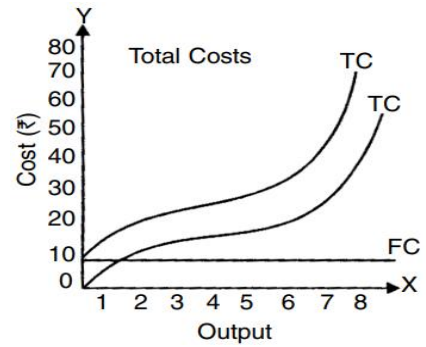
### 8.4 Relation Among Total Cost, Total Fixed Cost and Total Variable Cost

The total cost in various levels of production in short run is the addition of total fixed cost and total variable cost. The relation among the total cost, total fixed cost and total variable cost is represented by Table 8.3 and Fig. 8.4.

Output	Fixed Cost	Variable Cost	Total Cost
0	10	0	10
1	10	10	20
2	10	18	28
3	10	24	34
4	10	28	38
5	10	32	42

Fig. 8.4

6	10	38	48
7	10	46	56
8	10	62	72



In Table 8.3, the total cost can be assumed by the addition of fixed cost and variable cost. The total cost is increased as the production increases. When production is zero even then the total cost is ₹ 10. The variable cost is zero though. When production is increased by 6 units, then the variable cost is ₹ 48 (38 + 10). The total cost can be represented by Fig. 8.2 also. In Fig. 8.4, the quantity of production is on axis OX and the cost is on axis OY. FC is closed cost curve. VC is variable curve and TC is total cost curve. This curve represents the addition of FC and VC. TC curve starts from the original point of FC curve.

The production is 0 at point O but FC is 10. So the total cost is also 10. The difference between total cost and variable cost is equal to fixed cost. So there is equal difference between TC and VC curve. So both the curves means TC and VC curve are parallel to each other.

**Significance of Difference between the Fixed and Variable Costs**

There is the significance of difference between the fixed and variable costs in short run.

**Production decision during Depression or decision regarding Shut Down:** The demand and the price get low in short run due to crisis. The firm needs to decide whether to open its production or close. If firm closes production even then it needs to bear the rent of building, the interest in fixed capital etc. So the firm gets loss even it shut down the production in short run. Thus if in crisis time, the product’s price is as low as to equal to variable cost, the firm will resume their production. It would bear the loss of fixed cost. Firm will produce until it gets variable costs. But if the firm does not get variable cost, it will shut down its production.

**8.5 Average Cost**

The average cost is the cost of per unit of product. Average cost is total cost divided by output. It has three parts—(i) Average Fixed Cost (ii) Average Variable Cost (iii) Average Total Cost or Average Cost

- (i) **Average Fixed Cost** Average fixed cost is the fixed cost per unit. Total fixed cost is divided by the quantity of output average fixed cost that is called the quotient. Means,

$$AFC = FC / Q$$

(Here AFC = average fixed cost, FC = fixed cost, Q = quantity of output).

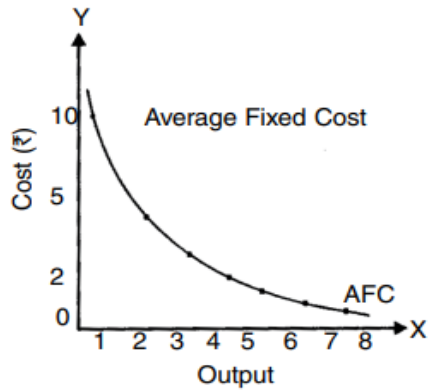
Since fixed cost remain constant, therefore, produce higher fixed cost per unit is lower.

From Table 8.4 and Fig. 8.5 we can explain average fixed cost.

Output (1)	Fixed Cost ₹ (2)	Average Fixed Cost (3) = (2 ÷ 1)
1	10	10.0
2	10	5.0
3	10	3.3
4	10	2.5

Fig. 8.5

5	10	2.0
6	10	1.7
7	10	1.4
8	10	1.2



From Table 8.4 it is clear that when one unit is produced the average fixed cost is ₹ 10. Opposite to it when 5 units are produced then the average fixed cost decreases to ₹ 2. The average fixed cost of production decreases with increase in production. Figure 8.5 AFC is the average fixed cost line. The line is sloping downward to the right. From the nature of average fixed cost falling downward it is clear that any where this curve will touch OX axis. But it is not possible because the point where AFC curve will touch OX axis in that place AFC should be zero. But AFC can never be zero because FC cannot be zero. It is proved that with increase in production average fixed cost decreases. Average fixed cost is a rectangular hyperbola because at every point total fixed cost is equal.

**(ii) Average Variable Cost**

Average variable cost is average cost per unit. Its estimation is done by dividing total variable cost with quantity of output. So, average variable cost is total variable cost divided by output means

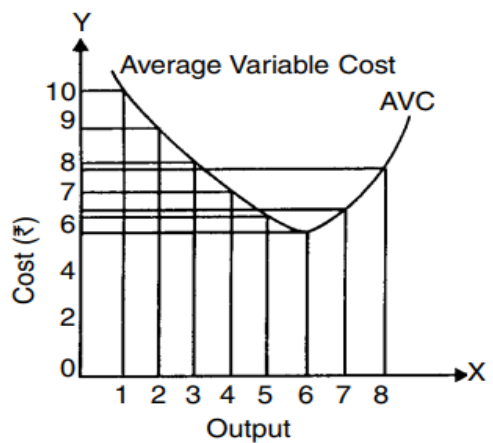
$$AVC = TVC/Q$$

(Here AVC = average variable cost, TVC = total variable cost, Q = quantity of output). Average variable costs can be explained by Table 8.5 and Fig. 8.6.

From Table 5, it is clear that with increase in output the average variable cost of production reduced to sixth unit, but from seventh unit began to lift. The cause of this is that at the starting of production the increasing return rule is applied. For this average variable cost decreases. After a limit, decreasing return rule of production is applied. That is why cost increases.

Output (1)	Total Variable Cost in ₹ (2)	Average Variable Cost (3) = (2 ÷ 1)
1	10	10
2	18	9
3	24	8
4	28	7
5	32	6.4
6	38	6.3
7	46	6.6
8	62	7.8

Fig. 8.6



**(iii) Average Total cost**

Per unit cost of an object is called the average cost. According to Ferguson, "The average cost is total cost divided by inputs." We can define average fixed cost and average variable cost; average

cost is defined as the sum. It means all the fixed and variable cost per unit is a measure of the average. It can be expressed as follows:

$$AC = TC/Q = AFC + AVC$$

(Here, AC = average cost, TC = total cost, Q = quantity of output, AFC = average fixed cost, AVC = average variable cost.)

Average cost can be clarified from Fig. 8.7. In Fig. 8.7, on OX axis output is presented and on OY axis cost is presented. AC curve shows the average cost. This curve looks like English alphabet 'U'. From this it is clear that with increase in output initially average cost decreases. After a limit it increases. The cause of this is that initially when output increases then decreasing return rule is applied. After a limit when output increases then increasing return rule or average cost rule is applied. For this, this curve looks like increases up.

Let an item of six units has a total cost of 180, The average cost per unit cost or  $180/6$  will be = 30. Table 8.6 and the average cost can be interpreted with the aid of Fig. 8.7

Output	Average Fixed Cost ₹ (AFC)	Average Variable Cost ₹ (AVC)	Average Total Cost = AFC+AVC
1	10.0	10	20
2	5.0	9	14
3	3.3	8	11.3
4	2.5	7	9.5
5	2.0	6.4	8.4
6	1.7	6.3	8
7	1.4	6.6	8
8	1.2	7.8	9

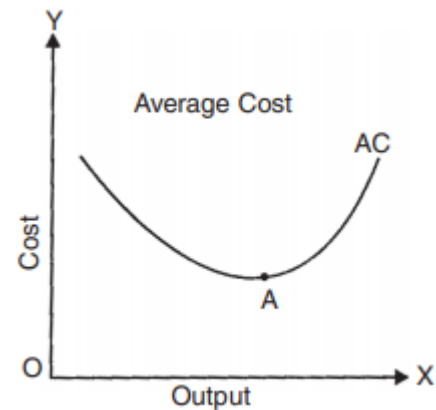


Fig. 8.7

Average costs can be explained by Fig. 8.7. In Fig. 8.7 production is shown on OX axis whereas OY shows cost. AC curve is disclosing average cost. This curve is like the English alphabet U. It appears that the average cost of production is just beginning to grow. After a limit it starts increasing becomes increase. The cause of this is in the beginning, when output growth is increasing then increasing or decreasing of the cost of return rule applies. After a range increasing or decreasing the production yield is applies the law of increasing yield and take it up the curve.

### Why is the Short Run Average Cost Curve 'U' Shaped?

Short-term average cost curve is U-shaped. The significance of this happened before the curve downward and falls. After it reaches the lowest point and then rises. U-shaped average cost curve can be interpreted to be the following three ways:

- (i) **Interaction of Average Fixed Cost and Average Variable Cost:** Average cost is the sum of average fixed cost and average variable cost. As the production increases average fixed cost decreases, the average variable cost is also reduced. So initially the average cost decreases to the point A of Fig. 8.7, the average cost curve is falling. As the average curve keeps on falling and becomes minimum at point A. Potential output in the form of the condition is thought to be fully utilized. Model output is also known as the volume of production. Increasing the volume of production beyond the average fixed cost curve is falling, but the average variable cost curve begins increasing as a result, the average cost curve and rise above it. This is because the rate of increase of the AVC, AFC is more than the rate of decline. As a result, the total effect of the increase in the average cost curve i.e., the AC comes in the form of rising to the top. Thus the average cost curve, average variable cost and average fixed cost falls down before being added to the lowest point after it reaches the next move is started.

(ii) **Application of the Law of Variable Proportions:** A Committee with any other means of production in the short decreasing- increasing production, reducing the use of resources is the growing proportion of the rule. Beginning with stable means of dynamic Notes resources are used more efficiently. Consequently, the average cost goes down. Figure 8.7 is known as a point of diminishing returns or cost of production. This proves stable means of production is being optimally utilized. This situation persists to some extent on the production and post production of a range Laws may return identical or similar costs, this situation seems to be at point A. After point A full potential use of resources seems to be a constant change, to use their resources more and tied proportion of resources is reduced. This in turn decreases the efficiency of the instrument variable. Increasing rate decreases in the production and decreasing production costs, increasing returns or the applicable law. Rising costs due to the rules applicable after point A, the average cost rises.

### 8.6 Marginal Cost

To produce an additional unit of a commodity in which the difference between the total cost is called the marginal cost. This can be explained by the following formula. Let the total cost be 135 of 5 objects and for 6 objects, the total cost be 180. Therefore, the marginal cost of the sixth object can be calculated.

$$\text{Marginal Cost} = 180 - 135 = 45$$

Therefore, the marginal cost of the sixth unit will be 45.

According to Mc Connell, "Marginal cost may be defined as the additional cost of producing one more unit of output".

According to Ferguson, "Marginal cost is the addition to total cost due to the addition of one unit of output."

Change in cost divided by the change in production or n by n -1 of the total cost of the unit down the total cost of the marginal unit cost can be determined. This can be explained by the following formula-

$$MC = \Delta TC / \Delta Q = TC_n - TC_{n-1}$$

(Here MC=marginal cost,  $TC_n = n$  the total cost amount,  $TC_{n-1} = n-1$  the total cost amount,  $\Delta TC =$  total cost changes and  $\Delta Q =$  change in volume of production.)

This should take care of the fixed cost (FC) does not change with the change in output in the  $\Delta FC / \Delta Q$  is always equal to zero. The firm's marginal cost does not affect the fixed costs. Marginal impact on the cost of the total variable cost (VC). An estimate of the total variable cost of ( $\Delta VC$ ) producing the change in the amount divided by the ( $\Delta Q$ ) change can be detected.

$$MC = \Delta TC / \Delta Q = \Delta FC / \Delta Q + \Delta VC / \Delta Q = \Delta VC / \Delta Q, \therefore \Delta FC / \Delta Q = 0$$

The concept of marginal cost can be understood with the help of Table 8.7 and Fig. .8.8:

Units of Output	Total Cost	Marginal Cost
1	20	20 - 0 = 20
2	28	28 - 20 = 8
3	34	34 - 28 = 6
4	38	38 - 34 = 4
5	43	43 - 38 = 5
6	48	48 - 43 = 5

Fig. 8.8

7	56	$56 - 48 = 8$
8	72	$72 - 56 = 16$

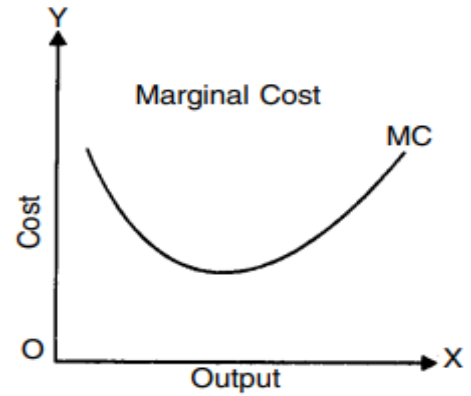


Table 8.7 suggests that to produce the first unit there is an increase of ₹ 20 in the total costs ₹ 20 will therefore be marginal cost of the first unit. Marginal cost of the second unit will be (₹ 28 - ₹ 20 = ₹ 8). Hence, the marginal cost of the third unit will be (₹ 34 - ₹ 28) = ₹ 6. This is evident from the table before the increment in production marginal cost initially decreases. Then it starts to grow. Marginal costs can be explained by Fig. 9.8. Axis OX shows production (output) and on OY axis in the figure the marginal cost of production has been revealed. MC curve is the marginal cost curve. This is U shaped curve. This is accomplished that early marginal cost of production is reducing and increasing thereafter.

**Why is MC Curve 'U' Shaped?**

Marginal cost, total cost or variable cost of producing one unit more or less reflects the change. Initially the output when the total cost and the variable cost are increased by decreasing rate. This is because increasing returns at the beginning of the production rule applies. The firm provides a variety of savings. The effect of this is, the cost of each additional unit is less than the previous unit. The MC falls so early. After a certain extent, the growth in the total cost and variable cost is minimal if MC is also minimal. Thereafter, increasing the total cost and variable cost rate increases. This is because the output of the applicable law of decreasing returns. The firm has a variety of impairments. The cost of each additional unit exceeds the cost of the last unit is also increasing the MC. MC falls in the beginning, after arriving at the lowest point increases.



Marginal cost can be defined as extra cost incurred for producing an extra unit of object.

**8.7 Relation between Average Cost and Marginal Cost**

Economic analysis, especially product pricing and relation between average cost and marginal cost of product are important concepts to be understood, and marginal cost pricing is essential. Table 8.8 explains this.

1. **When AC Falls, MC is less than AC:** If the AC curve falls below the (MC) curve will be below it because the average cost (AC), average fixed cost (AFC) and average variable cost (AVC) is the sum of the marginal costs only variable cost (VC) involves changes in the Fig. 8.9, BF makes it clear that the MC curve to reduce the cost of the variable rate both variable and fixed costs are greater than the sum of the rate of reduction. Figure 8.9 is also shows that after the point F, the additional variable costs or marginal cost increase is initiated; the average of the sum of the fixed and variable costs are falling through E, AC curve point. Both AC and MC at point E are equal.

Production	TC	FC	VC	AFC	AVC	AC	MC
0	10	10	0	∞	0	∞	-
1	20	10	10	10	10	20	10
2	28	10	18	5	9	14	8

Fig. 8.9

3	34	10	24	3.3	8	11.	6	
4	38	10	28	2.5	7	3	4	
5	42	10	32	2.0	6/4	9.5	4	
6	48	10	38	1.7	6.3	8.4	6	
7	56	10	46	1.4	6.6	8	8	
8	72	10	62	1.2	7.8	9	16	

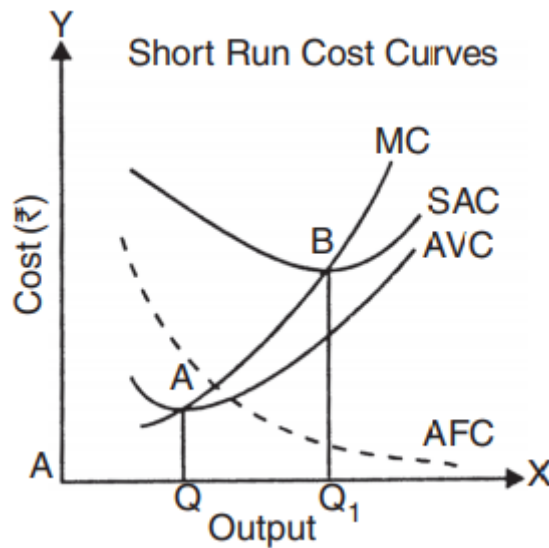
2. **When AC rises, MC is greater than AC:** If the average cost increases marginal cost also increases, but the marginal cost rises faster than the average cost. This is because of the Law of Diminishing Returns. Average Cost (AC) in the Fixed Cost (FC) reduces the rate of increase in the fraction. Marginal and average cost curves up the slope and then the MC curve is above the curve AC.
3. **MC Cuts AC at its Lowest Point:** The lowest average cost will be equal to the marginal cost. In other words, the marginal cost curve is U-shaped average cost curve at its lowest point. Table 8 is determined by the lowest average cost that is the seventh unit is 8. Seventh unit's marginal cost (MC) is the 8 rupees. Figure 8.9 is determined by the marginal cost curve (MC), Average Cost (AC) curve at the minimum point E is cut. This should take care of the marginal cost curve the average cost of the lowest point of the average cost has come before. Table 8.8 is determined by the marginal cost (MC) is the lowest point on the fifth unit, while the average cost at the lowest point is the seventh unit. The question is why is it produced? There is no economic reason. Marginal and average curve is characterized primarily mathematical.

### 8.8 Relationship of Different Cost Curves in the Short Period

The cost of short-term fixed costs (FC), Variable Costs (VC), the average fixed cost (AFC), the Average Variable Costs (AVC), average cost (AC) and marginal cost (MC) with a study of Fig. 8.10 can be done with the help of.

1. **Average Fixed Cost Curve:** It is tilted up and down. This is known as the AFC decreases as output increases. Initially drops quickly. Thereafter it slows down the rate of reduction.
2. **AVC (Average Decrease - Increase the Cost Curve):** It is falling to point A. The point A is the lowest point. AVC curve at this point is equal to MC. After that point A is pointing upwards. This is also U shaped, but also like the AC curve is much deeper.
3. **SAC (Short-Term Average Cost Curve):** It also has a U shape. The first fall, reaches a minimum point B, and then gradually increases, the minimum AC arrives at B, then the MC (SAC) equals it. Average variable cost curve (AVC), the lowest point 'A', the average cost curve (AC) to the lowest point 'B', comes before. It is important to note that the difference between average cost and average cost increases but gradually decreases. This is because the average fixed cost is equal to the fixed cost. As AFC decreases, the difference becomes less too.
4. **MC (Short-term marginal cost curve):** The marginal cost curve is also U-shaped. This means, it first Notes decreases, reaches minimum at point A, and then increases upward. This leads to decreasing average cost curve (AVC) curve, and the average cost (AC) curve is crossed at their lowest point. When AVC, and AC are falling, the MC curve is at their bottom, and when they increase the MC curve is above them.

Fig. 8.10



### 8.9 Costs in Long Run

Long is the period of time in which the instrument is subject to change. Firm has enough time to use all the tools needed to produce at minimum cost. In other words, longer the period of another aspect of the firm is planning to produce at minimum cost. Firms can make long-term plans for the future, and various methods of short-term can be chosen from, the production method which they adopt in the long run. In the long-term in a way, all methods are available, of which the firm may choose. In short, each firm operates in the short-term production, but it is made for long-term production related schemes. Therefore, a firm's production plans related to knowledge is necessary to study the long-term costs. Short and long-term cost depends on three things – (1) long-term total cost (LTC) (2) long-term average cost (LAC) (3) long-term marginal cost (LMC).

### 8.10 Long Run Total Cost – LTC

In short, we can distinguish three types in the total cost, total fixed cost (TFC), total variable cost (TVC) and short-term total cost (STC) of the same type but in the long run total cost (LTC). Long-term total cost of the minimum cost at which each level can be produced.

According to Leibhafasky, "The long run total cost of production (LTC) is the least possible cost of producing any given level of output when all inputs are variable."

A certain amount of objects in the long run a firm can produce at minimum cost. This is because the firm has sufficient time in which it (i) can choose the ideal size plant (ii) Least Cost Factor Production.

It implies that short-term total cost will be less than or equal to the total cost. But the long-term costs never cost more than short-term. This fact can be explained by the following formula-

$$LTC \leq STC$$

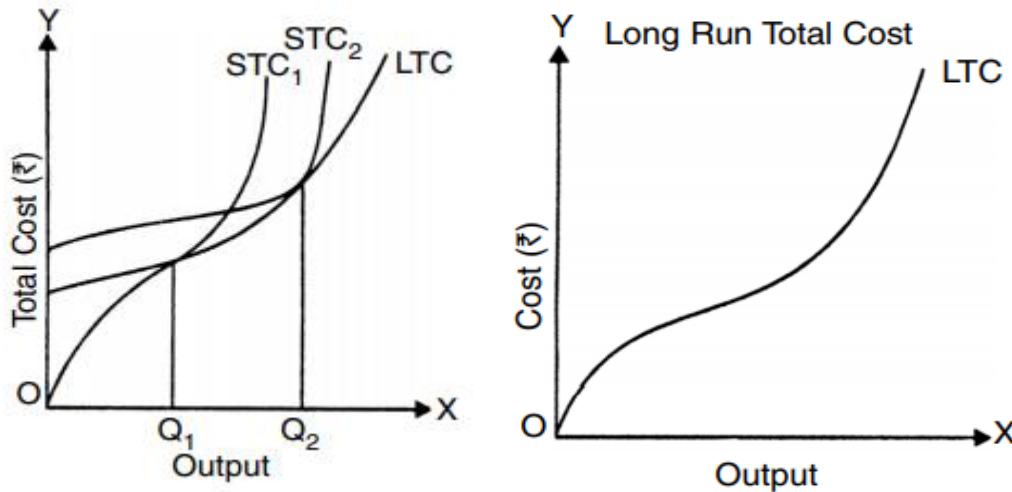
It will read as – Long Term Total Cost (LTC) will either be less than (<) or equal to (=) short term total cost (STC).

Long-term total cost curve at the minimum cost of production reflects various quantities. Therefore, it is the curve at a point short of the total cost to the touch line. This can be explained by Fig. 8.11. In Fig. 9.12 STC1 and STC2 in two different sizes of plants is a short-term total cost curve. Long-term total cost (LTC) minimum points and the curve consisting of various short-term cost curve is earmarked. Long-term cost is the minimum cost of production of a certain quantity of plants are all available to choose from. The total cost of long-term total cost curve is tangent to the curve that is why, the curve LTC, envelopes curve STC.

Fig. 8.11

Fig. 8.12





In Fig. 8.12, long-term total cost curve (LTC) is shown. This curve is in the shape of inverted 'S'. The Notes following are the main features of the curve:

- (i) In Fig. 8.12, the total long-term cost curve starts from the origin point O, while the short-term cost curve of Fig. 8.11 is initiated from any point of the axis OY. The significance of this is due to variable costs in the long-term, the production volume is zero, and then the total cost is zero, while the short-term costs are never zero.
- (ii) Long-term total cost curve slope is positive. This means a large amount of the production costs are high.
- (iii) LTC curve at first decreases then increases at the same rate and the rate is increasing

### 8.11 Long Run Average Cost Curve or Envelope Curve

Long-term average cost, in the long run to generate various quantities of a commodity is the lowest possible cost per unit. In the words of Mansfield, "The long-run average cost curve is that curve which shows the minimum cost per unit of producing each output level, corresponding to different scales of productivity."

It is estimated when long-term total cost is divided by the quantity of production. The minimum average cost is received at that time, when all resources are dynamic and can be built to any size of the plant.

In the long run, each firm can use different sized plant. This fixed amount of production is better suited to a particular type of plant. The average cost of production with the help of the plant is minimal. Changes in production with demand - will change with the size of the plant. Each plant has a short-term average cost curve (SAC). With it we can predict long-term average cost curve (LAC).

Suppose a firm can use two types of plants. Its short-term cost curve is a small plant  $SAC_1$ . There is a big plant its short-term cost is  $SAC_2$ . Of these two the firm is planning to invest in the most profitable plant. On various quantities of production both short-term cost curves can be determined with the aid of various quantities of output produced by the plant from which the average cost will be minimal.

In Fig. 9.13 Two types of plants appear to have been short-term average cost curves. Small plant's average cost curve is  $SAC_1$  while large plant's average cost curve is  $SAC_2$ . If the firm wants to produce quantities of OM it will select the smaller plant. The plant produces the lowest average unit costs with the help of OM on BM, as known from  $SAC_1$ . By contrast, OM unit to produce large plant, the average cost will rise to AM. But if the firm is to produce ON the unit will use the larger plant.

Minimum average cost of production of the plant by the ON unit can be used by the CN, ON by the plant to produce smaller amounts DN will increase the average cost. If we take the value of the firm's plant has lots of different sizes Each level of the minimum cost of the plant to reveal the long-

term average cost curve (LAC) will be called. Therefore, The production will be done by both small plant ( $SAC_1$ ) and large plant ( $SAC_2$ ) on the minimum average cost OM and ON respectively.

Fig. 9.13

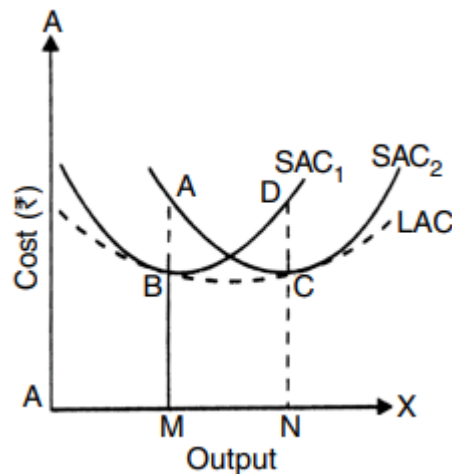
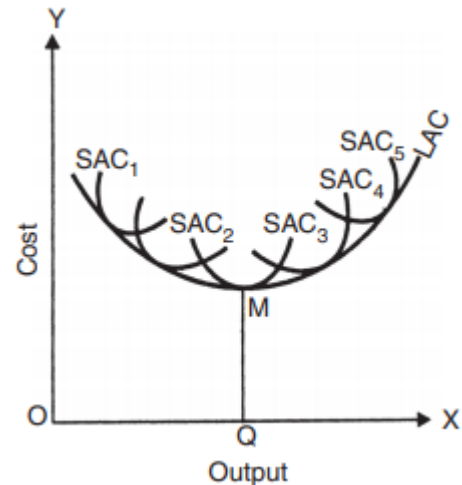


Fig. 9.14



In Fig. 9.14, long-term average cost (LAC) is shown. Long-term average cost curve, the average cost of each short course is tangent to the curve at some point. The long-term average cost touch point short of the minimum point M to the left of the parts is below average cost. This is because the minimum point M to the long-term average cost (LAC) curve has a negative slope. The short-term average cost (SAC) will have a negative slope of the curve, because the touch point on the two parts of the curve will be going up. After point M, the long-term average cost curve is rising up. Point M in the long term and short term minimum average cost is a minimum average cost-equal to each other.

Therefore, it should be noted that, as stated by Holland, "The lowest point on each SAC curve, however, may not be the point of tangency with the LAC Curve. The lowest point on an SAC curve is tangent to the LAC curve only at the lowest point of the LAC curve."

Therefore, at the M point short of the ideal plant is used.

### Different Names

Long-term average cost curve is called by the following names-

1. **Envelope Curve:** This curve is called the envelope curve because it is able to cover all the short-term average cost lines. This means that the average cost in the long-term cannot exceed the average cost. Full Potential use of resources in the long run may be inseparable. The long-term average cost curve will encompass SAC curve. It will not cut these curves for going up.
2. **Planning Curve:** Average cost curve is also known as long-term planning curve. With the help of this curve firm can plan, for which plants used to produce various quantities that can be produced at minimum cost. In the words of Koutsoyiannis, "The long-run average cost curve is a planning curve, in the sense that it is a guide to the entrepreneur in his decision to plan the future expansion of his output."

### Why is LAC Curve U-Shaped?

Long-term cost curve is much like the English alphabet the 'U'. This implies that when a firm is scheduled to begin production LAC is falling from the top downward. At this stage of LAC decreases in production volumes grow. LAC remains constant thereafter. LAC after a certain amount of production would start to move. Average long-term cost due to economies and diseconomies of the scale of production is also U-shaped.

1. **Economies of Scale:** Economies of scale are received by the downfall of LAC curve of a firm which results in the increment in the production.
  - (i) **Division and Specialisation of Labour:** According to Left witch, "A large number of plant specialization workers who work reasonably to have more opportunities." Work due to large scale production of can be divided into smaller parts. Workers in each part of the work to be individualized. Workers acquire skills in that particular job, which is an increase in efficiency. Further specialization in a particular job saves time and capital. Division of labour has opened more opportunities for new developments. Consequently, the production cost per unit decreases.
  - (ii) **Technical Economies:** Long-term increase in the scale of production is achieved as a result of a variety of technical avoid using automatic machines. Production costs can be reduced by advanced technology. So technically the average cost saving decreases.
  - (iii) **Economies of Indivisibility:** According to J.S. Bain as a result of the indivisibility of the means of production to increase the average cost goes down. Several modes of production is required to use a certain amount, whether the output is low or high. For example, a production manager of a large firm can use it to its full potential. However, the Production Manager of a small firm cannot use the efficiency of the tenth part. Therefore, as the production volume increases unshared resources are used to their full efficiency and average cost decreases.
2. **Diseconomies of Scale:** Long-term average cost rose to the top of the main causes of the increase in production is due to the scale of the losses. And to coordinate the efficient management of a firm's efficiency has its own limitations. These limits are called scale losses. As the scale of production in a firm is contributed to a growth, division and specialization of tasks through the manager become more efficient. But after a limit increases the difficulties associated with managing the firm. The managers' business daily tasks gradually move away. This in turn decreases the efficiency of production and operation of various departments. The responsibility is to pass judgment on others. The expense for paper work, travel expenses, telephone bills increase. Occasionally coordination in various decision-making does not have plans to employees. As a result, production decreases and average costs increase.

## 8.12 Long Run Marginal Cost

The difference which comes in the total cost in the long-term in producing one object less or more is termed as long-term marginal cost.

In the words of Ferguson, "Long-run marginal cost is the addition to total cost attributable to an additional unit of output when all inputs are operationally adjusted."

Long-term marginal cost curve is explained by Fig. 8.15. LMC is the long-term marginal cost curve. It first falls to become minimum and then rises.

- (i) **Relation between Long Run and Short Run Marginal Cost:** The marginal cost curve determines Notes a short, decreasing - increasing changes in the volume of an object to produce a more or less consequent impact on total cost. In contrast, it is determined by long-term cost curve, changes in the modes of production of a commodity, to a greater or lesser amount, consequent impact on the total cost.

Fig. 8.15

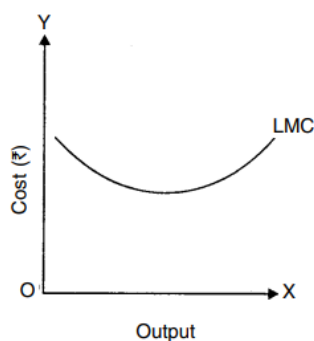
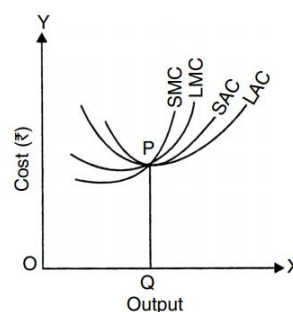


Fig. 8.16



In the long run we all know that all instruments are subject to change. Short-term marginal cost curve is determined by the marginal cost curve, but it does not envelops them. Long-term marginal cost of production and short-term marginal cost (SMC) at that level (LMC), must be equal. SMC regarding the long-term average real cost curve (LAC) is a tangent. When a firm develops an appropriate scale of the plant for the production of the object then, short-term and long-term marginal costs become equal to cost curve. As it is clear from Fig. 8.16 on the optimal product OQ,  $SMC = LMC$ . OQ output at the optimum level will be lower, then the SMC and LMC will be more. In contrast if the output is more than level OQ then SMC will be more and LMC in comparison to SMC will be less. LMC in comparison to SMC will be more flatter.

- (ii) **Relation between LMC and LAC:** LMC, and LAC relationship is evident from Fig. 8.16. The figure suggests that in long-term LMC and LAC hold the same relation as in short-term. When the LAC drops, LMC is less. LAC at the minimum point P is equal to LMC. The figure concludes that LMC curve in comparison with LAC curve falls down with a greater speed and even goes up with a greater speed. Optimum production point P,  $SAC = SMC = LAC = LMC$ .

### 8.13 Modern Theory of Cost Curves

The modern theory of cost curves is rendered by the economists like Stigler, Andrews, Sargent Florence, Friedman etc. As per Traditional Theory of Cost Curve, the cost curves are U-shaped, means with the increase in production, the cost of production will decrease.

According to the modern theory of the long-term costs are mainly two types:

- 1. Production Cost and 2. Managerial Cost:** As a result of the continuous increase in production, production cost decreases. In contrast, on a large scale production, managerial costs might increase. But the reduction in production cost is higher than the increase in managerial costs. With the increase in production in the long term - long-term average cost curve decreases. In the long run, each firm uses different sized plants. A certain production volume is appropriate for a particular type of plant. Each plant has a short average curve. With its help we can estimate the LAC. Suppose a firm can use four types of plant size. The short-term cost curve is  $SAC_1$ ,  $SAC_2$ ,  $SAC_3$  and  $SAC_4$ . According to the modern theory of the cost curve, it appears that in long-term cultivation, a firm normally produces two third of the plant's efficiency. Efficiency cannot use the total output. From each plant's production capability related to SAC, LAC can be estimated. Figure 8.17 depicts the long-term LAC. Production capabilities' related output points of various short-term cost curves like  $SAC_1$ ,  $SAC_2$ ,  $SAC_3$  and  $SAC_4$ . give long-term average cost curve.

Figure 8.17

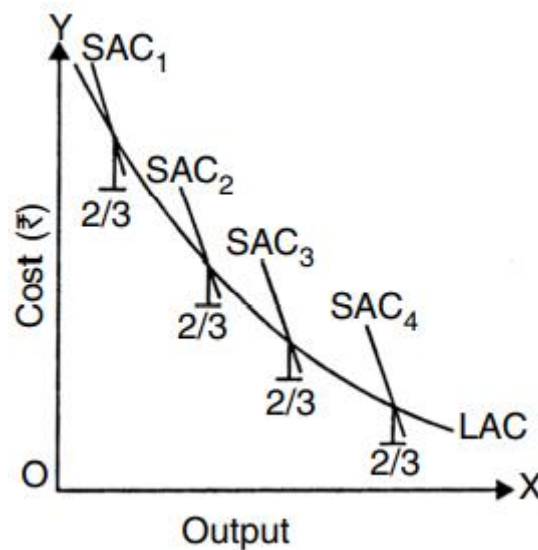
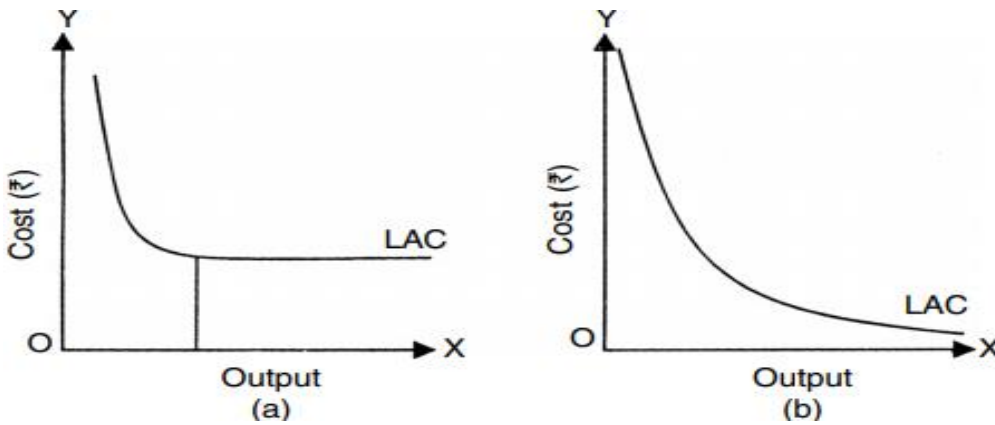


Figure 8.17 is determined by two main features of the long-term average cost curve-

- (1) No long-term average cost curve is U-shaped.

(2) Long-term average cost curve is the envelope curve. The short-term cost curve intersects the cover in place.

Figure 9.18



According to modern theories LAC as shown in Fig. 8.18 (a), and (b), is either L-shaped or an inverted J-shaped.

1. L-Shaped LAC: Figure 8.18 (a) shows L-shaped LAC. It is L shaped because in long-term, there is a minimum scale for production, in which all links of savings are achieved. As a result, the cost of production after minimal ideal level is stable.
2. Inverted J-Shaped LAC Curve: Figure 8.18 (b) shows the reverse J-shaped the long-term average cost curve. Long-term average cost curve is inverted J-shaped, because with the increase in the Notes production cost of production decreases.

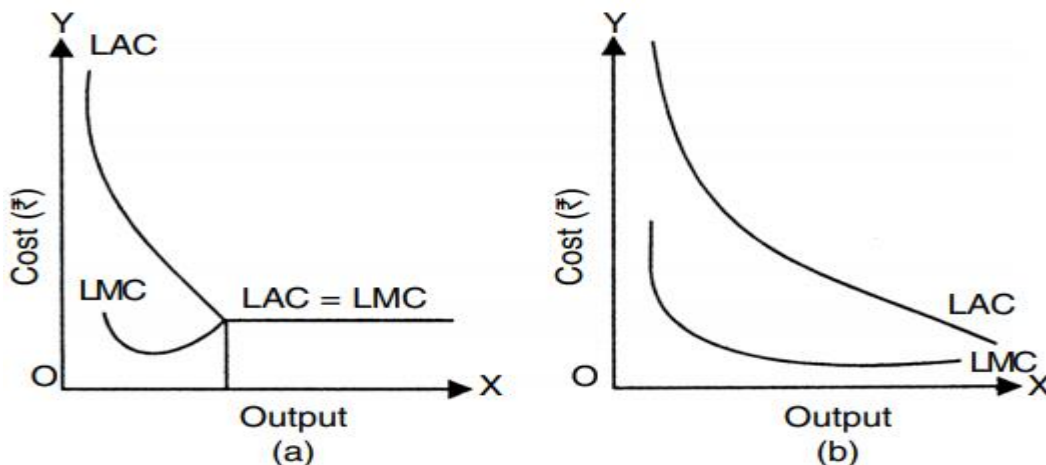
According to the modern theory, the cost relating to the data available, it certainly cannot be based on the long-term average cost curve is L-shaped or inverted J-shaped. But it can certainly be said that LAC, is not U shaped. It is U-shaped when it will be in a position to produce high-scale production may suffer losses. But in real life scale to production scale of losses is not high.

### 8.14 Long Run Marginal Cost Curves

According to the modern theory of the long-term marginal cost curve LAC relative size is the size of the type. LMC curve and the LAC curve relationship is shown by Fig. 8.19.

- (i) Figure 8.19 (a) shows that the LAC curve is L-shaped The LMC is also stable and always LAC curve is below the curve. But the LAC curve is stable LMC curve is stable and coincides with LAC curve.
- (ii) Figure 8.19 (b) shows if LAC is in inverted J-shape when LAC curve is falling downwards, LMC is also falling downwards and the LAC, LMC curve while falling down is under the fallen part of LAC.

Fig. 8.19





Express your views on the long-term marginal costs.

### 8.15 Cost and Learning Curves

The learning curve is an important modern concept according to which cumulative experience in the production of a product over time increases efficiency in the use of inputs such as labour and raw materials and thereby lowers cost per unit of output.

K.J. Arrow, one of the pioneers in putting forward this concept calls it "Learning by doing". The process by which producers learn from experience. The extent to which average cost of production falls in response to increase in output. The equation of learning curve can be expressed as:

$$C=AQ^b$$

(where C is the cost of input for the Q<sup>th</sup> unit of output produced and A is the cost of the first unit of output obtained).

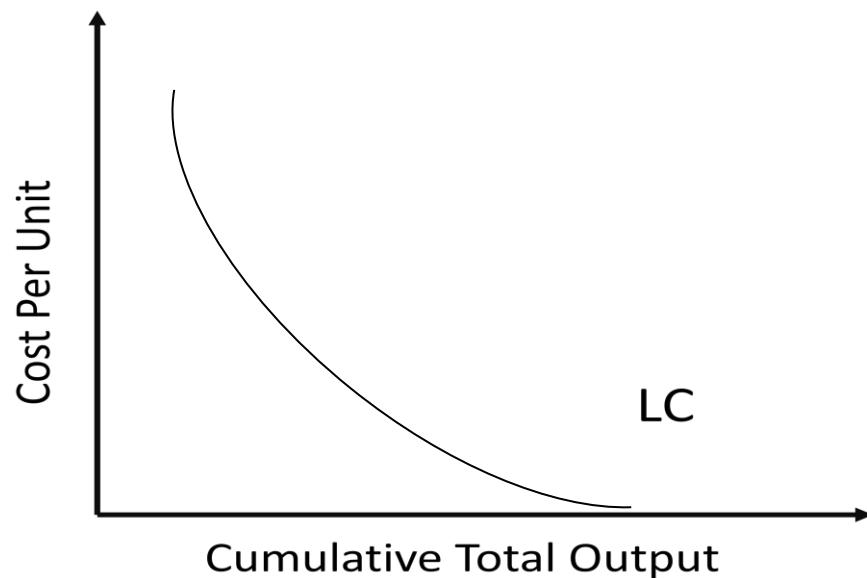
Since increase in cumulative output leads to a decrease in cost, "b" has a negative value.

Logarithmic form of this equation is :

$$\log C= \log A + b \log Q$$

(where b is the slope of the learning curve Figure 8.20).

Figure 8.20

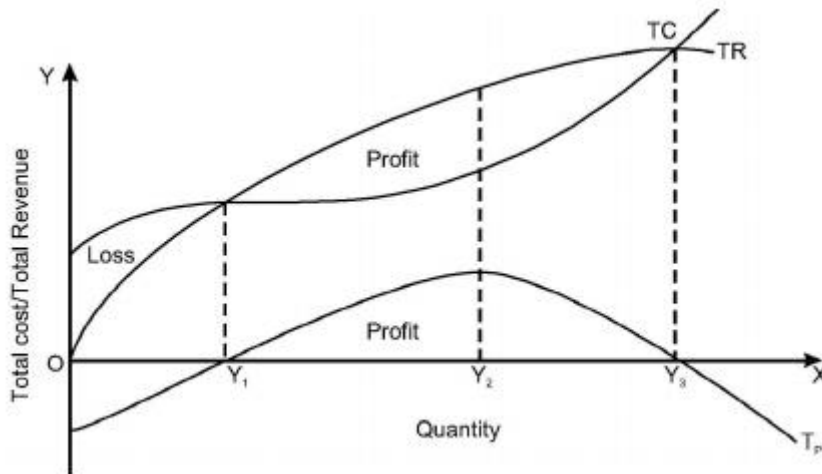


### 8.16 Break-even Analysis

Many of the planning activities that take place within a firm are based on anticipated level of output. The study of the interrelationship among firm's sales, costs and operating profits at various level of output levels is known as cost-volume profit analysis or break-even analysis. This analysis is often used by business executive to determine the sales volume required to break even and total profits and losses at different output levels. It is assumed that the cost and revenue curves are non-linear as shown in Figure 8.21. Total revenue is equal to the number of units of output sold multiplied by the price per unit. The concave form of revenue curve implies that the firm can sell additional units of output only by lowering the price. The total cost curve is based on traditional approach of

relationship between cost and output in short-run. Graphical Representation of Break-Even Analysis by fig. 8.21

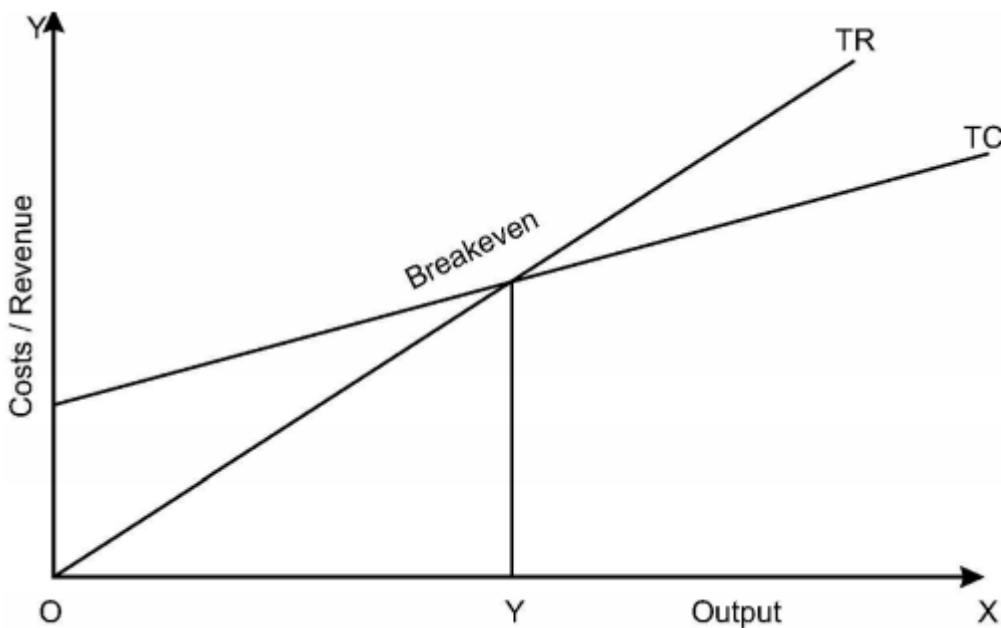
Figure 8.21: Break-even Analysis by using Non-linear TC and TR Curves



The difference between total revenue and total cost at any level of output represents the total profit or loss that will be realised. The total profit (TP) at any level of output is given by vertical distance between the total revenue (TR) and total cost (TC) curves. A breakeven situation (zero profit) occurs whenever total revenue equals total cost. In Figure 8.20, breakeven condition occurs at two different output level -  $Y_1$  and  $Y_3$ . Below an output level  $Y_1$  losses will incurred because  $TR < TC$ . Between  $Y_1$  and  $Y_3$  profits will be obtained because  $TR > TC$ . An output level above  $Y_3$ , losses will occur again because  $TR < TC$ . Total profit are maximised within the range of  $Y_1$  to  $Y_3$ , where the vertical distance between the TR and TC curves is greatest, that is at an output level of  $Y_2$

For practical decision making the non-linear revenue output and cost output relationship of economic theory are generally replaced by linear functions. The breakeven analysis based on linear function is shown in Figure 8.22 TR is a straight line assuming that firms change a constant selling price  $P$  per unit of output. In case of cost curve, total cost is taken as sum of fixed cost which are independent of the output level plus the variable costs which increases at a constant rate per unit of output. In this case the breakeven analysis occurs at point  $Y_b$  in Figure 8.22 where TR and TC intersect. If a firm's output level is below this breakeven point that is If  $TR < TC$ , it incurs operating losses.

Figure 8.22: Break-even Analysis by using Linear TC and TR Curves



If firm's output level is above this breakeven point that is if  $TR > TC$  it realises operating profits. Algebraically, it can be defined as: Total revenue is equal to the selling price per unit times the output level.

$$TR = P \times Y$$

Total cost is equal to fixed cost plus variable cost, where the variable cost is the product of the variable cost per unit times the output level.

$$TC = TFC + AVC \times QY$$

Now break-even output level is that level where profit is zero.

$$TR = TC.$$

### **8.17 Economies of Scale**

A larger plant will lead to lower per unit cost in the long run. However, beyond some point, successive larger plants will mean higher average costs. Exactly, why is the long run ATC curve U-shaped, needs further explanation.

It must be emphasised, first of all, that the law of diminishing returns is not applicable here for it presumes that one resource is fixed in supply and also that in the long run resource prices are variable. Also, we assume that resource prices are constant in the short run. The U-shaped long run average cost curve is explainable, thus, in terms of "economies and diseconomies" of large scale production.

Economies and diseconomies of scale are concerned with the behaviour of average cost curve as the plant size is increased. Economies of scale explain the down sloping part of the long run AC curve. As the size of the plant increases, LAC typically declines over some range of output for a number of reasons. The most important is that, as the scale of output is expanded, there is greater potential for specialisation of productive factors. This is most notable with regard to labour but may apply to other factors as well. Other factors contributing to declining LAC include ability to use more advanced technologies and more sophisticated capital equipment, managerial specialisation, opportunity to take advantage of lower costs for some inputs by purchasing larger quantities, effective utilisation of by-products, etc.

But after sometime, expansion of a firm's output may give rise to diseconomies, and therefore, higher per unit cost. Further expansion of output beyond a reasonable level may lead to problems of over crowding of labour, managerial inefficiencies, etc., pushing up per unit cost.

All these are examples of internal economies and diseconomies of scale arising due to the firm's own expansion. According to Marshall, external economies and diseconomies of scale may arise due to the expansion of industry as a whole.

### **8.18 Economies of Scope**

According to the concept of economies of scale, cost advantages follow from the increase in volume of production or what is called the scale of output. According to the concept of economies of scope, such cost advantages may follow from variety of output-product diversification within the given scale of plant. If the same plant can produce multiple products, there is the scope for a lot of cost savings because of joint use of inputs. Broad banding policy enables manufacturers to exploit economies of scope through product diversification.

Example: Escorts produces four wheelers from the same plant for two wheelers with small adjustments. Instead of increasing the scale of production of an existing product, the firm can now add new and newer products if the size and type of plant allow this scope. In this process, the firms will have access to scope economies in place of scale economies. In certain processes, the firm can plan wisely to exploit both types of economies simultaneously.

### **Summary**

In short-term the demand and price of commodity decreases. The firm has to take the decision to continue production or stop it during the recession. In the short-term after stopping production, the firm still has to pay fixed costs such as building rent, interest, etc. Therefore, at the time of recession, the decline in commodity prices - is the same as the cost increases. The firm will opt only for continuing production. It will bear loss of fixed costs. Firm will continue production till the time it doesn't get variable costs. But if the firm will not receive variable costs then it will stop the



production. Costs enter into almost every business decision and it is important to use the right analysis of cost. Different business problems call for different kinds of costs such as future and past costs, incremental and sunk cost, out of pocket and book costs, replacement and historical costs etc. Fixed costs are those costs which do not vary with the change in the level of output in the short run. Variable costs change with output levels. The short run is a period of time in which the output can be increased or decreased by changing only the amount of variable factors such as labour, raw materials, chemicals, etc. Long run, on the other hand, is defined as the period of time in which the quantities of all factors may be varied. There are short run average fixed cost and variable cost as well as long run average costs. Total cost is the sum of total of the explicit plus implicit expenditure. Average cost is the cost per unit of output. Marginal cost is the extra cost of producing one additional unit. Economies of scope are reductions in average costs attributable to an increase in the number of goods produced.

### **Keywords**

**Economic Cost:** Pay by rupees.

**Private Cost:** The cost used by production.

**Abandonment costs:** Costs incurred for disposing of the fixed assets, when any plant is to be permanently closed down.

**Book costs:** Costs that do not require current cash expenditure.

**Direct costs:** Costs which can be directly attributed to the production of a unit of a given product.

**Explicit costs:** Expenses which are actually paid by the firm (paid-out-costs).

**Implicit costs:** Theoretical costs which go unrecognized by the accounting system.

### **Self Assessment**

1. Generally speaking the "cost" is the term used for ..... cost.
2. Opportunity cost is the cost of other outstanding ..... which is discarded.
3. Under the explicit costs, opportunity costs include the costs .....
4. Financial cost is different from ..... cost.
  - A. ledger Cost
  - B. curve
  - C. straight
  - D. social
5. Social cost is different from ..... cost.
  - A. ledger Cost
  - B. social
  - C. curve
  - D. personal
6. The implicit cost of production is the ..... cost of ownership and self cost.
  - A. factors
  - B. social
  - C. products
  - D. money
7. The difference between social and personal cost is .....
  - A. external cost
  - B. implicit cost
  - C. private cost
  - D. rupee cost
8. The total fixed cost does not vary with quantity of production .....

- A. fixed
  - B. variable
  - C. changed
  - D. unchanged
9. The total cost divided by the amount of production gives average cost.
10. Average fixed cost curve is a Rectangular Hyperbola.
11. In production, the increase in the total cost which occurs due increment of one unit in production is known as Average Cost.
12. Long-term total cost is that minimum cost at which each level of production can take place.
13. Economies to scale refer to
- A. the fact that in the long run, fixed costs remain constant as output increases.
  - B. the range of output over which the long-run average cost falls as output increases.
  - C. the point at which marginal cost equals average cost.
  - D. a feature of short-run production functions but not long-run production functions.
14. When long-run average costs decrease as output increases, there are
- A. economies of scale.
  - B. constant marginal costs.
  - C. diseconomies of scale.
  - D. constant returns to scale.
15. "Diseconomies of scale" occur in
- A. the short run, but not the long run.
  - B. the long run, but not the short run.
  - C. both the short run and the long run.
  - D. neither the short run nor the long run

### Answer for Self Assessment

1. Monetary    2. options    3. contain ed    4. A    5. D
6. A    7. A    8. C    9. True    10. True
11. False    12. True    13. B    14. A    15. B

### Review Questions

1. What do you understand by the actual costs?
2. What do understand by the economic costs?
3. Social cost is different from individual cost. Explain it.
4. Describe the relationship between Average cost and Marginal cost.
5. What type of cost is depreciation – Direct cost or Indirect cost? Support your argument with reasons.
6. What types of costs would you incur if you have to organise a musical concert in your city?



### **Further Readings**

1. Microeconomics – Robert S. Predik, Daniel L. Rubenfield and Prem L. Mehta, Pearson Education, 2009, PBK, 7th Edition.
2. Microeconomics – David Basenco and Ronald Brutigame, Wiley India, 2011, PBK, 4<sup>th</sup> Edition.
3. Microeconomics – Shipra Mukhopadhyay, Annie Books, 2011.

## Unit 09: Perfect Competition

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### Objectives

After this lecture, you would be able to

- understand the meaning and concept of market.
- analyze the various types of markets.
- understand the concept and characteristics of perfect competition market
- analyze the equilibrium condition of perfect competitive market in short run and long run.

### Introduction

*Meaning of Market:* In general, the word 'market' refers to a place or an area where buyers and sellers generally meet so as to buy and sell a particular commodity. In Economics, we make use of the term 'market' in a different sense. It refers to a particular commodity that is sold and purchased rather than a place or an area. For example, cotton market, tea market etc. Any effective arrangement for bringing buyers and sellers into contact with one another is defined as a market in economics. The essentials of a market are the following:

1. Market does not confine to a particular place but the whole area wherein buyers and sellers of a commodity are spread over;
2. There must be buyers and sellers and for that physical presence is not necessary. In modern days, we sell goods through websites or electronic shopping markets or through telephonic media;
3. There must be a commodity which is bought and sold; and
4. There should be free interaction between buyers and sellers so that only one price is agreed upon for the commodity.

### FORMS OF MARKET

Economists have classified markets on the basis of:

- (a) the number of buyers and sellers of the commodity;
- (b) the nature of the commodity produced by the sellers;
- (c) degree of freedom in the movement of goods and factors; and
- (d) whether knowledge on the part of the buyers and sellers regarding prices in the market is perfect or imperfect.

On the basis of these criteria, economists have distinguished between four basic forms of the market:

1. Perfect competition
2. Monopoly
3. Monopolistic competition
4. Oligopoly

These market forms are discussed as under.

### 9.1 PERFECT COMPETITION

A market is said to be perfect when there is a large number of buyers and sellers of the product and there is a complete absence of rivalry among the firms. The firms sell products which are homogeneous.

#### Features of Perfect Competition

The important features of this type of market are summarized as follows:

1. *Large number of buyers and sellers.* The number of buyers and sellers is so large that no individual buyer or seller can influence the market price and output by his independent action. The reason for this is that every buyer and seller purchases or sells a very insignificant amount of the total output.
2. *Homogeneous products.* A firm produces a product which is accepted by customers as homogeneous or identical. There is no way in which a buyer can distinguish products sold by different sellers. The assumptions of large numbers of sellers and buyers and of product being homogeneous indicate that a single firm is a price-taker. Demand curve or average revenue curve is infinitely elastic, i.e., demand curve is horizontal straight line parallel to output axis. Therefore, a firm under perfect competition sells any amount of output at the prevailing market price.
3. *Free entry and exit of the firms.* Every firm is free to join or leave the industry. If the industry is making profits new firms can enter the market to share these profits. Similarly, if the industry suffers losses the individual firms can quit the market.
4. *No government regulation.* There is no government interference in the market in the form of taxes, subsidies, rationing of essential goods etc.
5. *Uniform price.* At a particular time uniform price of a commodity prevails all over the market.

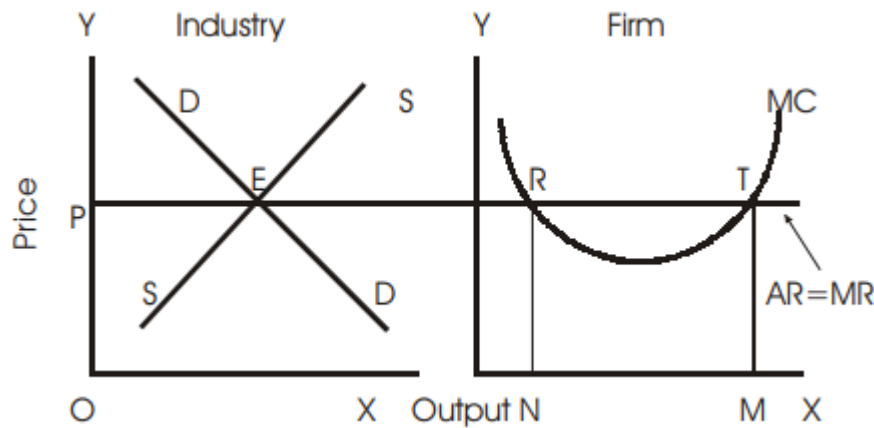
The above five conditions are related to pure competition. Perfect competition requires the following additional assumptions/conditions to be fulfilled.

6. *Perfect knowledge of market conditions.* Buyers and sellers have full knowledge of the price at which transactions take place in the market.
7. *Perfect mobility of the factors.* Factors of production can freely move from one firm to another in the industry. They can also move from one job to another and in this way there is a scope for learning newer skills.
8. *Absence of selling and transportation costs.* Selling and other promotional costs are not present in perfect market.

### 9.2 PRICE AND OUTPUT DETERMINATION UNDER PERFECT COMPETITION

Equilibrium price under perfect competition is determined not by the seller/firm but by the industry (all firms together). The price determined by the industry is accepted by all firms. Thus, individual seller/firm is a price taker under perfect market. This is explained with the help of diagrams below:

Fig. 9.1



In the diagram 9.1 (Industry), DD and SS are the demand and supply curve respectively. The equality point of SS and DD is E, which is the equilibrium point. At this point, price OP is determined. OP price will be accepted by all firms in the perfect market and sell any amount of good at this price. Hence, average revenue curve faced by an individual firm is horizontal straight line parallel to the x-axis or perfectly elastic. Now, the firm's task is to determine equilibrium output.

It is to be remembered that any seller will sell or produce that level of output where its profit is maximized. And profit is maximized where the following two conditions are satisfied:

1.  $MR = MC$
2. MC curve cuts MR from below.

In the second diagram 9.1 (Firm), it is seen that there are two equilibrium points-R and T, because at these points the first condition is met. However, point T satisfies both conditions. Hence the firm will be in equilibrium at point T and produce OM level of output at OP price. The firm will not stop producing at point R because beyond this point  $AR > MC$  and therefore, there is still enough scope to earn profits and maximize it. Similarly any output level greater than OM will bring losses to the firm as  $MC > AR (=MR)$  beyond point T.

In the short run, there are three possibilities for a firm. These are - (a) when a firm makes abnormal profits ( $AR > AC$ ); (b) when it earns only normal profit ( $AR = AC$ ); and (c) when it incurs losses, but does not shut down. Firms will operate till they are able to get variable costs. They will shut down their business when they cannot earn even average variable costs of production.

### 9.3 Short-Run Equilibrium of the Firm and Industry:

#### Short-Run Equilibrium of the Firm:

A firm is in equilibrium in the short-run when it has no tendency to expand or contract its output and wants to earn maximum profit or to incur minimum losses. The short-run is a period of time in which the firm can vary its output by changing the variable factors of production. The number of firms in the industry is fixed because neither the existing firms can leave nor new firms can enter it.

#### Assumptions:

#### This analysis is based on the following assumptions:

1. All firms use homogeneous factors of production.
2. Firms are of different efficiency.
3. Cost curves of firms vary from each other.
4. All firms sell their products at the same price determined by demand and supply of the industry so that the price of each firm,  $P$  (Price) =  $AR = MR$ .
5. Firms produce and sell different quantities.

The short-run equilibrium of the firm can be explained with the help of marginal analysis and total cost- total revenue analysis.

**(1) Marginal Cost-Marginal Revenue Analysis:**

During the short run, a firm will produce only if its price equals the average variable cost or is higher than the average variable cost (AVC). Further, if the price is more than the average total costs (SAC or ATC), i.e.,  $P - AR > SAC$ , the firm will be earning supernormal (or abnormal) profits. If price equals the average total costs, i.e.,  $P = AR = SAC$ , the firm will be earning normal (or zero) profits or breaks-even. If price falls even a little below AVC, the firm will shut down because in order to produce it must cover at least its AVC during the short-run.

So, during the short-run under perfect competition, a firm is in equilibrium in all the above noted situations. We illustrate them diagrammatically as under.

**Supernormal Profits:**

The firm will be earning supernormal profits in the short-run when price is higher than the short-run average cost, as shown in Figure 2 (A). The firm is in equilibrium at point  $E_1$  where  $SMC=MR$  and  $SMC$  cuts  $MR$  from below.  $OQ_1$  is the equilibrium output and  $OP (=Q_1E_1)$  is the equilibrium price.  $Q_1S$  are the short-run average costs.

$SE_1 (=Q_1E_1-Q_1S)$  is the profit per unit.  $TS$  (equilibrium output) (per unit profit) =  $TSE_1P$  area is the supernormal profits.

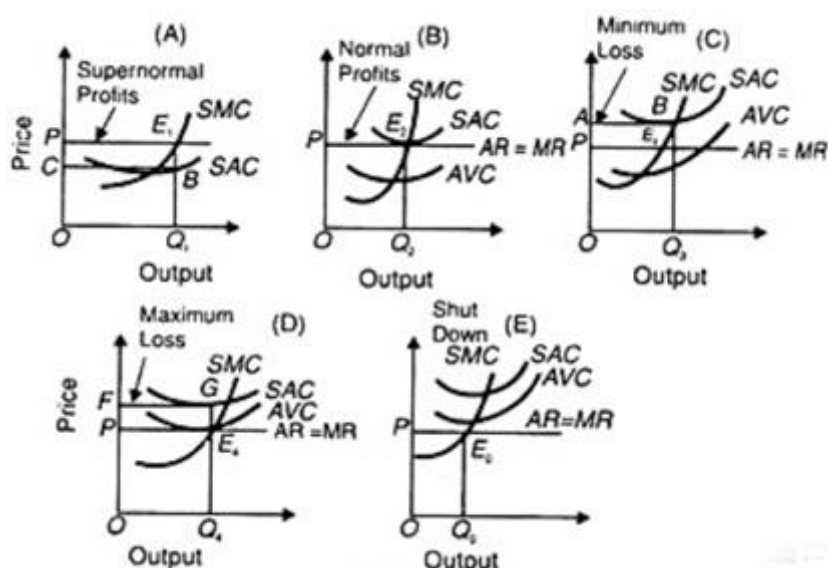
**Normal Profits:**

The firm may earn normal profits when price equals the short-run average costs as shown in Figure 9.2 (B). The firm is in equilibrium at point  $E_2$  where  $SMC = MR$  and  $SMC$  cuts  $MR$  from below.  $OQ_2$  is the equilibrium output and  $OP (=Q_2E_2)$  is the equilibrium price. The firm is earning normal profits because  $Price = AR = MR = SMC = SAC$  at its minimum point  $E_2$ .

**Minimum Loss:**

The firm may be in equilibrium and yet incur a loss when price is less than the short-run average costs, as shown in Figure 2 (C). The firm is in equilibrium at point  $E_3$  where  $SMC = MR$  and  $SMC$  cuts  $MR$  from below.  $OQ_3$  is the equilibrium output and  $OP (=Q_3E_3)$  is the equilibrium price. Since the average costs  $Q_3B$  are higher than the price  $Q_3E_3$ ,  $E_3B$  is the loss per unit ( $Q_3B-Q_3E_3$ ). The total loss is  $PE_3 \times E_3B = PE_3BA$ . The firm will continue to produce  $OQ_3$  output so long as it is covering its average variable cost plus some of its fixed cost.

Figure 9.2

**Maximum Loss:**

If the price fig. 9.2 falls to the level of AVC, the firm will just cover its average variable cost, as shown in figure 2 (D). It is indifferent whether to operate or close down because its losses are the maximum.

It will pay such a firm to continue producing  $OQ_4$  output and incur  $PE_4GF$  losses rather than close down in the short-run.  $OQ_4$  is the shutdown output because if the price falls below  $OP$ , the firm will stop production.  $E_4$  is, therefore, the shutdown point.

### Shut Down Stage:

Figure 9.2. (E) shows a firm which is unable to cover even its AVC at  $OQ_0$  level of output because the price  $OP$  is below the AVC curve. It must shut down. Thus in the short-run, there are firms which earn normal profits, supernormal profits and incur losses.

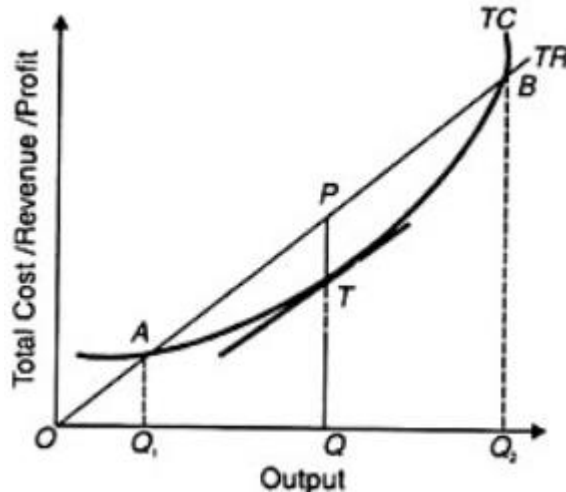


Fig.9.3

### (2) Total Cost-Total Revenue Analysis:

The short-run equilibrium of the firm can also be shown with the help of total cost and total revenue curves. The firm is able to maximize its profits when the positive difference between TR and TC is the greatest. This is shown in Figure 9.3 where TR is the total revenue curve and TC the total cost curve.

The total revenue curve is an upward sloping straight line curve starting from O. This is because the firm sells small or large quantities of its product at a constant price under perfect competition. If the firm produces nothing, total revenue will be zero. The more it produces, the larger is the increase in total revenue. Hence the TR curve is linear and slopes upward.

The firm will maximize its profits at that level of output where the gap between the TR curve and the TC curve is the maximum. Geometrically, it is that level at which the slope of a tangent drawn to the total cost curve equals the slope of the total revenue curve. In Figure 3, the maximum amount of profit is measured by TP at OQ output.

At outputs smaller or larger than OQ between A and B points, the firm's profits shrink. If the firm produces  $OQ_1$  output, its losses are the maximum because the TC curve is above the TR curve. At  $Q_1$  its profits are zero.

This is the break-even point of the firm. It starts earning profits when it produces beyond  $OQ_1$  output level. At  $OQ_2$  level, its profits are again zero. If it produces beyond this level, it incurs losses because  $TC > TR$ .

### 9.4 Short-Run Equilibrium of the Industry:

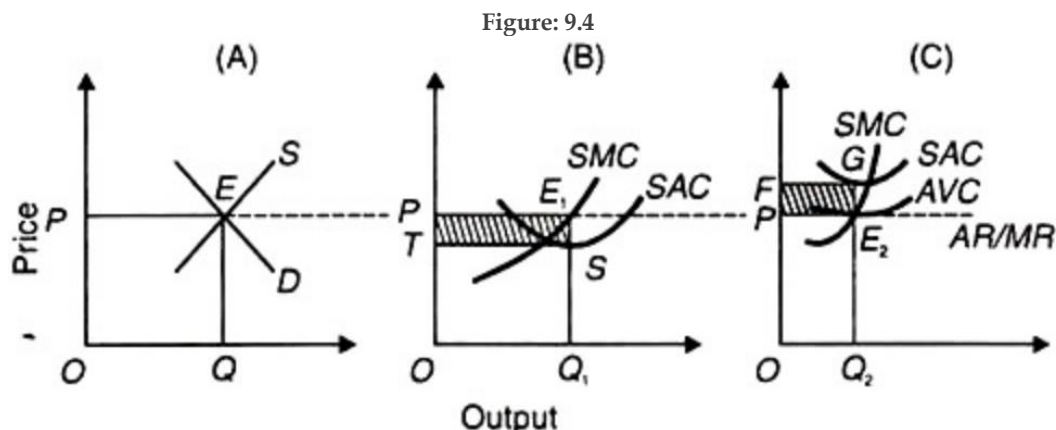
An industry is in equilibrium in the short-run when its total output remains steady, there being no tendency to expand or contract its output. If all firms are in equilibrium, the industry is also in equilibrium. For full equilibrium of the industry in the short-run, all firms must be earning only normal profits.

The condition for this is  $SMC = MR = AR = SAC$ . But full equilibrium of the industry is by sheer accident because in the short-run some firms may be earning supernormal profits and some incurring losses. Even then, the industry is in short-run equilibrium when its quantity demanded and quantities supplied are equal at the price which clears the market.

This is illustrated in Figure 4 where in Panel (A), the industry is in equilibrium at point E where its demand curve D and supply curve S intersect which determine OP price at which its total output OQ is cleared. But at the prevailing price OP, some firms are earning supernormal profits



PE<sub>1</sub>ST, as shown in Panel (B), while some other firms are incurring FGE<sub>2</sub>P losses, as shown in Panel (C) of the figure.



## 9.5 Long-Run Equilibrium of the Firm and Industry:

### Long-Run Equilibrium of the Firm:

The long run is a period of time in which the firm can change its plant and scale of operations. Thus in the long-run all costs are variable and there are no fixed costs. The firm is in the long-run equilibrium under perfect competition when it does not want to change its equilibrium output.

It is earning normal profits. If some firms are earning supernormal profits, new firms will enter the industry and supernormal profits will be competed away. If some firms are incurring losses, some of the firms will leave the industry till all earn normal profits.

Thus there is no tendency for firms to enter or leave the industry because every firm must earn normal profits. **“In the long-run, firms are in equilibrium when they have adjusted their plant so as to produce at the minimum point of their long-run AC curve, which is tangent (at this point) to the demand (AR) curve defined by the market price”** so that they earn normal profits.

### Assumptions:

This analysis is based on the following assumptions:

1. Firms are free to enter into or leave the industry.
2. All firms are of equal efficiency.
3. All factors are homogenous. They can be obtained at constant and uniform prices. SMC
4. Cost curves of firms are uniform.
5. The plants of firms are equal, having given technology.
6. All firms have perfect knowledge about price and output.

Given these assumptions, each firm of the industry will be in long-run equilibrium when it fulfils the following two conditions.

- (1) In equilibrium, its short-run marginal cost (SMC) must equal to its long-run marginal cost (LMC) as well as its short-run average cost (SAC) and its long-run average cost (LAC) and both should equal  $MR=AR=P$ .

**Thus the first equilibrium condition is:**

$SMC = LMC = MR = AR = P = SAC = LAC$  at its minimum point, and

- (2) LMC curve must cut MR curve from below: Both these conditions of equilibrium are satisfied at point E in Figure 5 where SMC and LMC curves cut from below SAC and LAC curves at their minimum point E and SMC and LMC curves cut  $AR = MR$  curve from below. All curves meet at this point E and the firm produces OQ optimum output and sells it at OP price.

### Self Assessment

#### Multiple choice questions:

1. In perfect competition, the product of a single firm
  - (a) is sold to different customers at different prices.
  - (b) has many perfect complements produced by other firms.

- (c) has many perfect substitutes produced by other firms.  
 (d) is sold under many differing brand names.
2. In perfect competition, restrictions on entry into an industry
    - a) do not exist
    - b) apply to labor but not to capital
    - c) apply to both capital and labor
    - d) apply to capital but not to labor.
  3. In perfect competition, the elasticity of demand for the product of a single firm is
    - a) 0.
    - b) Infinite
    - c) 1.
    - d) between 0 and 1.
  4. In perfect competition, the price of the product is determined where the industry
    - a) elasticity of supply equals the industry elasticity of demand.
    - b) supply curve and industry demand curve intersect
    - c) fixed cost is zero
    - d) average variable cost equals the industry average total cost.
  5. In perfect competition, a firm that maximizes its economic profit will sell its good
    - a) Below the market price
    - b) Above the market price
    - c) Below the market price if its supply curve is inelastic and above the market price if its supply curve is elastic.
    - d) At the market price

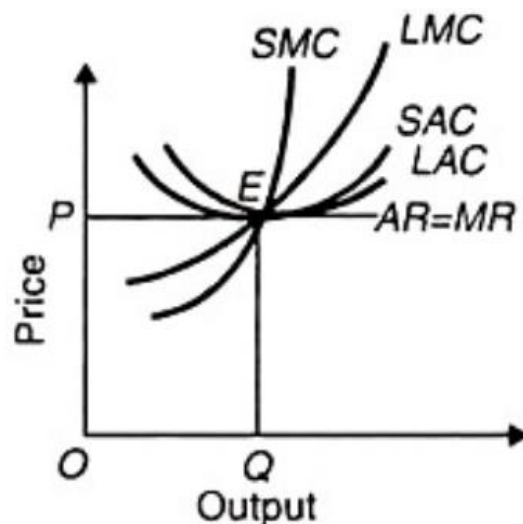


Figure: 9.5

Since we assume equal costs of all the firms of industry, all firms will be in equilibrium in the long-run. At  $OP$  price a firm will have neither a tendency to neither leave nor enter the industry and all firms will earn normal profits.

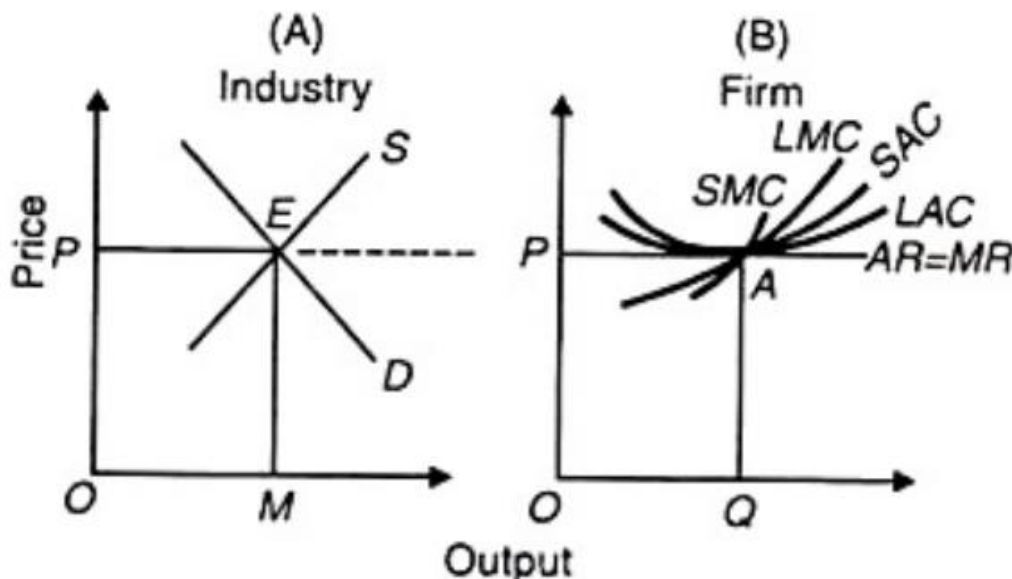
### 9.6 Long-Run Equilibrium of the Industry:

The industry is in equilibrium in the long-run when all firms earn normal profits. There is no incentive for firms to leave the industry or for new firms to enter it. With all factors

homogeneous and given their prices and the same technology, each firm and industry as a whole are in full equilibrium where  $LMC = MR = AR (-P) = LAC$  at its minimum.

Such an equilibrium position is attained when the long-run price for the industry is determined by the equality of total demand and supply of the industry.

Figure: 9.6



The long-run equilibrium of the industry is illustrated in Figure 6 (A) where the long-run price  $OP$  is determined by the intersection of the demand curve  $D$  and the supply curve  $S$  at point  $E$  and the industry is producing  $OM$  output. At this price  $OP$ , the firms are in equilibrium at point  $A$  in Panel (B) at  $OQ$  level of output where  $LMC = SMC = MR = P (= AR) = SAC = LAC$  at its minimum.

At this level, the firms are earning normal profits and have no incentive to enter or leave the industry. It follows that when the industry is in long-run equilibrium, each firm in the industry is also in long-run equilibrium. If both the industry and the firms are in long-run equilibrium, they are also in short-run equilibrium.

### Summary

In theory, perfect competition implies no rivalry among firms. In a perfectly competitive market structure there is a large number of buyers and sellers of the product and the product is homogeneous. There is free mobility of factors of production and the buyers and sellers have perfect knowledge of the market. In the short run the best level of output of the firm is the one at which the firm maximises profits or minimises losses. This is possible at  $P = MR = MC$ . The point at which the firm covers its variable costs is called "the closing down point". In long run the best level of output is one at which price  $P = LMC$ . At equilibrium the short run marginal cost is equal to the long run marginal cost and the short run average cost is equal to the long run average cost. Thus, given the above equilibrium condition, we have

$$SMC = LMC = LAC = SAC \quad P = MR$$

### Self Assessment

#### 2. State true or false for the following statements:

- In a perfect market there are large number of sellers.
- In a perfect market there is products differentiation.
- In a perfect market a change in the output of a single firm will affect the market price of the product.
- In perfect market, market agents are not fully aware of market.
- In a perfect market there is perfect mobility of resources.

- (f) Under perfect competition the price curve and the marginal revenue curve are the same.
- (g) Industry has no role in the determination of price under perfect competition.
- (h) When the supply of a commodity decreases and its demand remains constant then it leads to decrease in price.
- (i) For equilibrium MC curve should cut the MR curve from below.

### 3. Fill in the blanks:

- (a) A perfectly competitive firm faces an ..... elastic demand curve.
- (b) The closing down point is at which the firm covers its ..... cost.
- (c) In the long run all costs are ..... .
- (d) In the long run the best level of output is, where  $P = \dots\dots\dots$  .
- (e) The LMC cuts the LAC at its ..... point.
- (f) The ..... LRS is generally a feature of rapid growth.
- (g) The ..... of an industry might lead to a fall in prices of some of its input.
- (h) The factors of production are ..... to move in perfect competition.

### Keywords

**Equilibrium:** Condition when the firm has no tendency either to increase or to contract its output.

**Minimum price:** Price at which the sellers refuse to supply the goods at all and store it with themselves.

**Perfect competition:** A market structure characterized by a complete absence of rivalry among the individual firms.

**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.

### Review Questions

- In which condition under perfect competition, would a firm maximize profit in the short run?
- To maximize the profit in the short run, a perfectly competitive firm produces the output for which price is equal to average variable cost- Why/Why not?
- Why are firms operating under conditions of perfect competition depicted as having a horizontal demand curve?
- What will happen to the demand curve of a perfectly competitive firm if:
  - new sellers are attracted to the industry by the existence of supernormal profits?
  - there is an increase in market demand for the firm's output?
- Why is it inappropriate to refer to a perfectly competitive firm as 'earning supernormal profit in the long-run'?
- Under what conditions will a firm operating in a perfectly competitive industry choose to leave the industry?
- For a perfectly competitive firm, why is it insufficient to say that profit maximisation takes place at the output where marginal cost equals marginal revenue?
- In the perfect market, if individuals are enjoying consumers' surplus, does it mean that, as a consequence, producers are not receiving producers' surplus?
- The case of perfect competition is sometimes referred to as a 'benchmark' industrial structure. In this context, what do you think commentators mean by the term 'benchmark'?
- Taking a real life example, discuss the features of the perfect competition.

11. Why is a firm under perfect competition described as a price-maker? Deduce its equilibrium conditions in the short run.
12. Assume that firms in the short run are earning above normal profits. Explain what will happen to these profits in the long run for a market having perfect competition.
13. How and when will you determine the closing down point in the short run?
14. Explain  $LMC = LAC = P$ . Comment.
15. Examine the shut down decision in the long run.

### Answers: Self Assessment

- |    |  |   |                                   |
|----|--|---|-----------------------------------|
| 1. | 1. (a),<br>4. (b),                         | 2. (a),<br>5. (d).                      | 3.(b),                            |
| 2. | (a) True<br>(d) False<br>(g) False         | (b) False<br>(e) True<br>(h) False      | (c) False<br>(f) True<br>(i) True |
| 3. | (a) Infinitely<br>(d) LMC<br>(g) expansion | (b) variable<br>(e) minimum<br>(h) free | (c) variable<br>(f) rising        |



### Further Readings

1. Microeconomics – Robert S. Predik, Daniel L. Rubenfield and Prem L. Mehta, Pearson Education, 2009, PBK, 7th Edition.
2. Microeconomics – David Basenco and Ronald Brutigame, Wiley India, 2011, PBK, 4th Edition.
3. Microeconomics – Shipra Mukhopadhyay, Annie Books, 2011.

## Unit 10: Monopoly

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### Objectives

After this lecture, you would be able to

- Discuss the meaning of monopoly
- Examine how the monopolist determines the best level of output and price
- Compare monopoly with perfect competition

### Introduction

Monopoly is exactly opposite to the perfect competition. We can define a Monopolist as a sole supplier to particular market. In fact, after going through this unit you will realise that monopoly is an extreme case and it is rarely found in practice. However, we may also understand the case of monopoly by analysing two different cases - one that is presented in textbooks which says that in a monopoly there is only one firm producing the good. And other, the real world case such as the operating system monopoly, that says that in monopoly there is one firm that provides the overwhelming majority of sales (say, for example Microsoft), and a handful of small companies that have little or no impact on the dominant firm. In this unit, we will stress more on the former case.

#### 10.1 Monopoly

The word monopoly has been derived from the combination of two words i.e., 'Mono' and 'Poly'. Mono refers to a single and poly to control. Monopoly refers to a market situation in which there is only one seller of a commodity. There are no close substitutes for the commodity it produces and there are barriers to entry. Monopoly is said to exist when one firm is the sole producer or seller of a product which has no close substitutes.

According To Koutsoyiannis, "Monopoly Is a Market Situation in Which There is A single Seller, There are no close substitutes for commodity it produces, there are barriers to entry."

According To Baumol, "A pure Monopoly is defined as the firm that is also an industry. It is the only supplier of some particular commodity for which there exist no close substitutes."

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

According to this definition, there must be a single producer or seller of a product. If there are many producers producing a product, either perfect competition or monopolistic competition will prevail depending upon whether the product is homogeneous or differentiated. On the other hand, when there are few producers, oligopoly is said to exist. A second condition which is essential for a firm to be called a monopolist is that no close substitutes for the product of that firm should be available.

From the above discussion it follows that for monopoly to exist, following conditions are essential:

1. One and only one firm produces and sells a particular commodity or a service.
2. There are no rivals or direct competitors of the firm.
3. No other seller can enter the market for whatever reasons — legal, technical or economic.
4. Monopolist is a price maker. He tries to take the best of whatever demand and cost conditions exist without the fear of new firms entering to compete away his profits.

In the case of monopoly one firm constitutes the whole industry. Therefore the entire demand of the consumers for that product faces the monopolist; which slopes downward. Monopolist can lower the price by increasing his level of sales and output and he can raise the price by reducing his level of sales. Demand curve facing the monopolist will be his average revenue curve, which also slopes downward. Since average revenue curve slopes downward, marginal revenue curve will be below it.

## 10.2 Features of Monopoly

Main features of Monopoly are given below:

- 1 **One seller and Larger Number of Buyers:** In monopoly, there should be single producer of commodity whether it is single, or group of partners, or joint capital company or state. Hence in the situation of monopoly there is only one firm but the number of buyers should be enough. As a result the price of goods would not be affected by buyer but by the seller.
- 2 **Monopoly is also an Industry:** In the situation of monopoly there is only one firm, hence the difference between firm and industry finishes, that means there is no difference in the study of monopoly firm or industry.
3. **Restrictions on the Entry of the New Firms:** In the field of monopoly, there are restrictions for new firm to enter into the market. These restrictions have many forms like Patent proprietorship, government laws, savings of coordinate etc.
4. **No Close Substitutes:** For goods that are being produced by monopolist should not have any close substitutes otherwise monopolist will not be able to control the price of goods he produces, according to his wish. According to Boulding, "A pure monopoly firm is that firm which is producing such a product whose production by other firms outcomes no effective substitute."
5. **Price Maker:** Monopolist determines the price, which means he himself determines the price of his product. This is because he is the only supplier of goods but the number of buyers being very large. The demand of single buyer is very small portion of total demand, that is why buyer would not be able to affect the price, and they have to borne the price determined by monopolist. In other words price of goods is totally controlled by monopolist. If monopolist increases the supply of goods then their price may fall. Opposite to it if he decreases the supply, the price may rise.
6. **Price Discrimination:** Monopolist for any goods could charge differently to different buyers and for different purposes. In this way price discrimination is done by monopolies.
7. **Absence of Supply Curve:** In the situation of monopoly there is no supply curve. Taking both

marginal revenue and marginal cost into consideration, he decides how much quantity to be produced and what price to be charged. So in monopoly no supply curve exists.

**Monopoly Equilibrium or Determination of Price and Output Under Monopoly**

Monopolist is said to be at the state of equilibrium, where he produces that much amount of goods by which determination of price and equilibrium can be studied within following two approaches:

1. Total Revenue and Total cost curve Approach.
2. Marginal Revenue and Marginal cost Approach.

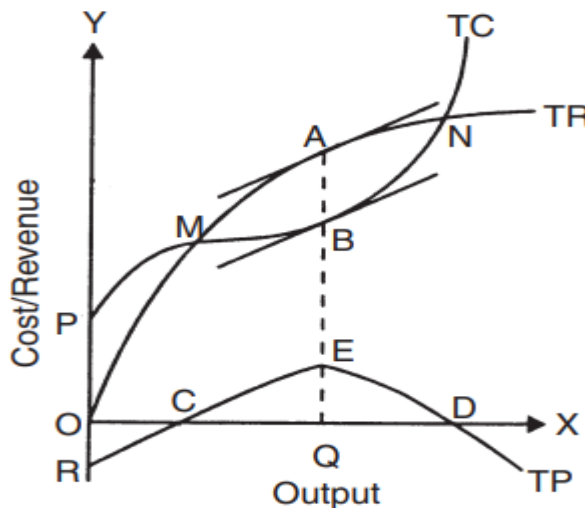


Monopoly is that situation of market where only one firm is the sole producer of goods. There are no close substitutes of those goods.

**1. Total Revenue and Total Cost Curve Approach**

Monopolist can achieve maximum profit by selling that particular quantity of goods at which the difference between total revenue and total cost would be maximum. A monopolist by projecting different prices of any goods or by altering the supply of goods, tries to understand that at which level of output the difference between total revenue (TR) and total cost (TC) would be maximum, or total profit would be maximum. At that quantity of output producing which monopolist will get the maximum profit, monopolist will be at equilibrium. It can be explained with the help of Fig. 10.1.

Fig. 10.1



In Fig. 10.1, TC represents total cost curve while TR represents total revenue curve. TR curve is starting at origin point O, which means when there is not output total revenue will also be zero. In opposite total cost curve is starting at point P. The reason behind this if firm will stop production even then, it has to borne the tied up cost OP. TP curve is total profit curve. This curve is starting at point R. By this we knew that initially firm is getting Negative Profits means firm is in loss because total cost is more than total income.

Figure 10.1 we learn that as the firm increases its output, the total income gets increased. But in initial stage total revenue is less than total costs (TR < TC). It is understood by RC portion of TP curve that firm is in loss. At point M, TR = TC, so as it is clear with point C of TP curve that firm is gaining profit nor exhibiting loss. Point M will be called as Break Even point. When firm will produce more than point M then total revenue will increase than total cost, (TR > TC). TP curve is also shifting upward from point C. This indicates that firm is gaining profit. When TP curve is at highest point E, then firm will gain maximum profit. Quantity of goods at which firm is getting its maximum profit will be known as equilibrium output.

If firm will produce more than equilibrium quantity OQ, then the difference between TR and TC will go on decreasing, and these lines will intersect each other at point N, that is TR = TC. This means profit of firm will be decreasing and even at point N neither it will gain profit nor any loss. As it is described by point D of TP curve. If firm will produce more than this then TR will be less



than TC. ( $TR < TC$ ), as a result firm will start losing. In brief, at point E firm will gain maximum profit. To know the maximum profit tangents are drawn to line TR and TC. At points where tangents are parallel, their distance will be maximum. As it is clear with this figure. Tangents are parallel at points A and B, so maximum difference of curve TR and TC will be specified with AB. At this state monopolist will gain maximum profit, as it is clear with point E of TP curve. This process of determining the price and equilibrium by monopolist is called Trial and Error method, because in this process by determining different price monopolist has to predict that at which level it will be at the state of equilibrium means will achieve maximum profit.

### Marginal Revenue and Marginal Cost Approach

According to this approach, equilibrium will be at place when following two conditions will be fulfilled –

- (i) Marginal Revenue (MR) = Marginal cost (MC) and
- (ii) Marginal Cost (MC) curve intersects to Marginal Revenue (MR) from below.

In this situation monopolist will gain maximum profit. By this analysis, the determination of price and equilibrium will be studied through two durations of time –

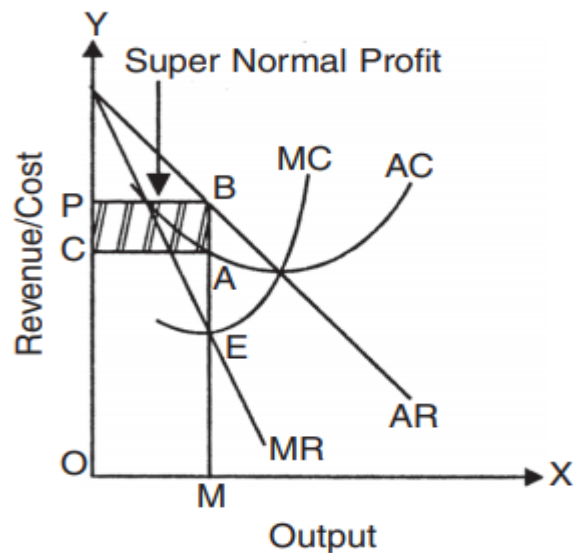
- (1) Short Run (2) Long Run

### 10.3 Short Run equilibrium

Short run is that duration of time in which time is so minute that monopoly cannot change tied up sources such as machinery and plant. Monopolist, with the rise of demand can increase supply by utilizing more quantity of variable sources and by utilizing the full capacity of tied up sources like machines. In the same way with the fall in demand monopolist will reduce the quantity of variable sources and also reduce the complete utilization of tied up sources. A monopolist will be at the state of equilibrium when it will produce that quantity of goods at which (1) Marginal cost will be equal to Marginal revenue ( $MC = MR$ ) (2) MC Curve cuts MR Curve from below. During short run, there are three situations under the state of equilibrium for monopolist. Monopolist (1) May gain Super Normal profits (2) May achieve Normal Profits and (3) May have to bear Minimum Loss. These can be explained with the help of Figs. 10.2 – 10.4.

- (1) **Super Normal Profits:** If under the situation of equilibrium the price of product (AR) determined by monopolist is more than their average costs (AC) ( $AR > AC$ ) then monopolist will gain Super Normal Profits. Monopolist will produce to the level where Marginal cost is equal to Marginal revenue ( $MC = MR$ ). It is called equilibrium production.

Figure: 10.2



If the price of equilibrium production is more than its average cost then monopolist will gain super normal profit.

$$\text{Super Normal Profit} = AR > AC$$

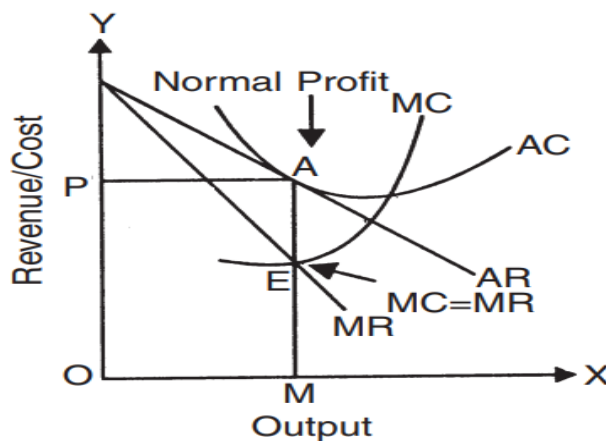
This situation of equilibrium can be explained with the help of Fig. 10.2. It shows monopolist will be at equilibrium at point E. Because at this point Marginal Revenue (MR) is equal to Marginal Cost (MC) means  $(MR=MC)$ . Monopolist will produce the OM unit of goods. At this quantity of production price of goods (BM) will be more by BA amount to its average cost (AM) i.e.  $(BM-AM = BA)$ . So in this situation monopolist will achieve total super normal profit of ABPC.

(2) **Normal Profits:** In the short run, in monopoly equilibrium state where  $MC = MR$ , price of the product (AR) is equal to (AC) Average cost then firm will earn only normal profits.

$$\text{Normal Profit} = AR = AC$$

This situation of monopoly equilibrium can be explained with the help of Fig. 10.3. The Fig. 10.3 indicates that monopolist will be at equilibrium at point E as at point E,  $MC = MR$ . Equilibrium production of the monopolist is OM units. Average Cost Curve (AC) touches Average Revenue Curve (AR) at point A at this level production is at point A, Price OP (AR) of the product is equal to average cost AM (AC) so the monopolist will earn only Normal Profits at equilibrium production because at equilibrium quantity and average cost are equal to price (Average Income)  $(AC = AR)$ .

Fig. 10.3

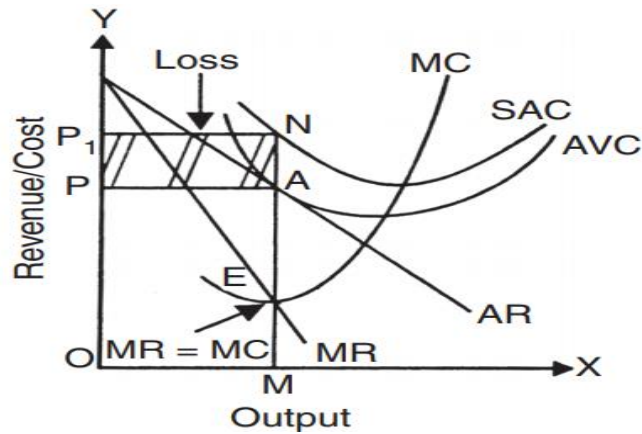


(3) **Minimum Loss:** In short run, demand of the goods decreases due to depression and as a result prices fall the monopolist will continue to produce at this reduced price if he is getting Average variable cost (AVC) at this price. If the monopolist will have to determine the prices less than the average variable cost then he will stop the production. Therefore, the monopolist in the short run may have to bear minimum loss means can bear loss of average fixed cost. In equilibrium situation prices (AR) of the product is equal to Average variable cost (AVC) so the monopolist may have to bear average fixed cost loss. This loss has to bear by monopolist even at the time when he stops work during short run. Therefore,

$$\text{Minimum Loss} = AC - AVC = AFC$$

This situation of equilibrium can be explained with the help of Fig. 10.4. Figure 10.4 shows monopolist is at equilibrium state at point E. Because at point E,  $MC = MR$ . By point E it is understood that monopolist will produce the OM quantity of goods. The price OP (AM) will be determined as the price for equilibrium quantity OM of goods. At this price, average variable curve (AVC) is touching AR curve at point A. It means firm will earn only average variable cost with this prevailing cost. Firm will have to bear fixed cost that means per unit AN loss. Firm will be in total loss of  $NAPP_1$ , as shown by shaded area. This will be lowest loss to firm. If monopolist will have to determine a price less than OP, then he will stop the production of goods.

Figure 10.4

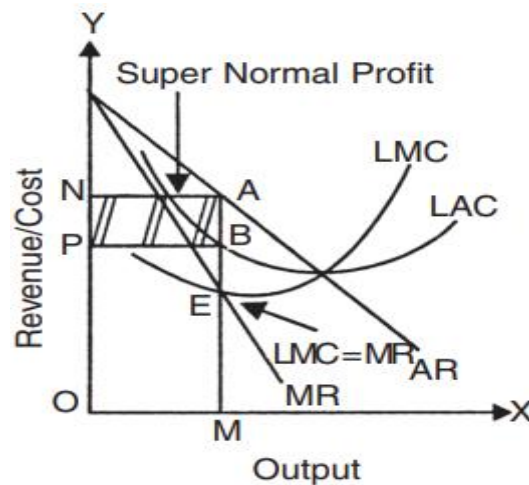


**10.4 Long-Run Equilibrium During**

Long Run, the monopolist will attain equilibrium at position where Long Run Marginal Cost will be equal to Marginal Revenue ( $LMC = MR$ ). Due to having long time during long run, monopolist can change all costs, and on the increase in demand supply to meet the demand can be adjusted in short-run price may be more, equal or less to this average costs. But in Long run price is more than long-run average costs. If price will be less than long-run average cost then monopolist will opt to stop production in place of bearing loss. During long run monopolist earns abnormal profit. This is because in opposite to complete competition, no firm can enter into market. So during long run when monopolists firm is earning abnormal profit, then no producer possibly with the intention of gaining abnormal profit can enter into market.

As a result, monopolist firm earns abnormal profit Notes even at the time of long run. In opposite to complete competent firm, monopolist can earn abnormal profit during long run, because the entrance of new firm in market is restricted. Thus the monopoly firm gets abnormal profits in long run. In market monopolist, neither due to the entrance of any firm nor due to availability of any substitute is required to set up an optimum sized plant or to utilize optimum production capacity during long run. Size of plant or the utilization up to which extent of any particular size plant, is always dependent on the demand in market. Under same market situation optimum capacity will be achieved but under some other situations monopolist will produce sub optimally. Under some different situations capacity more than optimum capacity can be utilized. It all depends on the demand in market. In Fig. 10.5, the maximum long run equilibrium has been explained, when size of market restricts monopolist to produce at minimum long-run average cost.

Fig. 10.5



The situation of long run equilibrium of monopolist can be explained with the help of Fig. 10.5. Figure 10.5 shows that monopolist will be at equilibrium at point E. At point E,  $MR = LMC$ , he will produce OM quantity of product. This would be the equilibrium quantity. At this quantity, the

price will ON (= AM) and long run average cost will be BM. As the price (AM) is greater than long run average cost (BM) i.e.  $(AR > AC)$ , monopolist will earn abnormal profit. Hence, monopolist will gain abnormal profit of  $AM - MB = AB$  per unit. Monopolist will gain a total of  $ABPN$ , as shown by shaded area.

### 10.5 Price Discrimination or Discriminating Monopoly

Price discrimination is that situation where goods are sold at more than one price. A monopolist can charge differently for particular goods to different consumers and for different purpose this price strategy is called Price Discrimination, and the monopolist who does this is called Discriminating Monopolist. Price discrimination is the situation where a supplier for a particular goods charge differently to different sellers. It is only possible when there is no competition in market and for different buyers the demand for goods is different. In the words of J.S. Bains, "Price Discrimination refers strictly to the practice by a seller to charge different prices from different buyers for the same product Q."

According to Koutsoyiannis, "Price discrimination exists when the same product is sold at different prices to different buyers."

**Types of Price Discrimination Price Discrimination are mainly of four types –**

1. **Personal Price Discrimination:** When particular goods are sold at different prices to different buyers then it is called personal price discrimination. Personal price discrimination is possible due to unawareness of customers, minor difference in price, or due to nature of goods or services. Like when a doctor takes different charges from rich and poor patients in the name of operation then it is called personal price disseminator.
2. **Geographical Price Discrimination:** When goods are sold at different prices at different places it is called Geographical Price Discrimination. For example, a trader sells his product at different prices in the foreign market and in local market as in case of jumping which means to sell the product at cheap rates in foreign market.
3. **Price Determination According to Use:** When a product is sold at different prices for different utilization it is called utilization price discrimination or Trade Discrimination like every unit price of electric is high but for agriculture use, it is low.
4. **Price Dissemination According to Time:** Many public utilities industries sell one product in various rates in various times. For example, telephone department charges low rate at night or early in the morning for calling, but the call charges are high during day time.

### 10.6 Degrees of Price Discrimination

Pigou has divided the Price Discrimination into following three different types in his book 'Economics of Welfare' –

1. **Discrimination of the First Degree:** Discrimination of first degree is that discrimination in which monopolies charge different prices for every unit of goods. That particular price of every unit is determined which price a buyer wants to pay. In this way, he has no consumer surplus. So the determination of first degree refers to a state consumer saving in zero.
2. **Discrimination of the Second Degree is that Condition:** Discrimination of the second degree where different products are charged at different prices. For example, the state electricity board charges less for initial unit upto a limit, after that the charges are more for further consumptions of units. In this state consumer has some surplus.
3. **Discrimination of the Third Degree:** Discrimination of the third degree is that discrimination where the producer divides total market of goods into two or three groups and charges at different prices from each group. For example, if the monopolist determines the high rate of product for local market and low rate for foreign market then it is called discrimination of the third degree. In real life situation, discrimination of the third degree is more common.

#### **Essential Conditions for Price Discrimination**

Price discrimination is possible when the following conditions are fulfilled in the market –

1. **Existence of Monopoly Power:** First condition of price discrimination is that seller must be a monopolist that means he must possess the power of monopoly. In the absence of monopoly power

seller cannot charge more price in comparison to other sellers. The perfect competitive firms cannot charge one price for homogenous product because as per the perfect competition, there is a nature for a single price in market.

**2. Separate Markets:** One condition is necessary for discriminating monopoly is that there must be two or more markets which can be separated and can be kept separate. Markets can be kept separate according to geographical point of view, or by brand, or by time. Persons providing personal services like doctors, lawyers etc. can charge different prices for the same service.

**3. Difference in the Elasticity of Demand:** Price discrimination is possible when the elasticity of demand available in different markets will be different. If this happens then monopolist will determine more prices in the inelastic market, whereas he will determine fewer prices in the market of more elastic in demand. In this way he can increase his total income because there is no fear in the alteration of demand. If the elasticity of demand in different market is equal then doing price discrimination is impossible.

**4. No Possibility of Resale:** For the existence of price discrimination it is necessary that the primary buyer of any goods or services should not be able to resale that product. It is only possible, when in one side, unit of goods would not be transferred from cheap market to expensive market, and on the other side buyers must not be able to move from expensive market to cheap market. If it happens then goods will be bought from cheap market and then it will be re-sold at expensive market, with this, the difference will be vanished which a monopolist wants to continue. That is why it is necessary for price discrimination that the unit of good must not transfer from a cheap market to a costly market. According to Lipsey, "The key to being able to disseminate among buyers is that discrimination among buyers requires that the goods cannot be resold by the buyer who faces the low price to the buyer who faces the high price." In summary, price discrimination can only be possible when one unit of goods cannot be transferred from cheap market to expensive market, and the elasticity of demand must be different in different markets.

### Price and Output Determination under Discriminating Monopoly

The aim of the monopolist in restoring to price discrimination is to increase total revenue and profit. Analysis of price determination under price discrimination can be made with reference to two or more than two market conditions there we study a situation of price discrimination in which a monopolist by selling a product at two different prices pockets a part of consumer surplus. Pigou has called this as "Price Discrimination of Third Degree". Every discriminating monopolist in order to maximize his profits will produce upto that level at which marginal revenue (MR) is equal to marginal cost (MC). The monopolist will apply this condition of marginal revenue and marginal cost to get maximum profit in every market. He will do the production as long as marginal revenue is more than marginal cost ( $MR > MC$ ). We assume that the monopolist will sell his product in two different markets A and B in which the demand of elasticity is different. Discrimination monopolist has to decide

- (i) what is the total output to produce;
- (ii) how much of output is to be sold in different markets and in what price so as to get maximum profit. In order to get maximum profit the monopolist will have to take two decisions.

#### 1. How Much to Produce?

As we assume that production of the monopolist is homogenous, so he considers marginal cost of the whole production irrespective of the type of market in which he sells. He will produce upto that point in which marginal cost is equal to Combined Marginal Revenue (CMR) of the two markets. So to get estimated marginal revenue curve, the marginal revenue curves of market A and market B i.e. MRA and MRB are added. The monopolist will produce that much amount of the goods where marginal cost and combined marginal revenue will be equal which means,

$$MC = MRA + MRB = MRA+B$$

#### 2. How Much to Sell in Different Markets and at What Price?

The monopolist, in order to maximize his profits, will equalize marginal cost (MC) and marginal revenue of market A is MRA and market B is MRB for the entire production. Figure 10.6 depicts in market A, market demand is less elastic and in market B, market demand is more elastic. This means that the monopolist will sell less quantity of the product (u) of OA units at more price  $OP_1$  in

market A. On the other hand, he will sell more quantity 'OB' units at less price  $OP_2$  in market B. Marginal revenue of the combined production of OQ units where combined marginal revenue is equal to marginal cost should be equal in both the markets as it should be equal to marginal cost of the entire production which means

$$MRA = MRB = MRA+B = MC$$

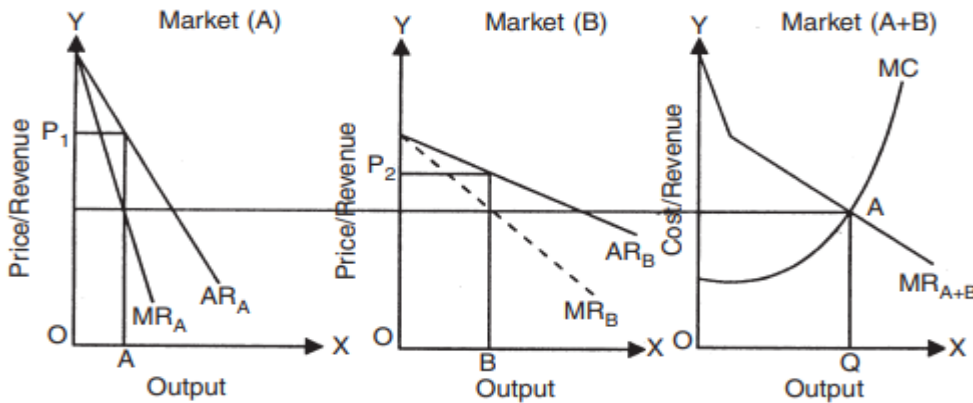
Suppose if this condition will not be satisfied, if in market A in comparison to market B, MR is less, then it will be beneficial for discriminating monopolist to sell same units of market A to market B where he will gain greater marginal revenue. This activity will go on till the marginal revenue of both markets will be equal.

### 3. Price Determination

Price determination under the situation of discriminating monopolist has been explained with the help of Fig. 10.6. Figure 13.6 shows the state of equilibrium under the situation of discriminating monopoly.

In Fig. 10.6, equilibrium state of discriminating monopolist has been parented. Suppose a market has been divided into two parts A and B. As it is clear with slopes curves  $ARA$  and  $ARB$  that the demand in market A is less elastic than market B. In this figure,  $ARA$  and  $ARB$  are the demand curves for market A and B, respectively, open situation of both market (A + B) has be shown in Fig.

Fig. 10.6



10.6. It is clear that at point E monopolist will be at the state of equilibrium and combined marginal revenue curve (combined MC curve) will be equal to marginal cost curve (MR curve). Total output of monopolist is OQ, and he will divide this output into two markets in a way that marginal revenue (MR) of both markets will become equal. If in one market its marginal revenue is higher then in this situation the transfer of goods from markets of less meaningful revenue would be profitable. To achieve the marginal revenue monopolist will sell OA quantity in market A and OB quantity in market B. He will sell less quantity of goods in market A in OP price of product and in market B, will sell more quantity of goods at lesser price  $OP_2$  in market B and the total quantity OA + OB of product will be equal to the total production OQ of monopolist.

It is clear from Fig. 10.6 (i) Margined cost of total production is equal to combined marginal revenue (ii) Marginal revenue of both markets is equal (iii) Marginal revenue of both markets is equal to the margined revenue of total production. Figure 13.6 shows elasticity of demand in market A is less than market B. So, in comparison to market B, price is high and quantity of selling is less in market A. In brief, according to Ferguson, "If the aggregate market for a monopolist product can be divided into sub-markets with different price elasticities, the monopolist can profitably practice price discrimination. Total product is determined by equating marginal cost with combined monopoly marginal revenue. The output is allocated among the sub-markets so as to equate marginal revenue in each sub-market with combined marginal revenue as  $MC = MR A+B$ . Finally, price in each sub-market is determined directly from the sub-market demand curve given the sub-market allocation of sales."

### 10.7 Dumping

Dumping is a special form of price discrimination. Dumping means selling of goods in foreign market at less price as compare to local market. Under this situation, there exist two types of market, first one is local market where the monopolist has complete monopoly and second one is foreign market where there is complete competition. That is why monopolist can change more for

goods in local market but in foreign market he has to charge comparatively less. Dumping can be practised to achieve many objectives, like (i) for eliminating the competitors in foreign market, (ii) for gaining the profit of law of increasing returns, (iii) for creating demand of goods in foreign market, (iv) for getting relief from high stock of goods, (v) for gaining profit due to the difference in elasticity of demand.

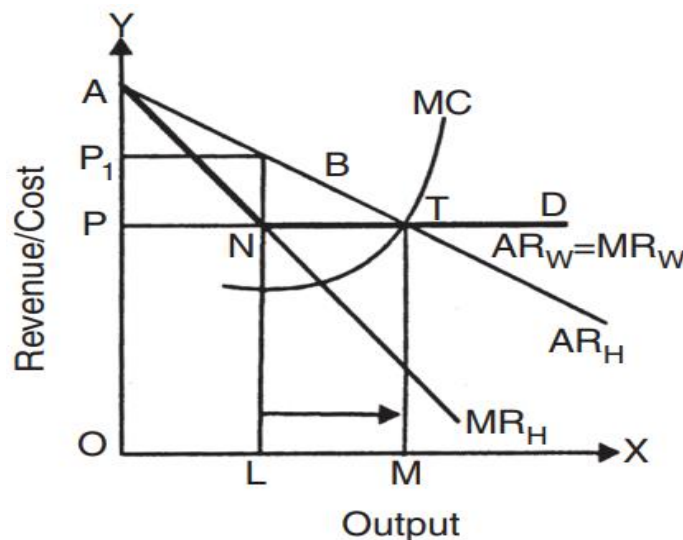
### Price and Output Determination Under-Dumping

Price and output determination under dumping can be explained with the help of Fig. 10.7. Figure 10.7 has been drawn with the assumption of having two markets—first local market and second foreign market. In local market firm enjoys monopoly, and in foreign market it stays in the state of perfect competition. Monopolist will be at the state of equilibrium when profit will be maximum and profit will only be maximum when total marginal revenue will be equal to total marginal cost as shown in Fig. 10.7.

- (i) In the state of perfect competition, horizontal line PD represents average revenue curve ( $AR_W$ ) in foreign market. In this condition of market average revenue (Price) is equal to marginal revenue ( $AR_W = MR_W$ )
- (ii) Due to state of monopoly in local market, slope of average revenue curve ( $AR_H$ ) is downward, and slope of marginal revenue curve  $MR_H$  is also downward, and which is below to  $AR_H$ .

MC is the marginal cost curve of total output of firm. How much monopolist should produce, is Notes dependent on the fact at which point his marginal cost curve will cut the combined marginal revenue curve of local and foreign market with this point his output will be determined. Now he will divide total output into two markets in a way that the marginal revenue of every market will become equal. In Fig. 10.7 ANTD has been shown as combined marginal revenue (combined MR), in ANTD curve. AN is the marginal revenue curve of local market, with this portion of foreign market NTD has been added. Now this ANTD curve is being intersected by marginal cost curve (MC) at point T, at this point output of firm in these two markets is OM. Monopolist will now sell OL output in local market and LM output to foreign market, because by doing this the marginal revenue of both markets will become equal. Monopolist will sell OL output at price  $OP_1$  and LM output at price OP. In comparison of foreign market, the price in local market will be more.

Figure: 10.7



Under the condition of dumping, monopolist need to keep one thing in mind that the price in foreign market must not be determined so less that business is not able to re-import the goods which are bought by them in less price. If this will happen then there will be no profit from dumping. That is why the difference between the prices in local market to that of foreign market should be less than the transportation cost of having goods back to the country.

## 10.8 Monopsony

A monopsony is a market condition in which there is only one buyer, the monopsonist. Like a monopoly, a monopsony also has imperfect market conditions. The difference between a monopoly and monopsony is primarily in the difference between the controlling entities. A single buyer dominates a monopsonized market while an individual seller controls a monopolized market.

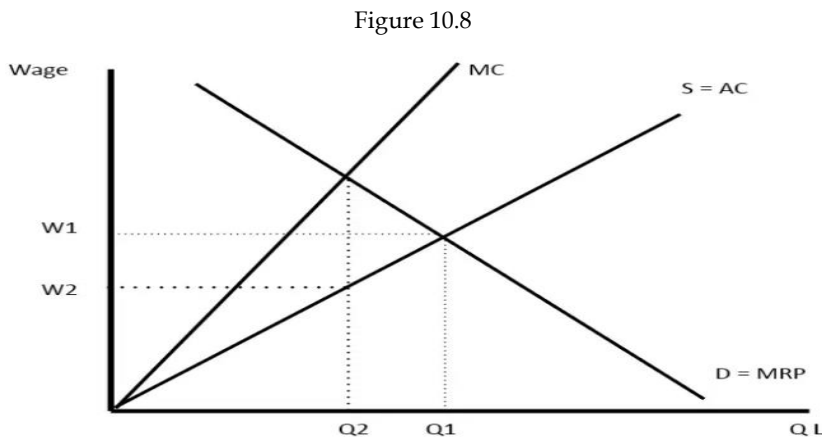
A monopsony occurs when a firm has market power in employing factors of production (e.g. labour). A monopsony means there is one buyer and many sellers. It often refers to a monopsony employer – who has market power in hiring workers. This is a similar concept to monopoly where there is one seller and many buyers.

### Monopsony in Labour Markets

An example of a monopsony occurs when there is one major employer and many workers seeking to gain employment. If there is only one main employer of labour, then they have market power in setting wages and choosing how many workers to employ.

#### Examples of monopsony in labour markets

- Coal mine owner in town where coal mining is the primary source of employment.
- The government in the employment of civil servants, nurses, police and army officers.



In a competitive labour market, the equilibrium will be where  $D=S$  at  $Q_1, W_1$ . However, a monopsony can pay lower wages ( $W_2$ ) and employ fewer workers ( $Q_2$ )

#### Profit Maximisation for a Monopsony

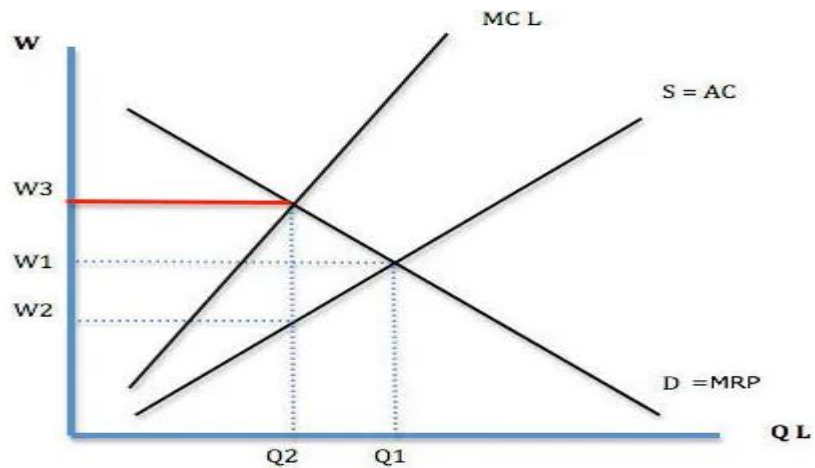
The marginal cost of employing one more worker will be higher than the average cost – because to employ one extra worker the firm has to increase the wages of all workers. To maximise the level of profit, the firm employs  $Q_2$  of workers where the marginal cost of labour equals the marginal revenue product  $MRP = D$ . In a competitive labour market, the firm would be a wage taker. If they tried to pay only  $W_2$ , workers would go to other firms willing to pay a higher wage.

#### Minimum wage in a Monopsony

In a monopsony, a minimum wage can increase wages without causing unemployment.



Figure: 10.9



A monopsony pays a wage of  $W_2$  and employs  $Q_2$ . If a minimum wage was placed equal to  $W_1$ , it would increase employment to  $Q_1$ . A minimum wage of  $W_3$  would keep employment at  $Q_2$ .

### Monopsony in the real world

Even if a firm is not a pure monopsony, it may have a degree of monopsony power, due to geographical and occupational immobility's, which make it difficult for workers to switch jobs and find alternative employment.

For example, there are several employers who might employ supermarket checkout workers. However, in practice, it is difficult for workers to switch jobs to take advantage of slightly higher wages in other supermarkets. There is a lack of information and barriers to moving jobs. Therefore, although there are several buyers of labour, in practice the big supermarkets have a degree of monopsony power in employing workers.

### 10.9 Workable competition

Since the market performance of industries varies along with their market characteristics, efforts have been some practical standard for identifying the sorts of market structure that engender socially satisfactory made to devise performance in a given industry. The term *workable competition* was coined to denote competition that may be considered as leading to a reasonable or socially acceptable approximation of ideal performance in the circumstances of a particular industry. The limits of such an approximation are of course debatable, and so the idea of workable competition must remain elusive because it is basically subjective.

Without entering into a complex theoretical discussion of the relationship between individual industry performance and overall welfare, it is plausible to suggest the following principal attributes of workable performance in an industry: (1) In the long term, selling price on average should be equal to or not significantly above average costs of production, so that profits do not appreciably exceed a normal interest return on investment. Prices should be responsive to basic reductions in costs. (2) Insofar as average costs of production are affected by the scales or capacities of plants and firms, the preponderance of industry output should be from plants and firms of the most efficient scale or with closely comparable technical efficiency. (3) The industry should not have chronic excess capacity—i.e., significant plant capacity that is persistently unused even in periods of high general economic activity. (4) The industry's sales-promotion costs should not be substantially greater than what is needed to keep buyers informed of the availability, characteristics, and prices of products. (5) The industry should be adequately progressive in introducing more economical production techniques and improved products, thereby balancing the costs of progress with the gains.

While the first three of these attributes are easier to appraise than the others, certain generalizations are possible concerning the workability of different market structures: (1) Unregulated single-firm monopolies tend to generate unworkable market performance, mainly in the form of output restriction, prices well above costs, and consequent excess profits. They have undesirable effects on the uses to which resources are put and on income distribution. (2) Oligopolies with high seller concentration and also very high barriers to entry tend toward unworkable performance, like that of single-firm monopoly. In general, however, they do not show significant degrees of technical

inefficiency resulting from inefficient plant scales or excess capacity. (3) Oligopolies with fairly high seller concentration but only moderate barriers to entry are also prone to unworkable performance of the sort just mentioned, but not to as high a degree. (4) Oligopolies with only moderate seller concentration and moderate-to-low barriers to entry tend toward workable performance both in price-cost relations and in technical efficiency, except that some of them may have recurrent chronic excess capacity due to periodic over entry by competing firms. (If cartels are legalized and their provisions are not rigorously controlled by government, the last two categories of oligopoly may have the same sort of unworkable performance as do very highly concentrated oligopolies.) (5) Industries of atomistic structure tend generally toward workable performance unless they suffer from destructive competition as described above.

## Summary

The English word 'Monopoly' is derived from the Greek word 'Monopolian'. It means right to sell. So the pure monopoly is the situation of the market in which only a single firm is the only producer of any product and that product does not have any close substitutes. As monopolist is the only seller of product in the market thus neither he has any rivals nor any competitors. Like a monopoly, a monopsony also has imperfect market conditions. The difference between a monopoly and monopsony is primarily in the difference between the controlling entities. The term workable competition was coined to denote competition that may be considered as leading to a reasonable or socially acceptable approximation of ideal performance in the circumstances of a particular industry.

## Keywords

Price Maker: One who determines the price of the production. ·

Price Discrimination: Different prices. ·

Short Run: Short Time

## Self Assessment

1. Monopolist is the ..... maker.
2. English word monopoly has been taken from Greek word.....
3. Slope of demand curve in monopoly is from top to..... .
4. Monopoly is that market where for any goods there is only one.....
5. In the situation of monopoly there is only one.....
  - A. firm
  - B. currency
  - C. cost
  - D. commodity
6. In the field of monopoly for the entrance of new firm in market there is..... .
  - A. tax
  - B. restriction
  - C. prohibition
  - D. permission
7. In the situation of monopoly, there is no ..... curve.
  - A. supply curve
  - B. cost curve

- C. curve
  - D. supply curve
8. For the commodity during monopoly there is no..... .
- A. close substitute
  - B. substitute
  - C. cost curve
  - D. none of these
9. Marginal Revenue (MR) = Marginal cost (MC).
- A. True
  - B. False
10. Minimum Loss = AC - AVC = AEC.
- A. True
  - B. False
11. Monopolists have to bear loss of average fixed costs.
- A. True
  - B. False
12. During long run price is less than long run average cost.
- A. True
  - B. False
13. Workable Competition is a situation where .....
- a) high degree of monopolistic power exists
  - b) low degree of monopolistic power exists
  - c) medium degree of monopolistic power exists
  - d) All of above
14. Predatory pricing is the practice of using
- a) below-cost pricing to undercut competitors and establish an unfair market advantage.
  - b) above-cost pricing to undercut competitors and establish an unfair market advantage.
  - c) fair pricing to in the market
  - d) All of above
15. Market performance refers to the end results of
- a) the relationship of selling price to costs,

- b) the size of output,  
 c) Both the relationship of selling price to costs and the size of output,  
 d) None of above
16. ....market can become inefficient and less innovative over time because they do not have to compete with other producers in a marketplace
- a) Perfect competition  
 b) Monopoly  
 c) Monopsony  
 d) All of above

### **Answer for Self Assessment**

1. Price      2. Monopolian      3. Below      4. Seller      5. A
6. B            7. D                      8. A            9. A            10. B
11. A            12. B                      13. A            14. A            15. C
16. B

### **Review Questions**

1. What is monopoly? Explain it.
2. What do you mean by total income and the view of total cost?
3. What is meant by marginal revenue and marginal cost view?
4. Describe the necessary conditions of prices discrimination?



### **Further Readings**

- Microeconomics – Frank Cowbell, Oxford University Press, 2007.  
 Microeconomics – Shipra Mukhopadhyay, Annie Books, 2011.  
 Microeconomics: An advanced Treatise – S.P.S Chauhan, PHI learning.

## **Unit 11: Monopolistic Competition**

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Summary

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### **Objectives**

After this lecture, you would be able to

- understand the meaning and nature of Monopolistic competition
- analyze the short run and long run equilibrium under monopolistic competitive market

### **Introduction**

Till now we have studied two ultimate conditions of market – perfect competition and monopoly. But in actual life, middle condition is found, which is known as Imperfect Competition. In economics, conditions of imperfect competition were studied after 1933. This year, in England, book Economics of Imperfect Competition of Ms. Joan Robinson and in America, book Theory of Monopolistic Competition of Chamberlin have been published. Imperfect Competition is a wide term in which following situations of market are included

- (1) Monopolistic Competition: many sellers come under it.
- (2) Oligopoly: only some sellers come under it.
- (3) Duopoly: only two sellers come under it.

## 11.1 What is Monopolistic Competition?

Monopolistic Competition is that condition of market in which there are many sellers of any commodity, but commodity of every seller is different from commodities of other sellers in any way. Therefore, product differentiation is main quality of monopolistic competition. Product differentiation can be in the way of brand's name, trademark, differences in properties, packing or services given to customer or differences in services. Many examples of this type of competition are found in actual life. Firms producing toothpaste like Forhans, Colgate, Pepsodent, Cibaca, Babool etc. are the examples of monopolistic competition. In this type of market situation, there are firm monopolies and also the competitor, firm monopolies are there because it has limited control on commodity due to the product differentiation. In accordance with, demand curve of every firm like monopoly is negative. For example, Lux trademark of Hindustan Lever Ltd. has monopoly. Any other firm cannot use it. But other firms can produce bath soap like Hamam, Breeze, Camay, Dettol etc. under its trademark. In other words, there is freedom of producing substitute of 'Lux' soap. In this situation of market, element of competition is due to many sellers of commodity and firms have the freedom of entry and exit.

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

In the words of Baumol, "The term monopolistic competition refers to the market structure in which sellers do have a monopoly (they are the only sellers) of their own product, but they are also subject to substantial competitive pressures from sellers of substitute product."

## 11.2 Characteristics of Monopolistic Competition

Following are the main characteristics of Monopolistic Competition –

**1. Large Number of Firms and Buyers:** Firm producing differentiated product and sellers are large in numbers in monopolistic competition.

**2. Product Differentiation:** Product differentiation is the main feature of monopolistic competition. Product differentiation means that product of different types, brands, and qualities will be available to customers in a fixed time-period. Product differentiation occurs when buyer of product can differentiate between two products. In this, firms are in large number, but their products are different from each other in anyway, but these products are close substitutes of each other. Product Notes differentiation is obtained due to characteristic of product like shape, measurement, colour, durability, quality etc. There are many examples of product differentiation like bath soaps Lux, Godrej, Camay, Rexona, etc. in tea, Lipton, Brooke Bond etc., in toothpaste, Pepsodent, Colgate, Forhans etc.

**3. Freedom of Entry and Exit of Firms:** In the situation of monopolistic competition there is freedom of entry and exit of firms in the industry like perfect competition. It should be noticed that Chamberlin has used group at the place of industry for group of firms which produce differentiated products under the monopolistic competition.

**4. Selling Cost:** An important characteristic of monopolistic competition is that every firm spends more money in promoting its product under it. Firm gives advertisements in newspapers, cinemas, magazines, radio, T.V. etc. for selling its product in the maximum amount. The investment done on all these is called as Selling Costs.

**5. Price Control:** Every firm has limited control on the cost of product. Average income and limitend income curve of a firm fall down like monopoly in monopolistic competition. It means that in this situation, firm can slow down the price for selling more products and raise price for fewer products. In monopolistic competition, a firm has control on cost of its production due to the product differentiation. But due to the availability of close substitute of opposite product firms do not have full control on cost in monopolistic competition. The cost of every firm is affected by cost policy of its competitors in market up to the certain limit.

**6. Limited Mobility:** In monopolistic competition, sources of production and products and do not have mobility in services.

### Why do Producers want to Differentiate their Production?

- As a result of product differentiation, partial restriction is possible on cost.
- As a result of product differentiation, possibility increases of increase in part of producer in selling in market.

**7. Imperfect Knowledge:** In the situation of monopolistic competition, buyers, sellers of products, and owners of sources do not have knowledge of different prices of product. The reason is that comparison between productions of different firms is not possible due to product differentiation. Customers are fond of the production of any one specific firm. They only buy the production of that firm even if it costs higher than others. In this way even sources of production are not able to know fully that how much the different firms are costing to the sources of services.

**8. Non-Price Competition:** The main characteristic of monopolistic competition is that under it different firms without changing the costs of products compete with each other like the example of companies producing 'Surf' and 'Ariel'. If you take a box of 'Surf', you will get a glass utensil similarly, with the box of 'Ariel' you will get the steel spoon. In this way, firms, by providing different types of facilities and products etc. to customers to attract them toward their products. This type of competition is called as Non-Price Competition

### 11.3 Profit Maximization or Equilibrium Under Monopolistic Competition

Intention of every production is to make maximum profit even in the situation of monopolistic competition. We have already seen that maximum profit occurs when marginal revenue is equal to marginal cost. Marginal revenue is not equal to average revenue like perfect competition in the situation of monopolistic competition. In the situation of monopolistic competition, if any firm wants to sell maximum quantity of its production then it has to decrease the cost. That's why, in the situation of monopolistic competition, Average Revenue Curve (AR Curve) and Marginal Revenue (MR Curve) fall down in the form of left to right. In monopolistic competition, a firm produce till the point or limit at which (i) Marginal Revenue is equal to Marginal Cost ( $MR = MC$ ) and (ii) Marginal Revenue Curve cuts Marginal Cost Curve from the lower side. In this situation firm is in the condition of balancing by the production. The study of equilibrium firm in monopolistic competition can be done in two different durations –

#### (1) Short Run and (2) Long Run



Monopolistic Competition is that situation of market in which there are many sellers of the commodity, but commodity of every seller is different from commodities of other sellers in any form.

### 11.4 Short Run Equilibrium in Monopolistic Competition

Short Run is that duration of time in which production can be increased only by increase in using variable resources on increasing demand. There is no time to increase or decrease constant resources of production like machine, plant, building, etc. In short run, an equilibrium of a firm will be in that situation in which (1)  $MC = MR$  and (2) MC curve will be cutting MR curve. In short run, the amount of profit obtained in situation of equilibrium production to the firm will depend on demand of commodity and work welfare. There can be three conditions of firms in this duration of time –

**(1) Super Normal Profits, (2) Normal Profits and (3) Minimum Losses.** Short minimum term equilibrium condition of firm of monopolistic competition can be explained by the leading figure.

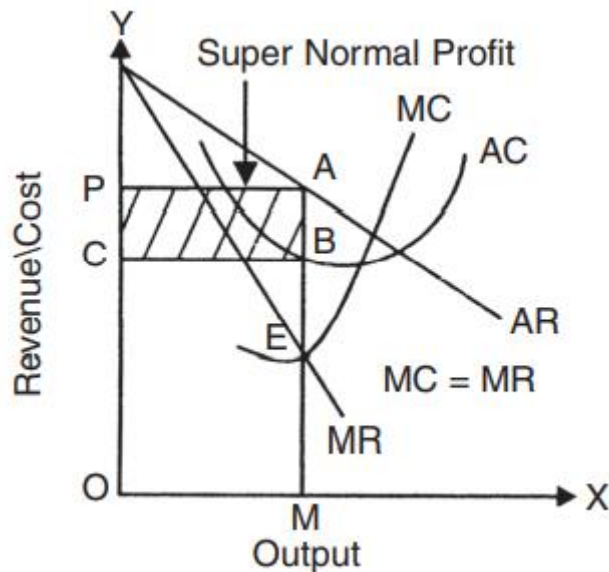
#### **The similarity of the MR and MC balance is the standard condition**

*Standard condition of similar equilibrium of MR and MC is in the condition of maximum profit and minimum loss of monopoly and perfect competition in monopolistic competition is also  $MR = MC$*

**1. Super Normal Profits:** It is known from Fig. 11.1 that firm is in equilibrium at point E because marginal cost and marginal revenue are equal ( $MR = MC$ ) on point E and MC curve cut MR curve from the lower side. It is known by point E that OM will be equilibrium production of firm. The cost of equilibrium production is OP (= AM). The cost (AM) of equilibrium production will be more ( $AM > BM$ ) than average cost BM so every unit of firm is obtained Super Normal Profits  $AM - BM = AB$ . In the situation of equilibrium, firm has total super normal profit ABCP, which has been shown by shaded parts.

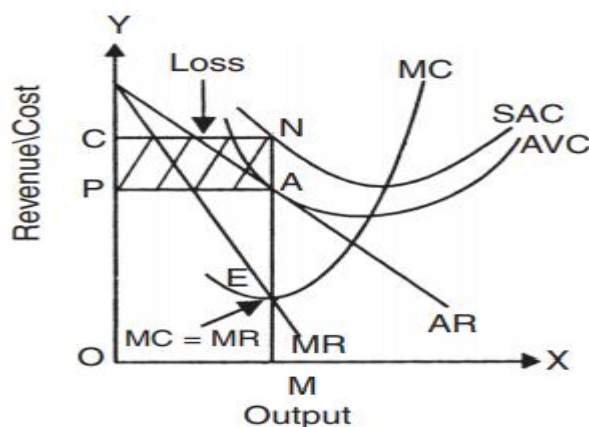
**2. Normal Profits:** In short-run, firm of monopolistic competition can have the normal profits. It is known by Fig. 11.2 firm will be in equilibrium situation at point E because at point E (i)  $MC =$

MR and (ii) MC curve cuts MR from the lower side. It is known by point E that OM will be the equilibrium production. The cost of equilibrium production is OP (AM) and average cost is also OP (AM). The reason is that AR curve is touching AC curve at point A. That's why in the situation of equilibrium cost (AR) and average cost (AC) are equal (AR = AC). Therefore, only normal profits will obtain to firm.



**3. Minimum Loss:** Firm can also have loss of fixed cost in short run. This is the minimum loss of firm. It is known from Fig. 11.3 that firm will be in equilibrium at point E. At this point,  $MC = MR$  and MC curve cuts MR curve from the lower side. In the equilibrium condition, firm will produce OM. The cost of equilibrium quantity OM is OP (= AM) and average cost OC (= NM). A short-run average cost of firm more than ( $SAC > AR$ ). So firm will have per unit loss of  $NM - AM = AN$ . But the cost of equilibrium production OM is equal to increased-decreased average cost because AR curve is touching AVC curve at point A. So, firm will obtain increased-decreased average cost equal to AM but will have loss of fixed cost AN. Total loss of firm will be NAPC which has been denoted by shaded part.

Fig. 11.3



### 11.5 Long-Run Equilibrium in Monopolistic Competition

Long-term is that duration of time in which firms can change level of their plants, new firms can enter the market and old firms can leave the market. It should be kept in mind that products differentiated in monopolistic competition are not similar. Chamberlin had used the word product group at the place of industry to those firms which produce differentiated product. There is freedom of entry and exit of firms in 'product group'. Because there is freedom of entry and exit of firms in monopolistic competition, so all the firms obtain only normal profit producing at higher level of profit in the situation of long-run equilibrium.



### Why only normal profits are obtained in long-run?

The reason is that like perfect competition there is freedom of entry and exit to firms in monopolistic competition also.

It is assumed that demand and cost curves for all products are uniform throughout the group. In long run, in the condition of monopolistic competition (i) firms do not earn super normal profits (ii) firms do not have loss (iii) firms earn only normal profits. These can be described as follows –

**(1) Firms will not Earn Super Normal Profits:** If in the situation of monopolistic competition, firms earn super normal profits so new firms will enter into the product group. They will produce nearby substitutes. When new firms attract customers of recent firms then demand of production of recent firms will become less. As a result, cost will decrease. Entry of new firms will continue in the market till when firms have not been earning the super normal profits. In other words, in long-run due to the freedom of entry of firm's super normal profits are not earned. Yet, every firm has monopoly in its differentiated product but due to the competition of conflicted firms producing nearby substitutes they are compelled to produce only in the situation of normal profits.

**(2) Firms will not incur loss:** No firm will incur loss in long-run. If any firm is getting loss in long-run, then it will be better to stop their production and exit from the group. This will decrease the level of production, accomplishment will be less in comparison of demand, cost will increase, and firms will earn normal profits again.

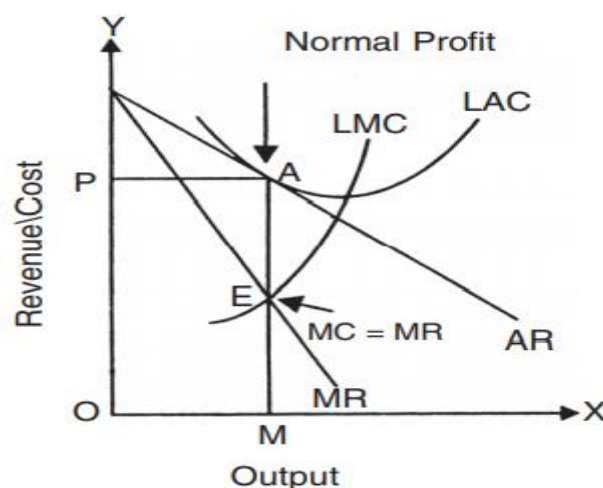
The cost determination in long-run can be clarified by Fig. 11.4.

In Fig. 11.4 LAC is long-run average cost curve and LMC is long-run marginal curve. AR is lead average and MR is marginal lead curve. MR and MC at point E are equal. Therefore, it will be equilibrium point. OM will be produced on this point, which costs OP(=AM). Average revenue curve on equilibrium production OM is touching long-run average cost curve at point A. So, in the equilibrium condition, cost, and long-run average cost (AR = LAC) are equal to each other. Therefore, firms are earning only normal profits. There will be maximum profits of LAC and AR at 'A', Point of Tangency.

The reason is that on any other cost average cost (AC) is more than average revenue (AR) of long-run average cost curve (AR) so firm will incur loss. Due to the normal profits obtained by the firm, there will be no encouragement for the entry of new firms in the group and no reason for exit of old firms from the group.

By viewing the Fig. 11.4, one more important thing is cleared that firm cannot use its fullest capacity on equilibrium point means production level of firm on equilibrium point is not optimum. The reason is that the average revenue curve falling cannot touch U-shaped long-run average cost curve to its optimum point. Average revenue curve is parallel to OX-axis in perfect competition, so it touches average cost on its optimum point on equilibrium point. But in monopolistic competition AR curve because of its negative slope touches U-shaped LAC curve to its point of highest cost, like it is known from Fig. 11.4. Therefore, in monopolistic competition long-run average cost is not optimum on equilibrium point. That's why firm production on equilibrium point is also optimized.

Fig. 11.4.



## 11.6 Excess Capacity

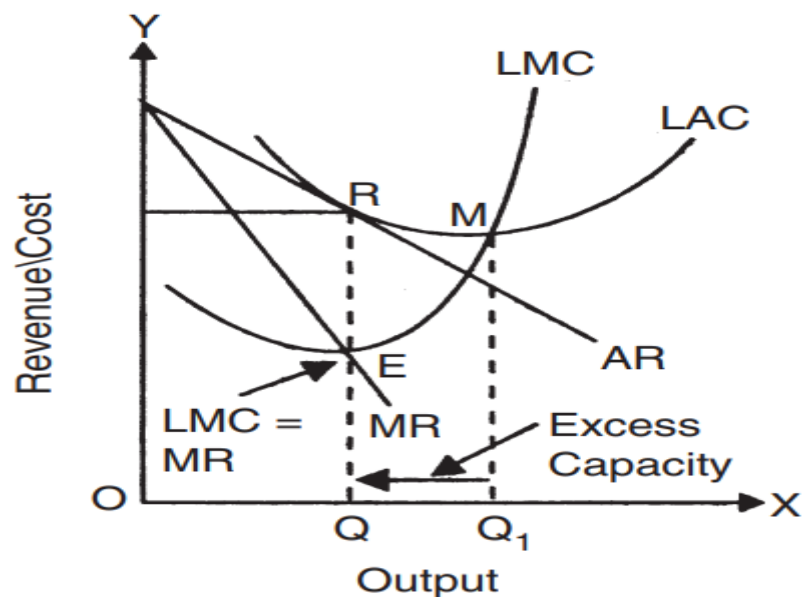
A quality of long-run equilibrium is 'Excess Capacity' found in 'group.' In the words of Mansfield, "Excess capacity is the difference between optimum output and the actual output in the long run equilibrium. **Optimum output of a firm has been regarded to be the output where long-run average cost is minimum.**"

The concept of excess capacity is long-run concept because in shortrun only perfect competition firm can use it less than optimum.

Excess Capacity is found in firms in monopolistic competition because it does not produce at optimum point of long-run average cost curve. In other words, excess capacity is that capacity which is not used in production. In this situation, every firm produce more and more on average cost than its average cost of optimum production. Concept of excess capacity can be explained by the Fig. 11.5.

It is shown Fig. 11.5 that firm is in long-run equilibrium condition at point E.  $LMC = MR$  and AR curve is touched line of LAC curve at this point. Equilibrium or Actual output is OQ. Optimum output is OQ<sub>1</sub>. The difference between optimum output and actual output represents the **excess capacity**.

Fig. 11.5



$$\text{Excess Capacity} = \text{Optimum Output} - \text{Actual Output}; \text{QQ}_1 = \text{OQ}_1 - \text{OQ}$$

The reason for the rise of excess capacity is that in long-run equilibrium downwards bended AR curve touches U-shaped AC curve to left of its optimum point. Tangent point 'R' is upper than optimum point 'M' means cost is more than average cost and less than optimum output (OQ<sub>1</sub>) means it is OQ.



Optimum Output is that output on which long-run average cost is optimum.

## 11.7 Is Excess Capacity Wasteful?

It is a subject to dispute that whether excess capacity is wasteful or not. The vote of some economists is that as a result of 'excess capacity' number of firms is large in 'group'. Because every firm produces less than the optimum production so firms can be more than necessity in the 'group' only in the situation of 'excess capacity'. As a result of it, there is extravagance. Because every firm is producing on the part of negative slope of average cost curve, so production is done on more than the cost. That's why use of recent production capacity of firm cannot be done. Due to the reason, concepts of some economists are that excess capacity is wasteful. In its absence, production of equal quantity of products will be possible by the less number of firms because more production

will be done by every firm. As a result, production cost will be less. Every firm will produce more quantity of product on less average cost.

Opposite to it, some economists, like Kelwin Lancaster does not admit this opinion that monopolistic competition is wasteful. According to him, under monopolistic competition, as a result of production of differentiated product it will be possible to increase their satisfaction on satisfying different interests of customers.

Related to it Lipsey said that "Consumers' satisfaction are maximized when the number of differentiated products is increased until the marginal gain in consumer's satisfaction from an increase in diversity equals the loss from having to produce each existing product at higher cost." We conclude that 'excess capacity' is not wasteful.

## 11.8 Empirical Evidence

Product differentiation is the global phenomenon. Actually, a mandatory condition of reaction of production is made in all economies of the world in protracted time. Increase and globalized reaction in international competition have made the thought of product differentiation very hard. Undoubtedly, product differentiation is the distinct quality of monopolistic competition even then it is believed that monopolistic competition (a kind of market) is not more extensive in market. Actually, the economists believe that there may be any monopoly behaviour present in market. How can we coordinate both the facts: One is that the product differentiation is expanding as market behaviour; second, the monopoly competition (production differentiation is the main characteristics of it) is not seen in real life. The reality is that there are fewer firms which differentiate the production of product. The product differentiation much occurs in consumer goods like Soap, Cigarette, Chemical and Fast Food. But these products have been produced by those big firms whose quantity is very low. McDonald's, Pizza Hut, Sub way, Dominos and KFC are some firms which are brands in processed food items. How can this industry add in the market? Definitely, this is not perfect competition or monopoly or monopolistic competition. The place for this is that place of market which is called Oligopoly and the main characteristic is competition among the few firms. This is described in next unit.



Give your opinion in Excess Capacity.

## 11.9 Non-Price Competition

The firms can opt two methods in monopolistic competition to raise its profit - (i) Price Competition (ii) Non-price Competition. In price competition, firm decreases its price. By this there may be no profit maximization because if a firm decreases its price, other firms also do this technique. Thus, the part of any firm doesn't go ahead because there is no sale increment in either of the firms. So in the monopolistic competition, firms mostly opt non-price competition.

In the words of Nicholson, "**Non-price competition is the competition by sellers for sales by means of other than price cutting.**"

The non-price competition means the technique which firms adopt without changing the price of product to lure the customers.

There are many ways by which the firms use to attract the customer like to change the quality of product, change in the place of sale, to give advertising, to give free gift with product like spoon, calendar, glass, ball pen etc., goods packaging, free home delivery etc. Thus every firm uses these techniques to attract the customers by giving such services. This competition is called non-price competition.

In the non-price competition, the main aim of firms is also to increase its profit and sale. This competition works till customer demand is not fulfilled. By this, consumer gets various products in attractive terms. But sometimes this non-price competition starts Cut-Throat Competition in mutually against firms and the social cost of these competition gets higher. In monopolistic competition, the unusual profit gets zero in long run due to independency of firm to get in. But sometimes the firms deny to get into the new firm by differentiating their production.

### **11.10 Selling Costs**

The monopolistic firms spend more of their money in advertising to sell more of its product. The cost which goes into publicizing and advertising the product, in economics this is called selling cost. The selling cost is main necessity in monopolistic competition. In perfect competition, all the products of all the producers are homogenous. So they do not need advertisement of product. In monopoly condition also, there is only one producer of product. When he starts production, then he may be spending some money to give information about product to consumer. This money is only an information which is spent in advertisement. When the consumer gets knowledge about the product, the advertisement technique has no need. In monopolistic competition, it is not enough to give information of the product only but to remember the quality of product is very necessary. So in monopoly condition, this selling cost is not only for informative purposes, but also for manipulative demand and sales promotion. In brief, the selling cost has all the processes which a producer uses for manipulative demand or to increase his demand of product. So the selling costs are those which are spent on advertisement, salesmanship, commission given to the shopkeepers, gifts and benefits etc.

According to Chamberlin, "Selling costs are costs incurred in order to alter the position or shape of the demand curve for the product."

According to Meyers, "Selling cost may be defined as costs necessary to persuade a buyer to buy one product rather than another or to buy from one seller rather than another."

### **Summary**

The main characteristic of monopolistic competition is that under it different firms without changing the costs of products compete with each other like the companies producing 'Surf' and 'Ariel'. For example, if you take a box of 'Surf', you will have a glass utensil similarly, with the box of 'Ariel' you will get the steel spoon. In this way firms, by providing different types of facilities and products etc. to customers, attract them toward their products. This type of competition is called as non-price competition.

### **Keywords**

- **Monopolistic:** Full rightful
- **Selling Cost:** Cost of Selling
- **Price Control:** Limited control on price
- **Imperfect Knowledge:** Half Knowledge

### **Self Assessment**

1. As a result of product differentiation ..... partial restriction on price.
2. Product differentiation is the ..... of monopoly.
3. Sources of production and commodities and ..... not in monopolistic competition.
4. of every firm is affected by ..... cost of its competitors in market for a long time.
5. Intension of every producer even in monopolistic competition is to be .....
  - A. more
  - B. less
  - C. zero
  - D. none of these
6. There ..... of entry and exit of firms in the situation of monopolistic competition.
  - A. dependence
  - B. freedom
  - C. equality
  - D. inequality
7. It is found in firms in monopolistic competition .....
  - A. freedom

- 
- B. equality
  - C. excess capacity
  - D. dependence
8. Under cost competition, firms do to cost .....
- A. more
  - B. zero
  - C. less
  - D. none of these
9. Economist, Kelvin Lancaster admits the opinion that monopolistic competition is wasteful.
- A. True
  - B. False
10. Product differentiation is not generally a global phenomenon.
- A. True
  - B. False
11. Non-price competition is that competition in which sellers do conflicts for selling through other methods in the place of decreasing cost.
- A. True
  - B. False
12. 12. Selling costs are those costs which are used for the intension of changing in the situation and shape of demand curve of any product.
- A. True
  - B. False
13. The loss of efficiency that occurs in monopolistic competition has to be weighed against the gain of
- A. an increase in employment.
  - B. higher wages for employees.
  - C. greater product variety.
  - D. reduced environmental damage
14. Selling costs, such as advertising, are likely to be a large share of total cost in an industry that is
- A. monopolistically competitive
  - B. perfectly competitive.
  - C. non-profit.
  - D. a monopoly.
15. In the long run, a firm in a monopolistically competitive industry has its price equal to its
- A. marginal cost.
  - B. marginal revenue.
  - C. elasticity of demand.
  - D. average total cost.

**Answer for Self Assessment**

- |             |                         |           |        |       |
|-------------|-------------------------|-----------|--------|-------|
| 1. Possible | 2. Main characteristics | 3. Motion | 4. Law | 5. A  |
| 6. B        | 7. C                    | 8. C      | 9. B   | 10. B |
| 11. A       | 12. A                   | 13. C     | 14. A  | 15. D |

**Review Questions**

1. What do you mean by monopolistic competition? Describe it.
2. What do you mean by excess limit? Describe it.
3. What do you mean by empirical evidence?
4. Give a note on 'non price competition'.

**Further Readings**

Microeconomics: An Advanced Treatise – S.P.S. Chauhan, PHI Learning.

Microeconomics: Behaviour, Institutions and Evolutions – Sampool Bowels, Oxford University Press, 2004.

Microeconomics: Principles, Applications and Tools – Sanjay Basotia, DND Publications, 2010

## Unit 12: Oligopoly

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### Objectives

- after going through this unit, the students will be able to:

### Introduction

A form of market in which the competition takes place only between some firms, is a new and emerging phenomenon. The number of goods producing firms is less and they compete with each other. Not in local but often in international market the competition is so acute that economist often relates it with cutthroat competition. This type of market is known as oligopoly market. Example: (i) There is an ongoing competition between Coke, Pepsi and Canada Dry and some other soft drinks throughout the world. (ii) There is a worldwide competition between General Motors, Toyota, Maruti Suzuki, Hyundai, Ford and some other car manufacturers.

Lipsey has defined oligopoly as "Theory of imperfect competition among the few; it refers to an industry that contains only a few competing firms. Each firm has enough market power to prevent its being a price taker; but each firm is subject to enough inter-firm rivalry to prevent it considering the market demand curve as its own."



Oligopoly cross elasticity of demand of commodities is much higher. Because these items are near replacement.

### 12.1 Features of Oligopoly Features of oligopoly are as Follows:

**1. Few sellers and many buyers:** Oligopoly is that condition of the market in which only few firms have their influence. For example, in India, four companies Maruti, Hyundai, Cielo and Tata produce 90% of the small cars. Products produced by oligopolistic firms can be homogeneous or discriminatory. These firms can influence prices and production with their actions. In Oligopoly, the number of buyers is very large.

**2. Homogeneous or Differentiated Product:** In Oligopolistic industry, firms either produce homogeneous or differentiated products. If the firms produce homogeneous products, like cement or steel, the industry is known as Pure or Perfect Oligopoly and if the firm is producing differentiated product, the industry is called as differentiated or imperfect oligopoly.

**3. Mutual Interdependence:** The interdependence of firms is an important feature of Oligopoly. Interdependence means that the firms get affected by each other's prices and production related decisions. In monopoly and competition, the firms can take their decisions independently and can work upon them without taking into consideration what effect would that have on other firms or how would other firms' reactions affect them. But an Oligopolistic firm cannot take an independent decision. As a small number of firms compete with each other in Oligopoly, the sales of a firm depend on the price taken by the firm itself as well as on the price taken by other firms. If a firm reduces its price, its sales tend to increase but the sales of other firms tend to decrease at the same time. In such a situation, it is possible that other firms may reduce their prices as well which might decrease the profit of the first firm. Therefore, a firm must calculate and predict the reaction of other firms as well as the effect of those reactions, before reducing its prices. The cross elasticity of goods in Oligopoly is very high as these goods are easily replaceable. To summarize, the Oligopolistic firms have to keep in mind the competitors' actions and reactions while deciding upon price and production. This mutual interdependence of the firms makes the Oligopolistic market different from monopoly, complete competition, and monopolistic competitor.

**4. Lack of Uniformity:** The absence of uniformity in the size of firms is another feature of Oligopoly. Some firms are very large, and some are small firms. For example, Maruti holds 86% of share in the market of small cars, whereas Hyundai and Tata hold a relatively small share.

**5. Advertisement:** A huge firm has to shell out a lot of money on advertising. Due to the price rigidity and cross elasticity of demand, advertising the product is the only means for a large firm to magnify its sales volumes. A large firm's primary objective of investing huge sums of money on advertising is to stimulate the demand for its product. In this context, Baumol has rightly said, "It is only in oligopoly; advertisement comes, fully into its own. Under oligopoly, advertising can become a life and death matter, where a firm which fails to keep up with the advertising budget of its competitors may find its customers rifling of to rival products."

**6. Element of Monopoly:** Schismatic and incomplete Oligopoly firms have the power of monopoly. Product distinction creates the sense of brand loyalty in consumers. Every firm has the monopoly over its brand. No other firm can sell a product within that brand (trademark). Other than this, firms can earn monopolistic profits by increasing prices through collusion.

**7. Existence of Price Rigidity:** Existence of price Rigidity is another feature of Oligopoly. Price rigidity means no change in the prices by the firms. Because any change in the price would not be profitable for the firm, therefore, a firm stick to its prices. If a firm tries to reduce its prices, in return its competitors would reduce their prices as well yielding no profits for any firm. In the same way, if a firm tries to increase its prices, it will end up losing its customers and in turn facing losses. Hence, price rigidity is witnessed in Oligopolistic market.

**8. Keen Competition:** There is an acute competition between the competitors in Oligopoly. The number of sellers is so less that a step taken by any firm affects other participants immediately. Consequently, each firm monitors the activities of its competitors and is always ready with its defensive actions. For an oligopolist, business is a continuous struggle because the market situations make him face every move in the market. This type of competition is unique and cannot be found in other markets. Oligopoly is the highest form of market.

**9. Uncertainty:** Due to the mutual interdependence of the firms, it is not possible to predict the behaviour of any firm. Based on the existing facts, it is very difficult to estimate the current financial changes. Therefore, uncertainty always exists in Oligopoly.

**10. Existence of Non-profit Motive:** In Oligopoly, maximum profit is not the only motive of a firm. There can be other motives like – sales maximisation, minimisation of risk, output-maximisation, security maximisation, etc. It is very difficult to determine the balance between price and production in case of absence of maximum profits as a motive.

**11. Some Barriers to Entry:** The restrictions on entry into the industry of the Oligopolistic firms are another feature. Some general restrictions are – scale of savings, absolute costs profit to old firms, control over patent rights importance inward, existence of preventive prices and excess capacity, etc. The above-mentioned barriers stop the entry of new firms.



### Three Basic Features of the Oligopolistic Market Structure

- (i) **Interdependence among the Firms:** Mutual interdependence of firms in decision-making is an important feature. Why interdependence? Because when the number of participants is very less, any change in the production or price by a firm directly affects the profits of other firms. Therefore, their reactions would either be in the form of change in price and production or in the form of intensive publicity in order to attract more buyers. Therefore, while deciding over quantity of production and price not only a firm has to consider the demand curve but also has to consider the reactions of the competing firms.
- (ii) **Advertising and Selling Costs:** Due to the mutual interdependence of the firms of an Oligopolistic market, the firms have to adopt various defoliation related aggressive and defensive techniques so that they can capture the maximum market share and can retain their current position in the market. Therefore, they have to spend on publicity and sale incentive. This is why publicity and sales costs hold an important place in the Oligopolistic market. To note, a firm does not keep reducing the price of its commodities rather they keep competing over non-price basis. Because price reduction results into price war between the firms, hence resulting in the ouster of few firms.
- (iii) **Group Behaviour:** The basis of Oligopoly is group behaviour and not gathering or personal behaviour. There is no general accepted basis of group behaviour. Will the members of the group agree to boost for their general rights, or should they fight for their own personal rights? Is there a leader of that group? If yes, then how does he manage to make the others follow him? Questions like these are important to determine the theory of group behaviour. But one thing is for sure. Every oligopolistic industry keeps vigilance over other oligopolistic industries' business behaviour. Based upon their behaviour and reactions, they plan everything.

The basic difference between complete competition, monopoly, monopolist competition and Oligopoly is that the decisions of the oligopolistic firms in the Oligopolistic market affect the other participants in the market, whereas this feature is missing in other forms of market.



Price rigidity exists in Oligopolistic market.

## 12.2 Behaviour of Oligopolistic Firms and Other Market Structures

Firms in the Oligopolistic firms get affected by the behaviour of other firms in the market. Therefore, the firms adopt a strategic way of conduct. In other words, they keep a crystal-clear idea of the effects their decisions would cause over other firms and how would they react. Whereas, in competitive and monopolistic competition have a non-strategic way of conduct which means that their decisions are

completely based upon their costs and demand curves and they do not have to anticipate the reactions of their competitors. Based on this, even the monopoly market adopts the non-strategic way as they do not have to face any competition.

### Strategic and non-strategic conduct

Strategic conduct is the one in which a firm considers and anticipates the behaviour and reaction of its competitor firms while deciding over the price and production. Oligopolistic market is a good example of this. Non-strategic conduct refers to the one in which a firm does not have to worry about the reaction and behaviour of its competitors and has to only consider its costs and demand curves while deciding over price and production.

### 12.3 Classification of Oligopoly

The classification of oligopoly can be defined as –

**1. Perfect or Imperfect Oligopoly:** In Oligopoly, firms produce homogeneous products. It is also known as Pure Oligopoly. On the other hand, in incomplete or differential oligopoly in which all the firms produce differential yet close substitute products.

**2. Open or Closed Oligopoly:** Open Oligopoly is the condition when there is no restriction or barrier to the entry of firms. Firms are free to enter the industry. But in closed oligopoly, firms have certain restrictions over entry in the industry. These restrictions could be technical, legal or of any other type.

**3. Partial or Full Oligopoly:** Partial Oligopoly is that condition in which a dominant firm exists. This firm is known as the Price Leader. This Dominant firm and the price head decide the prices and rest of the firms have to accept the prices. Full Oligopoly is the condition in which there is no Dominant or Price head in the industry.

**4. Collusive or Non-collusive Oligopoly:** In Collusive Oligopoly, firms support each other while deciding over the prices. They adopt one single policy and do not compete with each other. But in non-collusive Oligopoly, firms decide over the prices independently and also they compete with each other.



Write down your thoughts over “Classification of Oligopoly”

#### Firm-Created Causes

As mentioned above, the behaviour of Oligopolistic firms is very strategic. Though there is a trend of decrease of firms in the industry, however, the firms which survive (Survivors) have an increase in their average size. This because of the strategic practices, which the surviving firms undertake. Either the big firms purchase small firms, or a merger takes. This process increases the size and market share of small firms and also let them earn more profits being Oligopolistic. The mutual competition also decreases.

### 12.4 Duopoly

The duopoly is the unique part of monopoly theory where there are only two sellers. Both the sellers are independent and there is no agreement between both of them. However, there is no agreement between them but if one changes his price and production, the other will be affected and it is possible to create a change of reactions. But there might be possible that one seller thinks that the change does not affect other and put the changes in his price. On the other hand, if the seller thinks about the reaction behaviour of these changes, then he must think about direct and indirect pricing. And it also is possible to change in the quantity of product or its price does not affect the policy of opponent seller. So duopoly can be described by taking mutual dependency or avoiding this mutual dependency. The Cournot Edgeworth solution is already have which avoid this mutual dependency and this mutual dependency is taken in Chamberlain solution.

### 12.5 The Cournot Model

In 1838, economist from France A. A. Cournot proposed this duopoly solution. He gave example by two firms A and B as well as the lake of mineral water.

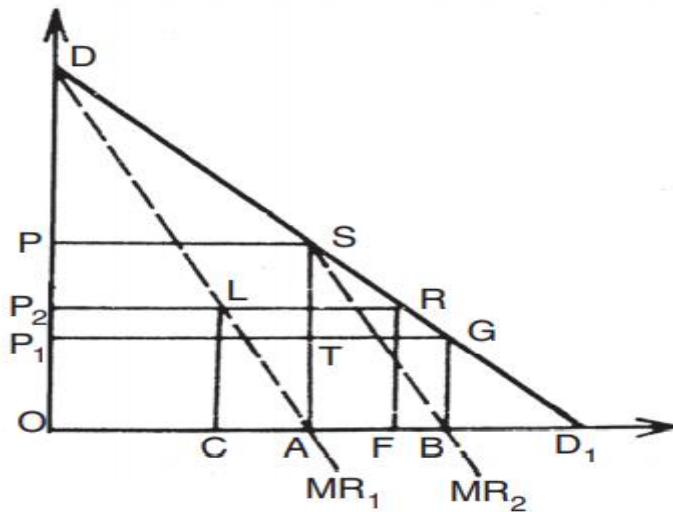
**Assumptions:** The Cournot model is based on these assumptions:

1. There are two independent sellers.
2. They produce a homogenous product which is mineral water.
3. The consumption of total production is essential because the product is destructive and non-volatile.
4. The number of buyers is more.
5. Every consumer knows about the market demand curve of the product.
6. The cost of production is assumed as zero.

7. Both the firms have equal cost and equal demand.
8. Every seller decides that what he wants to produce and sell in a period of time.
9. But from each, they do not know anything about the production of others.
10. Also, both the sellers assume constant to their opponent's production.
11. From each of them, no one has fixed the price of his product but accept the market demand price on which product sells.
12. The entry of new firm is closed.
13. Every seller's dream is to get maximum and pure profit and revenue.

On these given assumptions, suppose that two firms A and B extract water from waterfall of mineral water. Their market demand curve is  $DD_1$ , and marginal revenue curve is  $MR_1$  as shown in Fig. 12.1.

Fig. 12.1



The marginal cost of A and B is zero and it matches with parallel axis. Suppose that firm A is a single manufacturer. In this case when its  $MR_1$  curve is equal to  $MC$  curve (parallel axis) on point A then it produces and sells  $OA (= \frac{1}{2} OD_1)$  quantity. It takes monopoly price  $AS (= OP)$  and gets monopoly profit  $OASP$ . Now firm B comes into market and hope that firm A will not change its production level  $OA$ . So, it takes the part  $SD_1$  to its demand curve. Its marginal revenue curve is  $MR_2$  which intersects its  $MC$  curve on point B. So, it sells  $AB$  quantity  $(= \frac{1}{2} OD_1 = BD_1)$  on  $BG$  ( $OP_1$ ) price and hope to get profit as  $BGTA$ .



The duopoly is the unique part of monopoly theory where there are only two sellers.

Firm A knows that the price is decreased from  $OP$  to  $OP_1$  as B comes in market. So, the assumed profit falls as  $OP_1 TA$ . In this stage, it tries to adjust its price and production. To fix that firm B will sell the  $AB (= BD_1)$  quantity, firm A sells  $\frac{1}{2} OB$ . Thus, the decrease in quantity from  $OA (= \frac{1}{2} OD_1)$  to  $\frac{1}{2} OB$  rises the price which is not shown to simplify the figure. B reacts as the production of A decreases and increased its production to  $\frac{1}{2} (OD_1 - \frac{1}{2} OB)$  and by this price drops. Thus, the price increases due to decrease in production by firm A and the production increment by B by which price increases; the equilibrium price would be  $OP_2$ . In this price, the total production of mineral water is  $OF$ , which equally differentiate in both firms. Each sell  $\frac{1}{3}$  parts of market demand means firm A sells  $OC$  and firm B sells  $CF$ . In this price the profit of A is  $OCLP_2 =$  profit of B  $CFRL$ .

Both firms sell  $\frac{2}{3}$  of total production  $OD_1$ . If number of firms is  $n$  then rate of production will be multiple of  $n/n + 1$ . The total production of both the firm A and B is  $\frac{2}{2} + 1 = \frac{2}{3}$ . So, the total production of A + B is  $OD_1 (1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8} + \frac{1}{16} - \frac{1}{32} + \frac{1}{64} \dots) = \frac{2}{3} OD_1 = OF$ .

The duopoly solution of Cournot is tally with perfect competition solution. The duopoly firms A and B take price  $OP_2$  and sell quantity  $OF$  in equilibrium state. Under perfect competition, total production will be  $OD_1$  in zero price. Price is zero because marginal cost is zero. When  $MR$  curve intersects parallel axis  $MC$  curve on point A then price will be zero. The total production  $OD_1$  will

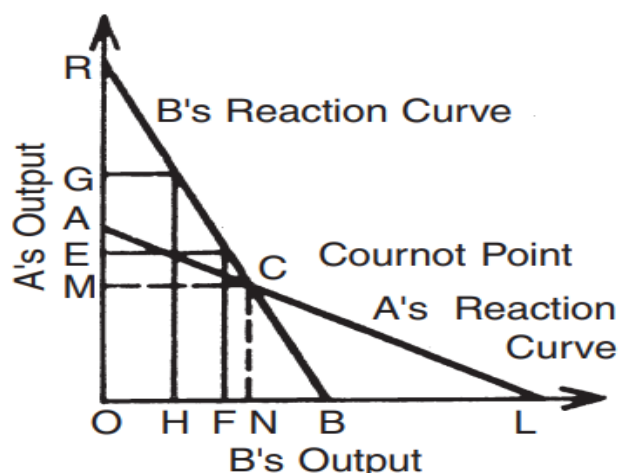
equally distribute between A and B firm:  $OD_1 = OA + AD_1$ .  $OA = AD_1$  In Cournot solution,  $OP_2$  price is greater than marginal cost and zero price and perfect competitive production  $OF$  is less than  $OD_1$ . But in Cournot solution, production  $OF$  is greater than monopoly production  $OA$  but price  $OP_2$  is less than monopoly price  $OP$ . Mathematically, in Cournot solution the production is  $4/3$  of monopoly production and  $2/3$  of perfect competition.

### Cournot Model in Terms of Reaction Curves

As the assumption of the basic model of Cournot, the economists have given a better solution by reaction curves. This definition takes an extra assumption that duopoly firms react from its competitive firm irrespective to production tactics.

So, by supposing this that if A will produce then B will not react or vice versa the output reaction curves can be drawn on vertical axis for production of A and on horizontal axis for production of B. In Fig. 12.2, the reaction curve A is  $AL$  and reaction curve for B is  $RB$ . Let's assume firm A produce  $OG$ . By fixing this that A will not change  $OG$ , firm B reacts by producing  $OH$ . Then A reacts by assuming that B will not react in its production  $OH$  and produces  $OE$ . Again, B reacts and produces  $OF$ . Now we see that by reacting A on B, the production of A decreases and the reaction on B over A increases its production. This reaction occurs till both reach on Cournot point  $C$  where both A and B produce similar production. The production of A is equal to  $OM$  while production of B is equal to  $OF$ . This conclusion comes on that time when we move downward from right to above in Fig. 12.2. Thus, the analysis of reaction curve model is affected to get Cournot model.

Fig. 12.2



## 12.6 Price Determination Under Oligopoly

To know the characteristics of oligopoly, we do further the study of price and production determination by monopolistic firms. But we limit our analysis from the non-collusive monopoly model of Sweezy and price determination and collusive monopoly model of Cartel.

### 1. The Sweezy Model of Kinked Demand Curve (Rigid Prices)

In a column in 1939, Prof. Sweezy proposed Kinked Demand Curve analysis for describing price constant in monopoly market. Sweezy thinks that if monopoly firm decreases its price, then in reaction, its opponents will cut their prices accordingly and regularly in fearing of losing the customer. Thus, the firms which cut their price will not increase its demand. So this portion of demand curve is less elastic. In contrast, if monopoly firms increase their price, then the opponent will not change their price. Thus, the demand of that product would be less. So this portion of demand curve is respectively more elastic. In both the conditions, kinked is found in the demand curve of monopoly firm which shows price stability.



The Cournot solution is not real because it gives zero cost in production.

**Its Assumptions**

The kinked demand curve theory of price stability is based on following assumptions –

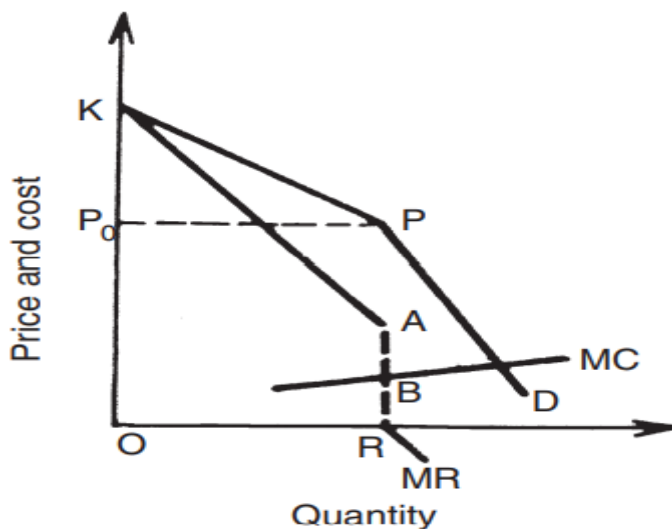
- (1) There are some firms in monopoly industry.
- (2) The product of a firm is nearly substituted by other firms.
- (3) Product is of single quality. There is no differentiation of product.
- (4) No marketing cost.
- (5) There is a fixed and current market price of product which satisfies all the sellers.
- (6) The behaviour of every seller depends upon their opponents.
- (7) If any seller tries to increase their selling by decreasing the product price, then all sellers will follow, and this technique will not fulfill the primary seller's desire.
- (8) If he increases the price then nobody will follow him and fulfill the consumer's demand with their existing price.
- (9) The marginal cost curve crosses in the middle of kinked part of marginal revenue curve. So, the change in marginal cost is not affected to production and price

**12.7 The Model**

By these assumptions, the relation between price and production in monopoly market is described in Fig. 12.3. In the figure, KPD is a kinked demand curve and  $OP_0$  is the current price of a seller in oligopoly market. For quantity  $OR$ , starting from  $P$  for current price  $OP_0$  and above, the price increment will decrease the selling of that product because it does not hope that its opponent will follow this tactic. The reason behind this is that the  $KP$  part of kinked demand curve is elastic and  $KA$  part of  $MR$  curve is positive. So if price increases then its total revenue and profit will decrease as well as total selling too.

On the other hand, if seller drops its price by  $OP_0 (= P)$  then its opponent will also follow him. However, its sell will increase but the profit will be low. The reason behind this is the  $PD$  of kinked demand curve below  $P$  is less elastic and the below part of  $R$  of marginal revenue curve is negative. Thus, seller will not get any profit, however, it decreases or increases the price. It will be on current market price  $OP_0$  which is rigid

Fig. 12.3



To know the process of kinked demand curve, now we analyze the effect of changes in demand stage and cost in pricing in oligopoly market.

**Changes in Costs**—In oligopoly stage, analysis of kinked demand curve, the current price is not affected by change in fixed cost. Suppose that the cost of production drops by this new  $MC_1$  curve goes into right side  $MC_1$  which is shown in Fig. 12.4. It intersects in difference  $AB$  to  $MR$  curve by which profit maximization product is  $OR$  which can sell on  $OP_0$  price. It must be known that,

however, price drops, new MC curve will cut MR curve in difference, because as price falls, the difference AB widens by two reasons – (i) as soon as cost drops, the KP part of demand curve will more elastic because it defines that the increment in price will not follow by their opponent and their sell will drop (ii) By dropping of cost, PD part of kinked curve will be non-elastic because it defines that decreasing of price will follow by all sellers.

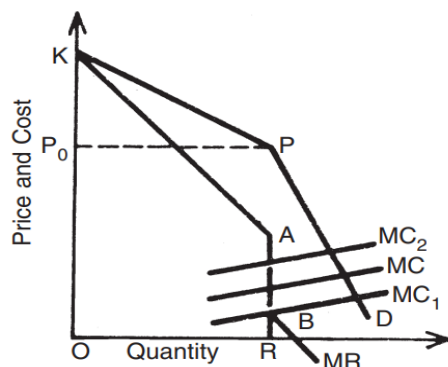


Fig. 12.4

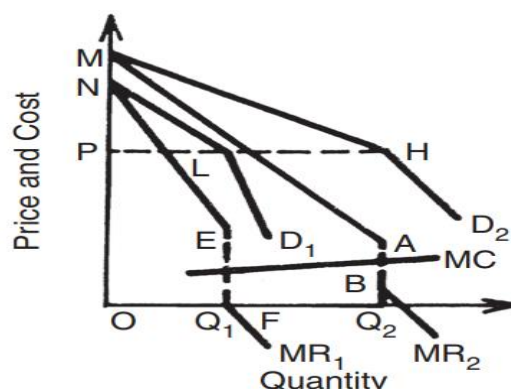


Fig. 12.5

So, there is a right angle found by angle KPD on point P and difference increases by this no MC curve cuts under MR below on point A. The result is that the production OR remains same on point  $OP_0$  and monopoly sellers get more profit.

If production cost increases, then the marginal cost curve goes on  $MC_2$  on old MC curve. Price will be stable until high MC curve intersects MR curve under point A. Yes, if cost increases then it will not be permanent and if MC curve goes above to A then it will intersect MR curve on KA part and by this, low quantity will cost more. Result is in oligopoly; price can be stable when changes cost until MR curve cuts to MC curve. But the stability in price is more found in less cost than more cost products.

**Changes in Demand** – Now we describe the changes in demand with price stability by the help of Fig. 12.5.  $D_2$  is original demand curve,  $MR_2$  is marginal revenue curve and MC is marginal revenue curve. Suppose that the demand decreases which is reflected by  $D_1$  curve and  $MR_1$  is its marginal revenue curve. When demand decreases then a seller cuts his price and opponents follow this approach. By this the new demand curve  $LD_1$  becomes more elastic than  $HD_2$  of old demand curve. This will reach angle L to right angle. This results that the difference between EF of  $MR_1$  will be wider than AB of  $MR_2$  curve. Thus, it reflects that in oligopoly industry, price is stable, however, the demand is low. Since the level of both demand curves kink H and L is equal, so after falling of demand, price remains same as OP. But the production level decreases from  $OQ_1$  to  $OQ_2$ .



Give your opinion in kinked demand curve model of Sweezy

To make opposite this situation by increase in demand  $D_1$ ,  $MR_1$  is original demand and marginal revenue curve, while  $D_2$  and  $MR_2$  are high demand and marginal revenue curve respectively. OP remains same in it, but production increases from  $OQ_1$  to  $OQ_2$ . Price is stable until MC curve cuts MR curve. When demand increases then a seller wants to increase his price and hopes that other sellers will follow him. Due to this, the upper portion of new demand curve MH will be elastic rather than old demand curve part NL. So there is a right angle created on H. The difference of AB is less in  $MR_2$  curve and MC curve intersects  $MR_2$ , which shows high price. But if crosses from marginal cost curve  $MR_2$  then price will be stable.

#### Reasons for Price Stability

There are various reasons for price stability in some oligopolistic markets:

**First**, it might be possible for the sellers of oligopolistic market, that by experience they know that price war is not better for them, so they prefer the price stability.

**Second**, it might be possible that they are not satisfied with current prices, production and profits and not want to step in uncertainty.

**Third**, it might be possible that to protect incoming of firms in market, they will prefer price stability.

**Fourth**, Sellers can practice increasing their price rather than to decrease. It might be possible that they prefer non-price competition than price war.

**Fifth**, after using a big money in advertising, they do not prefer to increase their price, so they will prefer to stay with current price of product.

**Sixth**, if there is a new price due to any agreement then no seller will leave this agreement because if he rises the price, others will follow, and he can drop in uncertainty and become unsafe.

**Last**, Kinked demand curve comes brings stability in oligopolistic market.

## Summary

Lipsey has described the Oligopolistic form of market as, "Oligopoly is the theory of an incomplete competition between firms. It is related to an industry in which there are only a few participants. Every firm has a market value of such magnitude that it stops it from becoming price-acceptor, but each firm has to face such inter-firm competitors which stop it from believing that the demand in the entire market is for that particular firm."

All the analysis of kinked demand curve expresses that when all sellers decrease their price then there is price stability in oligopolistic market. Generally, changes in demand and cost brings price stability until MC curve intersects MR curve in its below part. But price hike is found in high demand and high cost.

## Keywords

- **Oligopoly:** Sway of firms in the industry
- **Homogeneous:** Equal shaped
- **Excess capacity:** Having high capacity
- **Shortcomings:** Demerits
- **Stability:** Rigidity (in price)

## Self Assessment

1. Brand loyalty is ..... in consumers due to product distinction.
2. Every firm has ..... over their brand.
3. Price rigidity is another feature of .....
4. Price is found to be ..... in Oligopolistic market.
5. A firm can achieve ..... by coalition through increase in price.
  - A. monopolistic profits
  - B. profit
  - C. loss
  - D. none of these
6. Price rigidity means no ..... in the prices by the firms.
  - A. change
  - B. increase
  - C. reduction
  - D. none of these
7. Oligopolistic is the form of market .....
  - A. Lowest

- B. highest  
C. competent  
D. none of these
8. Deciding over production and price in the absence of profit maximisation as a motive is .....  
A. Hard  
B. very hard  
C. easy  
D. very easy
9. The basis of Oligopoly is group-behaviour and not gathering or personal behaviour.  
A. True  
B. False
10. Group-behaviour does not have an established base.  
A. True  
B. False
11. An Oligopolistic does analyze the business behaviour of other participants.  
A. True  
B. False
12. According to Adam Smith, labour division depends on the size of the market.  
A. True  
B. False
13. The duopoly is the unique part of monopoly theory where there are only ..... sellers.
14. According to Cournot model, the cost of production is .....
15. Every consumer knows about the market ..... of the product.
16. According to Marshall, Cournot model does not give solution to .....  
A. possible  
B. impossible  
C. tried  
D. none of these
17. Reaction curve analysis is helpful to Cournot model's stable and ..... equilibrium.  
A. unique  
B. curve  
C. cost  
D. marginal
18. The region of monopoly of Prof. Mculp is .....  
A. wide  
B. two  
C. four  
D. none of these



19. As per criticism of Cournot model, the solution is .....
- unreal
  - real
  - zero
  - none of these
20. Every seller's behaviour depends upon his opponents.
- True
  - False
21. Kinked demand curve brings price stability in oligopolistic market.
- True
  - False
22. Sellers can practice to increase their price rather than to decrease.
- True
  - False
23. Selling not always occurs on tagged price.
- True
  - False
24. The kinked demand curve is based on two assumptions.
- True
  - False

### **Answer for Self Assessment**

1. Creation    2. Monopoly    3. Oligopoly    4. Rigidity    5. A
6. A            7. B            8. B            9. A            10. A
11. B            12. B            13. Seller      14. Zero      15. Demand  
Curve
16. B            17. A            18. A            19. A            20. A
21. B            22. A            23. A            24. A

### **Review Questions**

1. What do you understand by oligopoly? Explain.
2. Explain the features of oligopoly.
3. What are the reasons for the emergence of oligopoly?
4. What do you understand by collusive and non-collusive oligopoly?
5. What do you mean by duopoly? Explain it.
6. What do you understand by Cournot model?
7. Write some points on 'Price Determination in Oligopoly'.



### **Further Readings**

modern microeconomics by koutsoyiannis a, macmillan

microeconomic analysis by varian, h, ww norton & company

managerial economics by dominick salvatore, ravikesh srivastava, oxford university press

**Unit 13: Alternative Theories of the Firm****CONTENTS**

Objectives

Introduction

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13.5 Limit Price Theory of Bain

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**Objectives**

After studying this unit, students will be able to:

- understand the Baumol's Theory of Sales Revenue Maximisation.
- analyze the Sales Revenue Maximisation with and without Advertisement.
- understand the concept of profit maximization and Revenue maximization.
- analyze the equilibrium condition of Maris Model.
- understand the concept of Williamson's Managerial Theory of the firm.
- analyze the equilibrium condition of Williamson's Managerial Theory of the Firm.
- understand the concept of Bains Limit pricing Theory.
- analyze the price decision under Bains Limit pricing Theory

**Introduction**

Traditionally decision-making by firms is analysed at the equality of marginal cost (MC) and the marginal revenue (MR). Such a condition satisfies their profit maximisation objective. However, the  $MR = MC$  principle has been attacked on various ground. One of them being that the firm to be able to do this must know its cost and demand curves with certainty, which is quite difficult. Secondly, this principle is a fall-out of profit maximising objective of a firm. But then as many economists have pointed out and which has enjoyed a fair degree of empirical support, firms do not generally opt for profit maximisation. They have a multitude of goals and profit maximisation is just one of them.

### **13.1 Baumol's Sales Revenue Maximisation**

W. J. Baumol suggested sales revenue maximisation as an alternative goal to profit maximisation. He presented two basic models: A static single-period model and a multi-period dynamic model of growth of sales revenue maximisation. Each model has two versions, one with advertising activities and another without.

Baumol offers several justifications for sales maximisation as a goal of the firm. In a modern firm, there is separation of ownership from management. So that the managers can act on their discretion. Generally, the owners want to maximise profit, but managers tend to maximise their own utility. Baumol points out from his own experience as a consultant to large number of firms that the utility of managers depends much on the sales, so that sales maximisation is a plausible goal for most of them. He even points out certain reasons as to why sales maximisation is important. Some of them are as follows:

- 1) The salaries and other earnings of top managers are correlated more with sales than with profits.
- 2) Banks and other financial institutions generally prefer firms with growing sales.
- 3) Large growing sales put the firm in a good stead to undertake competitive tactics. It also entails better bargaining power in the market.
- 4) Large sales, growing over time, give prestige to the managers, while large profits land up with the shareholders.

### **13.2 Baumol's Static Model**

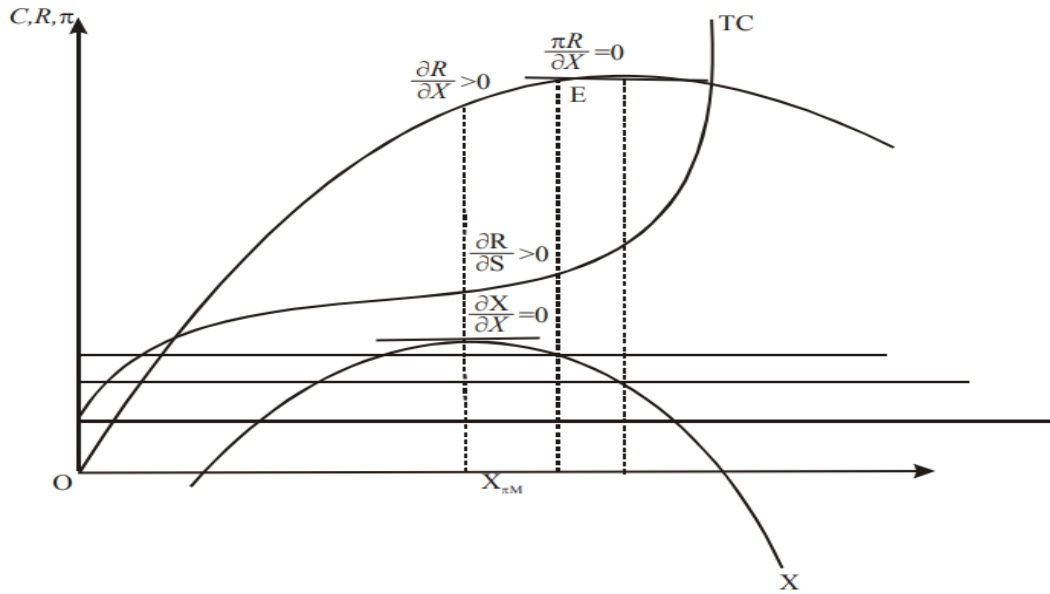
#### **Assumptions**

- 1) Time-horizon of a firm is a single period.
- 2) The firm maximises total sales revenue subject to a profit constraint.
- 3) The minimum profit constraint is exogenously determined by the demands and expectations of the shareholders, banks and other financial institutions.
- 4) Cost curves are U-shaped and the demand curve is downward sloping.

#### **Model 1: A single-product model without advertising**

The total cost (TC) and total revenue (TR) curves under the above assumptions are shown below in Figure 13.1. The curve (inverted U) below the TR and TC curves is the total profit curve, obtained by deducting TC from TR for every level of output (X).

**Figure 13.1: Sales Revenue Maximisation**



The maximisation of sales revenue for a firm occurs at a point where the marginal revenue equals zero. In the figure, the  $MR = 0$  is attained at a point like E, corresponding to which we have the firm producing  $OX^*$  level of output. But then whether this maximum sales revenue will be realized or not depends on the level of the minimum acceptable profit, which may act as a constraint to the activity of the firm.

If the minimum acceptable level of profit ( $\pi$ ) is  $\bar{\pi}_1$  then the firm will produce  $OX^*$  which will maximise the sales revenue. With  $OX^*$  output, the firm will actually earn a profit of  $\pi_{SM} > \bar{\pi}_1$ . In this case, the minimum profit constraint is not operative.

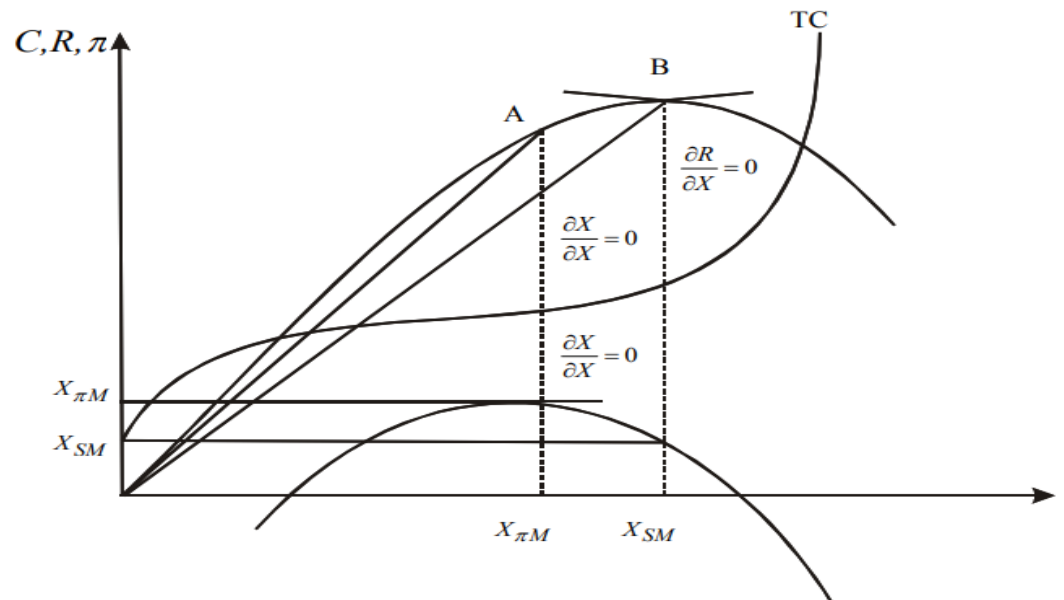
If the minimum acceptable level of profit is  $\bar{\pi}_2$ , then the firm will not be able to maximise sales revenue. It would end up at point E' on the TR curve where  $MR > 0$ , corresponding to which the firm produces  $OX'$ . In this case, the minimum profit constraint is operative.

If the profit constraint is operative, the following can be predicted in the single-period model of Baumol:

- 1) Sales maximiser produces a higher level of output compared to the profit maximiser.

Profit is maximised where  $\frac{\partial \pi}{\partial X} = 0$  corresponding to which we have the output level  $X_{\pi M}$ . At  $X_{\pi M}$ ,  $\frac{\partial R}{\partial X} = 0$ , which implies sales revenue is still rising. So that the output level  $\frac{\partial R}{\partial X} = 0$  would obviously lie to the right of  $OX_{\pi M}$ . Hence  $X_{\pi M} < X_{SM}$ .

Fig 13.2: Sales and Profit-maximer's Price Setting Difference



As slope of  $OA > OB$

$\Rightarrow P_{\pi M} < P_{SM}$

$\pi_M \Rightarrow$  Profit Maximiser

$S_M \Rightarrow$  Sales Maximiser

2) The sales maximiser sells at a price lower than that of the profit maximiser. The price at any level of output is the slope of the ray through the origin to the relevant point of the TR curve. In Figure 13.2, the price of profit-maximiser is given by the ray OA and the price of sales maximiser by the ray OB.

3) The sales-maximiser earns lower  $\pi$  than that of the profit-maximiser. This is shown in Figure 13.2 where  $\pi_{\pi M} > \pi_{SM}$ .

4) The sales maximiser will never choose a level of output at which price elasticity ( $e$ ) is less than 1.

Note that  $MR = P(1 - 1/e)$ .

If  $|e| < 1$ ,  $MR < 0$  implies TR is declining which is not acceptable for a sales revenue maximising firm. In fact, the firm will choose that level of output where  $MR = 0$  implying  $|e| = 1$ , provided the profit-constraint is not operative. If such a constraint is operative the firm would produce where  $|e| > 1$ .

### Model 2: A Single-product model with advertising

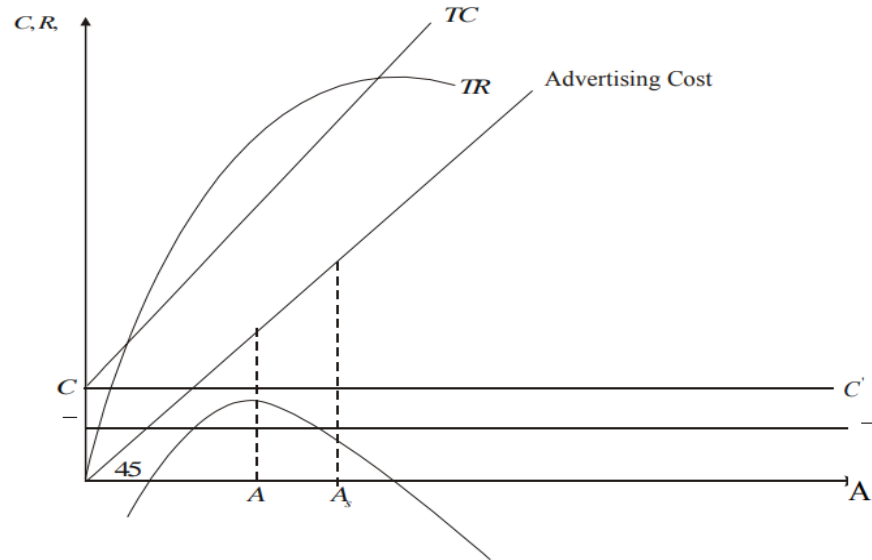
In this model, the firm maximises sales revenue subject to a minimum profit constraint, which is exogenously determined. An important addition into this model is that of advertising expenditure and a crucial assumption is that sales revenue rises with advertising expenditure (that is,  $\partial R / \partial \alpha > 0$ ,

Where;

R = sales revenue,

a = advertising expenditure). Baumol also assumes that price remains constant and production costs are independent of advertising. With a setting as described above, Baumol's single - product model with advertising is shown in Figure 13.3 below.

Figure 13.3: Revenue Maximisation with Advertising



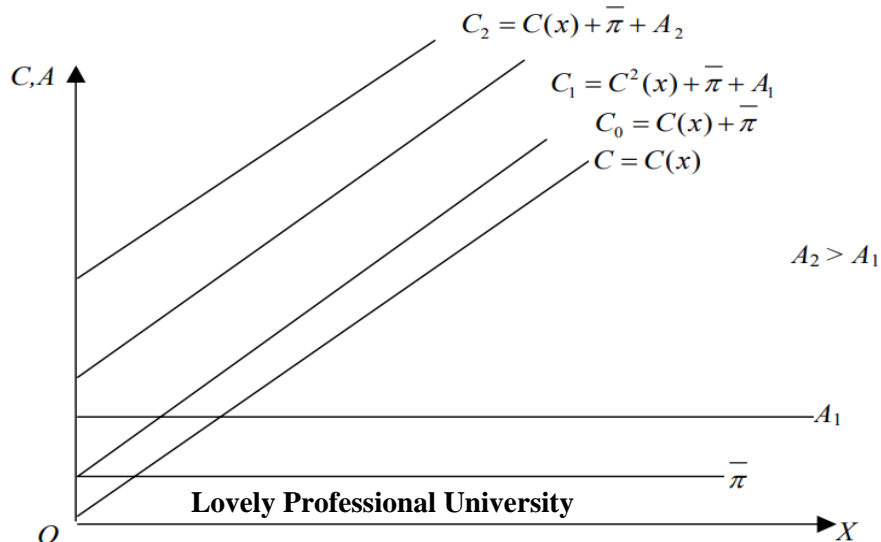
The advertising outlay is measured along the horizontal axis while costs (c), revenue (R) and profit ( $\pi$ ) along the vertical axis. The advertising function is shown as a 45-degree line. Production costs are shown as  $cc'$ , independent of the level of advertising. The TC (total cost) curve is obtained by adding the advertising cost with the production cost.

**The Cost Curves**

It is assumed that:

- a) Production costs vary proportionally with output. Hence, it is a positively sloped straight line through the origin.
- b) Advertising expenditure is independent of output. Therefore, it is represented as a straight line parallel to the quantity axis. Higher levels of advertising shifts up the lines parallelly.
- c) The minimum profit constraint  $\bar{\pi}$  is exogenously determined and is denoted by a line parallel to the X - axis. The TC function is the summation of production cost (C), advertising expenditure (A) and minimum profit constraint ( $\bar{\pi}$ ). Given C and  $\bar{\pi}$ , a change in advertising A will generate a family of upward sloping total cost curves. This is shown below.

Fig. 12.4: Total Cost with Minimum Profit Constraint



### The Revenue Curves

The TR curve has the usual shape, initially increasing but at a decreasing rate, reaching a maximum (where  $\partial R/\partial X < 0$ ). The total profit curve, as usual is obtained by subtracting by TC from TR.

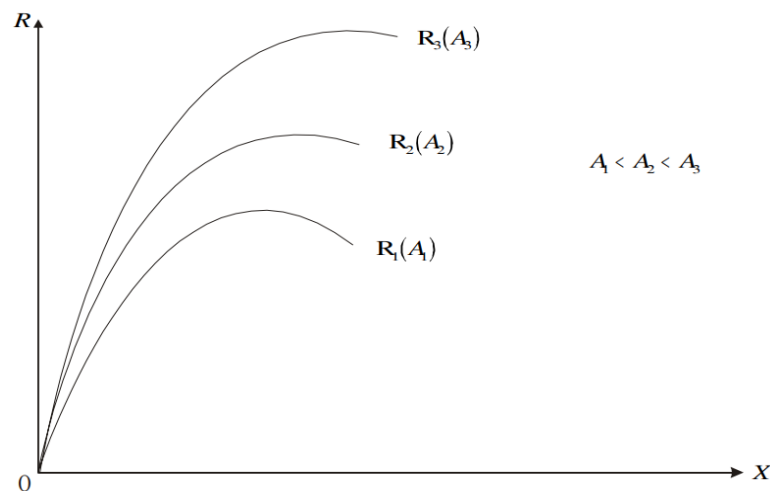
Given the profit constraint ( $\bar{\pi}$ ), equilibrium is attained at the OAs level of advertising outlay. Clearly,  $OAs > OA_{\pi}$  (which is advertising outlay corresponding to maximum profit.).

One drawback of this model is that Baumol does not examine the interrelationship between advertising, price, cost of production and level of output. Further, the assumptions made are not consistent. For instance, he assumes that the total production costs are independent of advertising. This implies the total output  $X$  remains constant after advertising is undertaken. Now, an increase in sales revenue  $R$ , given  $X$ , can be attained only if price is raised. But price was assumed to be constant, which indicates the presence of inconsistency.

New Model Taking into consideration the deficiencies and inconsistencies in Baumol's model, Haveman and De Bartolo have presented another model. In their formulation, price, cost, output and advertising expenditure are all free to vary. The graphical model, modified by M. Kafoglis, R. Bushnell and C.J. Howkins is presented below. But before that, we need to consider the assumptions made on cost and revenue curves.

The TR curve shifts up as  $A$  increases. Thus by changing  $A$ , we can generate a family of TR curves each representing the relationship between total revenue and output at different levels of advertising expenditure. The TR curves are depicted as follows:

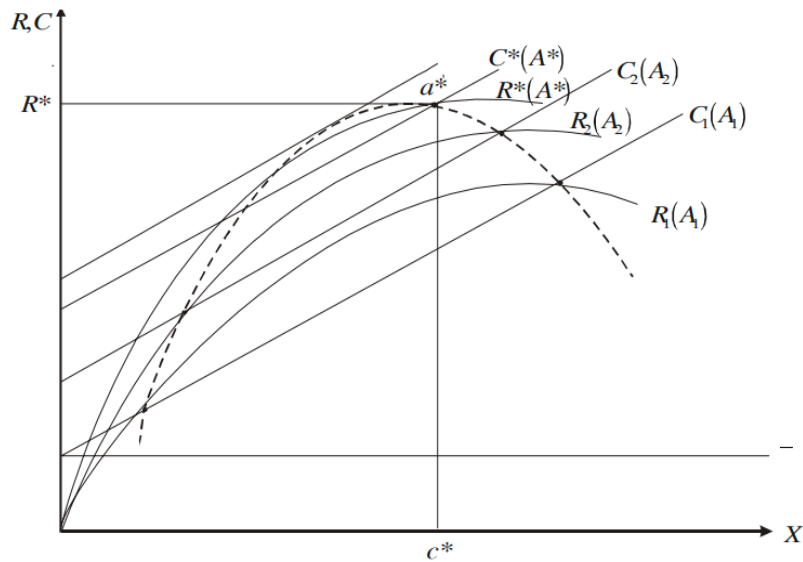
**Fig. 13.5: Revenue and Output with Different Levels of Advertisement**



Equilibrium of the Firm Superimposing Figures 13.4 and 13.5 and joining the points of intersection of TC and TR curves corresponding to the same level of advertising expenditure, we can derive the 'TC = TR' curve as had been developed by Haveman and DeBartolo. The firm reaches its equilibrium at the highest point of this curve. Hence, from Figure 13.6 we see the equilibrium of the firm at point  $a^*$  with total costs  $C^*$ , total revenue  $R^*$ , output  $X^*$ , advertising  $A^*$ , and price equal to  $OR^*/OX^*$ .

**Fig. 13.6: Equilibrium in Revenue Maximisation Firm with Advertising**





**13.3 Williamson’s Model of Managerial Discretion**

According to Williamson, managers pursue policies, which maximise their own utility rather than that of the owners. The managerial utility function depends on salary, security, power, status, prestige and professional excellence. Except salary, the rest of the variables are non-pecuniary and therefore need special treatment. In this model, the non-pecuniary variables are measured by means of “expense preference”, which is defined as the satisfaction derived by the managers from certain types of expenditures. In particular, staff expenditures on emoluments and funds available for discretionary investment give managers a positive satisfaction because these are a source of security and reflect the power, status, prestige and professional achievement of managers. As staff expenditures, emoluments and discretionary investment expenses are measurable in money terms, they are used as proxy variables to replace the non-operational ones like power, status, prestige and professional excellence appearing in the managerial utility function.

Thus, the utility function of the managers is given by:

$$U = f, (S, M, I_D)$$

where

S = staff expenditures, including managerial salaries (administrative and selling expenditure)

M = managerial emoluments.

$I_D$  = discretionary investment.

The Demand Curve of the Firm

It is assumed that the firm has a known downward-sloping demand curve given by

$$X = f (P, S, E)$$

$$\text{or, } P = f (X, S, E), \frac{\partial P}{\partial X} < 0, \frac{\partial P}{\partial S} = 0, \frac{\partial P}{\partial E} > 0$$

where X = output, P = price, S = staff expenditure, E = condition of the environment (this represents autonomous factor that affect dd., resulting in the shift of dd.)

**The production cost**

Total production cost (C) is assumed to be an increasing function of output X

$$\text{i.e., } C = f(X), \frac{\partial C}{\partial X} > 0$$

### Actual Profit ( $\pi$ )

$$\pi = R - C - S,$$

where R = revenue from sales, C = total production cost, S = staff expenditure

### Reported Profit ( $\pi_R$ )

$\pi_R$  is profit reported to the tax authorities. It is actual profit less managerial emoluments (M), which are tax deductible.

$$\text{Thus, } \pi_R = \pi - M = R - C - S - M$$

### Minimum Profit ( $\pi_0$ )

This is the amount of profits (after tax), which is required for an acceptable dividend policy by the shareholders.  $\pi_0$  is that which is essential to keep the shareholders satisfied.

$$\therefore \pi_R - T \geq \pi_0$$

where T  $\Rightarrow$  tax function, given by

$$T = \bar{T} + t\pi_R$$

$\bar{T} \Rightarrow$  Lump-sum tax, t  $\Rightarrow$  marginal tax rate or, unit profit tax.

### Discretionary investment ( $I_D$ )

$$I_D = \pi_R - \pi_0 - T$$

i.e., the amount left from the reported profit after subtracting the minimum profit and tax.

Discretionary profit ( $\pi_D$ )

$$\pi_D = \pi - \pi_0 - T$$

### The Model

$$\text{Maximise } U = f(S, I_D)$$

$$\text{Subject to } \pi \geq \pi_0 + T$$

[As M = 0 in this model,  $\pi_R = \pi$  Hence,  $\pi - T \geq \pi_0 = \pi \geq \pi_0 + T$ , which is the constraint function.]

Because, M = 0,  $\pi_R = \pi$ , we have

$$I_D = \pi - \pi_0 - T \text{ and substituting this in the utility function we get,}$$

$$U = f[S, (\pi - \pi_0 - T)]$$

Assuming no lump-sum tax, T = t $\pi$ .

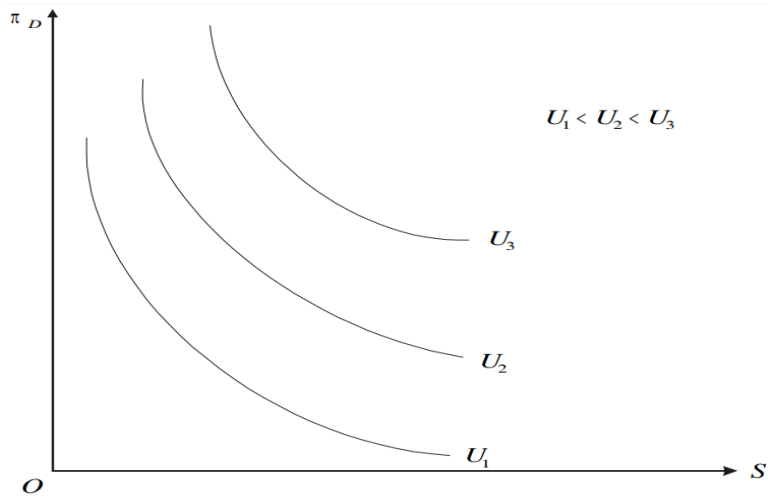
Therefore, the utility function becomes,

$$U = f[S, (1-t)\pi - \pi_0]$$

To arrive at the equilibrium, managerial indifference curves are drawn in the S- $\pi_D$  space. These curves indicate the combinations of S and  $\pi_D$  which yield the same level of utility to the managers. It is assumed that the ICs are downward sloping convex (representing diminishing MRS of S for  $\pi_D$ ). It is further

assumed that any of these curves does not intersect the axes. With these assumptions, we obtain the ICs as shown in the following Figure 13.7

Figure 13.7: Indifference Curves with Firm S- $\pi_D$  Space



The relation between  $\pi_D$  and S is determined by the profit function,

$$\pi = f(X) = f(P, S, E)$$

$$\text{Now, } \pi_D = \pi - \pi_0 - T = \pi - \pi_0 - t\pi$$

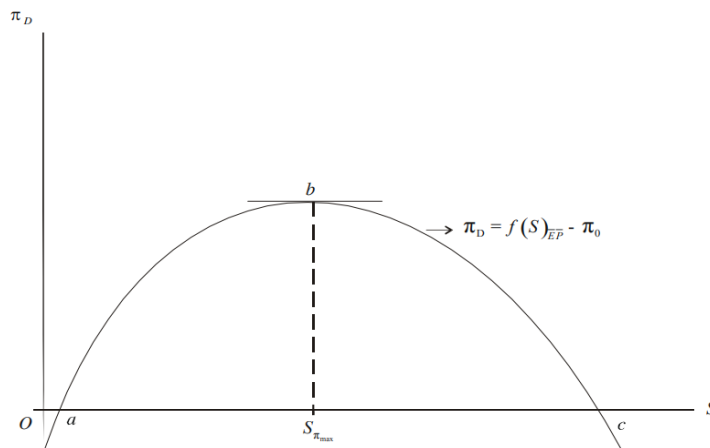
$$= (1 - t)\pi - \pi_0$$

$$= (1 - t)f(X) - \pi_0$$

$$= (1 - t)f(P, S, E) - \pi_0$$

t is exogenously given from the tax laws and so is,  $\pi_0$  because it is the demand for dividends of shareholders. Also, considering that the market environment is given by E and assuming that output is chosen optimally according to MR = MC, the relation between  $\pi_D$  and S is shown below in Figure 13.8.

Figure 13.8: Relation between  $\pi_D$  and S

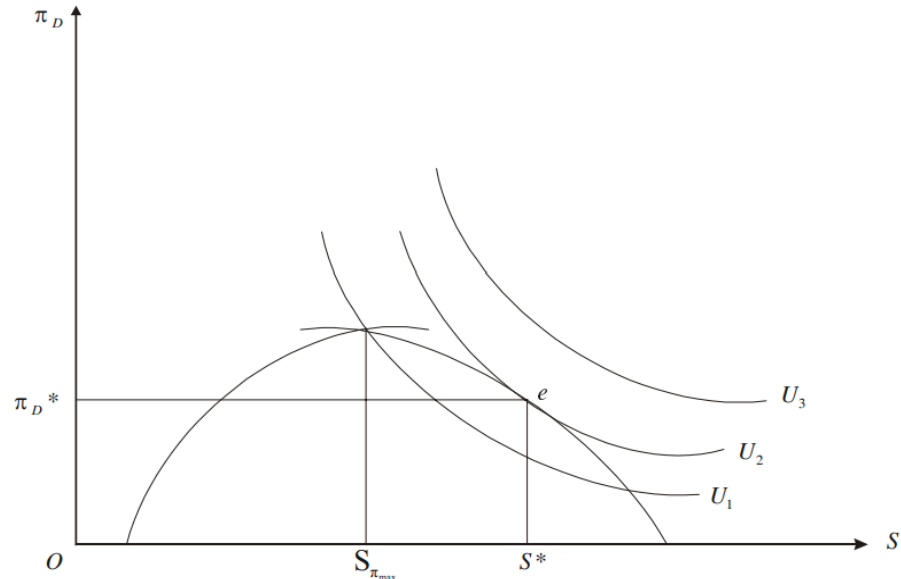


At the initial stages of production and up to the level of output where profit is maximum, both  $\pi_D$  and S increase. Beyond point b, (where  $\pi$  = maximum profit) if production increases, then profit starts declining although S increases. Beyond point c, the  $\pi = 0$ , and the minimum profit constraint is not satisfied. Therefore, points to the left of a and to the right of c are not feasible.

Superimposing Figure 13.7 on Figure 13.8, we get Figure 13.9, where the equilibrium is determined by the point of tangency between the profit-staff curve and the highest possible managerial indifference curve, as represented point *e* in the figure.

Given that the managerial indifference curves are downward sloping, it follows that the equilibrium will be on the falling section of the profit-staff curve. This shows that the preference of managers for staff expenditures ( $S^*$ ) is greater than that of a profit-maximiser.

**Figure 13.9: Equilibrium of Firm with Profit-staff and Marginal Indifference Curves**



### 13.4 Marris' Model of Managerial Enterprise

The model developed by Marris deals with a firm where there is separation of ownership and management. The utility of the managers (*M*) and owners (*O*) are given by

$U_M = U_M$  (salaries, power, status, job security) and

$U_O = U_O$  (profits, capital output, market share, public esteem) respectively.

Marris argues that most of the variables appearing in the above functions are strongly correlated with a single variable, the size of the firm. Among the various measures of size, some are - capital, output, revenue and market share. Marris limits his model to situations of steady rate of growth over time during which most of the relevant economic variables change simultaneously. Therefore, 'Maximising the long-run (LR) growth rate of any indicator can reasonably be assumed equivalent to maximising the LR growth rate of most others' (Marris, 'A model of the managerial enterprise'). In other words, we can pick up any one of the indicators to serve our purpose. Hence the utility function of owners

$$U_{\text{owners}} = f^*(g_c) \quad \text{where } g_c = \text{growth rate of capital.}$$

Marris argues that managers prefer to maximise the rate of growth of the firm instead of maximising the absolute size of the firm. This argument also seems empirically true. Otherwise, managers would prefer to move from smaller to bigger firms. In reality they prefer to be promoted within the same growing organisation, rather than move to a new one where the working environment might not be favourable.

Keeping this in mind, Marris implicitly assumes that salaries, status and power of managers are strongly correlated with the growth of demand for the products of the firm. Therefore, the managerial utility function may be written as,

$$U_M = f(g_D, s)$$

Where  $g_D$  = rate of growth of demand for the products of the firm and  $s$  = measure of job security. Marris suggests that 's' can be measured by a weighted average of three crucial financial ratios, viz.,

$$\text{i) Liquidity ratio} = \frac{\text{Liquid assets}}{\text{Total assets}} = \frac{L}{A} = \alpha_1 (\text{say})$$

Too low a liquid ratio increases the risk of insolvency and bankruptcy. Similarly, too high of it makes the firm attractive to take-over raids. Therefore, managers need to choose an optimum liquid ratio.

$$\text{ii) Leverage ratio} = \frac{\text{Value of Debts}}{\text{Total assets}} = \frac{D}{A} = \alpha_2 (\text{say})$$

Once again, the firm has to choose an optimum leverage ratio because debts are important from the point of view of functioning of the firm and also too high a debt is not good an indicator of good health of the firm.

$$\text{iii) Profit retention ratio} = \frac{\text{Retained profits}}{\text{Total assets}} = \frac{\pi_R}{\pi} = \alpha_3 (\text{say})$$

It may be noted that  $\pi_R$  is the most important source of finance for the growth of capital. It cannot be too high, otherwise distributed profit may be less, thereby not satisfying the share-holders, which in turn may result in fall of price of shares, and renders it attractive to take-over raiders.

Marris combines the above mentioned three financial ratios into a single parameter  $\bar{a}$ , 'the financial security constraint'. See that  $\bar{a}$  is a weighted average of  $a_1$ ,  $a_2$  and  $a_3$ , with the weights depending on the subjective decisions of the managers. Marris postulates that  $\bar{a}$  is negatively related to  $a_1$ , positively to  $a_2$  and  $a_3$ .

He further assumes that there is a negative relation between job security ( $s$ ) and financial constraint  $\bar{a}$ . If  $\bar{a}$  increases by reducing  $a_1$  or increasing  $a_2$  or,  $a_3$ , firm becomes more vulnerable to bankruptcy and/or take-over raids and consequently the job-security of managers is reduced. A high value of  $\bar{a}$  implies managers are risk-takers while its low value indicates managers are risk-avoiders.

Marris treats 's' as an exogenously determined constraint by assuming that there is a saturation level for job security. Above the saturation level, the marginal utility from an increase in  $s$  is zero, while below the saturation level the marginal utility from an increase in  $s$  is infinite. With this assumption, managerial utility function becomes,

$$U_M = f(g_D) \bar{s},$$

where  $\bar{s}$  is the security constraint.

Given the security constraint, the managers aim at the maximisation of their own utility

$$\text{i.e., Maximise } U_M = f(g_D)$$

The owner-shareholders, similarly maximise their utility

$$\text{i.e., Maximise } U_O = f(g_C)$$

In Marris model, the goal of a firm is the maximisation of the balanced rate of growth of the firm.

$$\text{i.e., Maximise } g = g_D = g_C,$$

where  $g$  = balanced growth rate.

In pursuing the maximum balanced growth rate, the firm faces two constraints. First, the financial constraint as discussed earlier. Second, a managerial constraint set by the available managerial team and skills.

For the managerial constraint, Marris adopts Peurose's thesis of the existence of a definite limit on the rate of efficient managerial expansion. At any one-time period, the capacity of the top management is given i.e., there is a ceiling to the growth of the firm set by the capacity of its managerial team. Similar is the case with the R&D department, which can set a limit to the growth rate of the firm. This department is the source of new ideas and new products, which can affect the growth. The work in the R&D department being 'teamwork' cannot be expanded quickly, because new scientists and designers require time before they can efficiently contribute to R&D.

In summary, Marris' model seeks to maximise the balanced growth rate of the firm

$$\text{i.e.,} \quad \text{Maximise } g = g_D = g_C$$

subject to two constraints,

a) Managerial

b) Job security

The first step towards arriving at the solution of the model is to determine factors that affect  $g = g_D = g_C$ . Marris establishes that the factors that determine  $g_D$  and  $g_C$  can be expressed in terms of two variables: the diversification rate  $d$ , and the average profit margin,  $m$ . In this model,  $m$  is a proxy for the policy variables  $A$  (Advertising) and  $R\&D$ . This is evident from the following price equation.

$$\bar{P} = \bar{C} + A + (R \& D) + m,$$

which is obtained from the average-cost pricing rule and on the assumption that  $P, C$  are given.

### Growth Rate of Demand ( $g_D$ )

$$g_D = f_1(d, k)$$

where  $d$  = diversification rate i.e., the number of new products introduced per time period.

$k$  = the proportion of successful new products.

Note that  $k$  depends on  $d, P, A, R\&D$ , intrinsic value of the products. Marris combines intrinsic value with price. In addition, as price is assumed to have reached equilibrium in some way or other, price is taken as given. Thus,  $k$  comes to depend on  $d, A$  and  $R\&D$ . The higher  $A$  and/or  $R\&D$ , higher is  $k$ . Marris also uses 'm' as a proxy for  $A$  and  $R\&D$ . Because  $m$  is negatively related to  $A$  and  $R\&D$ , it is negatively correlated to  $k$ .

Finally, we have,

$$g_D = f_1(d, m) \text{ with}$$

$$\frac{\partial g_D}{\partial d} > 0, \frac{\partial^2 g_D}{\partial d^2} < 0 \text{ and } \frac{\partial g_D}{\partial m} < 0$$

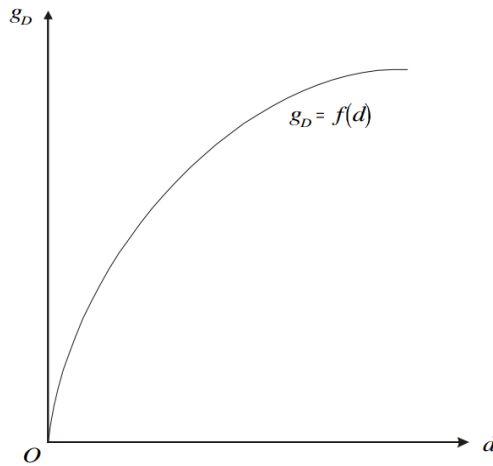


Figure 13.10: Rate of Profit and Demand Growth

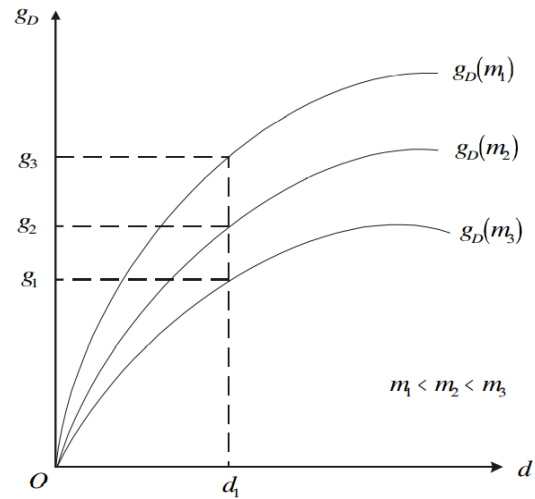


Fig. 13.11: Shift in GD and Rate of Profit

The average rate of profit ( $m$ ) is constant along any  $g_D$  curve. Therefore, we have a curve like that in Figure 13.10. As  $m$  increases,  $g_D$  decreases, so the curves shift down as shown in Figure 13.11, for a given  $d$ . This is because, for a given  $d$ , (say  $d_1$ ), lower the  $m$ , higher is  $A$  and R&D. Therefore, higher is  $k$  and hence higher is the growth rate.

**Rate of growth of capital supply ( $g_c$ )**

According to Marris, the main source of finance for growth is the profit. Therefore, he assumes  $g_c$  is proportional to the level of profit,

$$g_c = \bar{a}(\pi),$$

where  $\bar{a}$  = the financial security coefficient

$\pi$  = level of total profits.

$\bar{a}$  is assumed to be constant and exogenously determined in this model.

Now,  $\pi = \pi(m, \frac{K}{X})$ , where  $\frac{K}{X}$  = capital-output ratio.

$$\frac{\partial \pi}{\partial m} > 0, \text{ since an increase (decrease) in average profit margin results}$$

in an increase (decrease) in total profits, given,  $K = \bar{K}, (\frac{K}{X}) = F(d)$

The relation between  $X$  and  $d$  is such that, initially it reaches a maximum and then falls. This is evident from the fact that initially as  $d$  increases  $X$  increases owing to better utilisation of the managerial team and R&D. This happens up to an optimum level of  $d$ . Beyond that as  $d$  increases, efficiency falls and  $X$  decreases

Therefore, the profit function is modified to,

$$\pi = \pi \{m, F(d)\} = \pi(m, d).$$

Accordingly, the  $g_c$  function becomes,

$$g_c = \bar{a} \cdot \pi = \bar{a} \cdot \pi(m, d)$$

$$\bar{a} \text{ being constant, } \frac{\partial g_c}{\partial m} > 0, \frac{\partial g_c}{\partial d} > 0 \text{ for } d \leq \bar{d} \text{ and}$$

$$\frac{\partial g_c}{\partial d} < 0 \text{ for } d > \bar{d}$$

$\bar{d} \rightarrow$  optimum  $d$  beyond which  $g_c$  decreases.

The relation between  $g_c$  and  $d$ , keeping  $a$  and  $m$  constant, is shown in Figure 13.12. Allowing for both  $d$  and  $m$  to vary, we obtain a family of  $g_c$  curves, for a given  $\bar{a}$ , as shown in Figure 13.13. The higher the  $m$ , the higher is  $g_c$ .

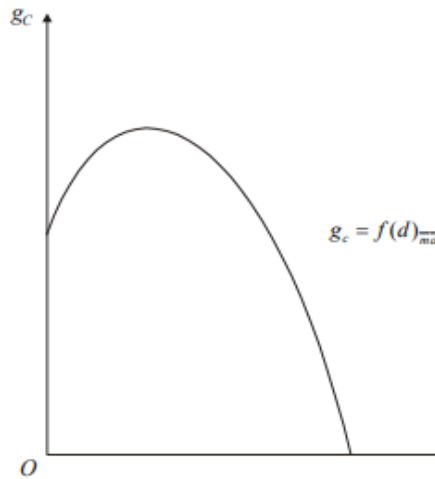


Fig. 13.12: Relation between Growth of Demand and Capital

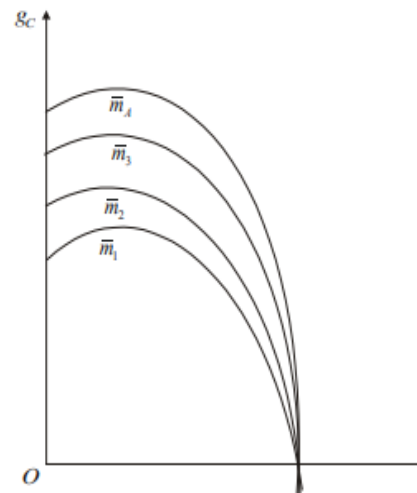


Fig. 13.13: Family of Capital Growth Curves

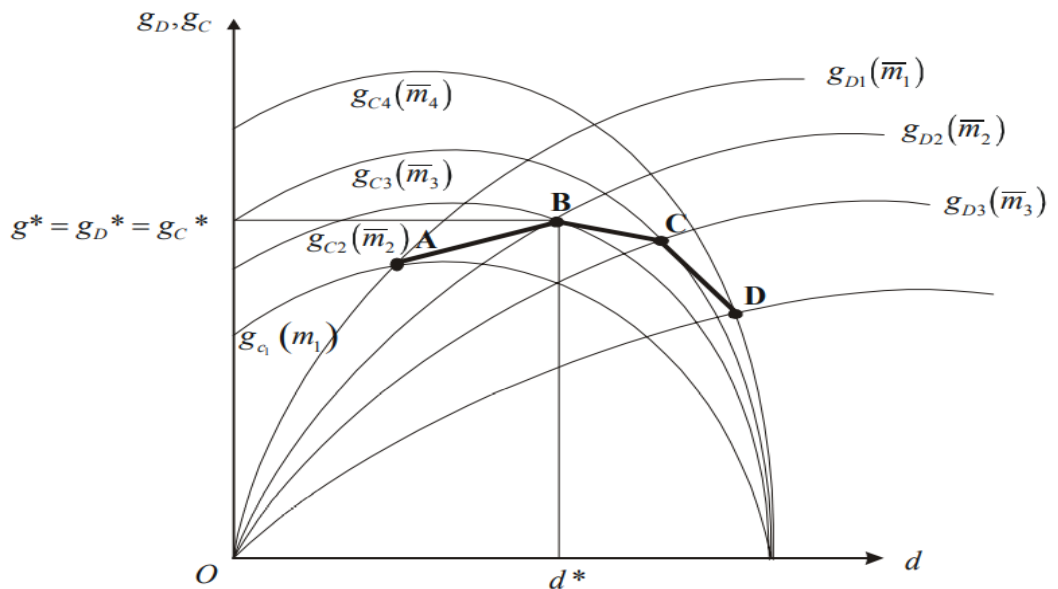
The balanced growth condition,

$$g = g_D = g_C$$

$$f_1(m, d) = \bar{a}[\pi(m, d)]$$

The equilibrium of the firm graphically represented in Figure 13.14, by superimposing Figure 13.11 on Figure 13.12 in a single  $g - d$  plane,

Fig. 13.14: Equilibrium Growth of Firm



Joining the points of intersection of  $g_d$  and  $g_c$  curves, we obtain the ABCD curve, which is shown as the bolder curve. This curve is what Marris calls the balanced growth curve (BGC) given the financial coefficient  $\bar{a}$ .

The firm is in equilibrium when it reaches the highest point on the BGC, which is point B in Figure 13.14, given that firm has decided on its financial policy denoted by  $\bar{a}$ . The balanced growth rate  $g^*$  is compatible with a unique pair of values of the policy variables  $m^*$  and  $d^*$ .



Thus, we get,

$$g^* = f_1(m^*, d^*) = \bar{a}[\pi(m^*, d^*)]$$

Accordingly,  $\pi(m^*, d^*) = \pi^*$

Thus, we see that profit gets endogenously determined in the Marris model.

### 13.5 Limit Price Theory of Bain

Bain has developed Limit Price Determination Theory to stop the entrance of new firms in a short authorized industry in his book *Barriers to New Competition* (1959). Joining with collusion, limit price is fixed by a group of firms, which is the highest general price. It is the price which can prevent the entry of other firms in the established firm industry without motivating it. This price can be less than the Notes profit maximum price in short duration and will depend on relative cost of firms of inside and outside the group and demand conditions in industry. Bain tells the limit price is upper maximum price than the competitor price, which is fixed by established firms. These price works as the barrier of entrance of new firms. The profits obtained by upper established firms of new entrants in the industry are the barriers of entrance.

#### Its Assumptions

Bain's Model depends on following assumptions –

1. Adjustments are done for price and production in long-term.
2. Least Right firms are established in the industry.
3. Demand curve for production of industry is not affected by the entrance of new firms or price adjustments by least right firms.
4. Collusion is potential among established firms. This trick pact depends on chief leader.
5. Other firms follow unification price policy in group.
6. Lead firm fixes limit price or entry barrier price, under which entry cannot be done.
7. There is only one probable entrant firm whose investments are less in comparison to other probable entrants.



Joining with collusion, limit price is fixed by a group of firms, which is the highest general price.

### 13.6 Bain Model

Bain initiates his limit price determination model by the conditions of entrance. It is premium or per cents by which established firms can raise price than the competitor price without attracting the entrance of new firms in group.

Symbolically, condition of entrance,

$$E = \frac{P_L - P_C}{P_C} \text{ and } P_L = P_C (1 + E)$$

Where  $P_L$  is limit price and  $P_C$  is competitor price. Formula shows that E is the premium which established firms obtain limit price ( $P_L$ ) without attracting the entrance of new firms. When established firms fix  $P_L$  above  $P_C$ , they earn more than general profit because competitor price is  $P_C = LAC$  in which general profit is also included. Therefore, E is the end limit above competitor price,  $P_C$  (or premium), which established firms earn fixing the high limit price ( $P_L$ ).

According to Bain, time duration included in situation of entrance is long in which a special range of changed condition of demand, procedure prices etc. is merged. This time duration can be of range of 5-10 years. More the time taken by a firm to establish, less will be the fear of entrance. Therefore, the gap between

limit price ( $P_L$ ) and competitor price ( $P_C$ ) will be more. This gap is known as Entry Gap or Entry Barrier. To understand basic relation between entry barriers and limit price determination, analysis of Bain has distributed between Sources of Entry Barriers and Determination of Limit Prices.

### Sources of Entry Barriers and Determination of Limit Prices

Bain mentions four main sources of entry barriers: Product Differentiation, Economies of Scale, Absolute Cost Advantages and more amount of money. Bain includes more amount of money in absolute cost advantages in his book Industrial Organization. So we are also not mentioning it differently.

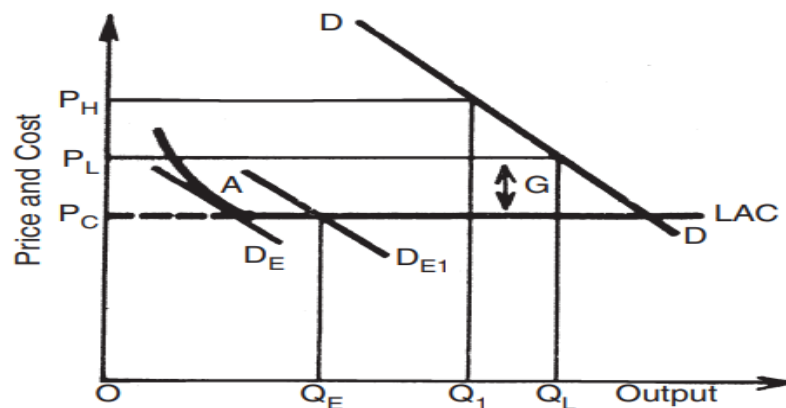
### Product Differentiation

**Product differentiation gives the following ways of an entry barrier of a new firm:**

1. Preferences for commodities of established firms.
2. Entrant firm needs to compete with established firms by advertising and big investment, which is far away from the economic budget of new firm.
3. There should be famous brand for established firms. In this way it can be difficult for new firm to compete with brand loyalty of customers.
4. If established firms have special sale ways to sale their commodities and have only one purchase agreement with wholesale buyers, then will face problems in establishing themselves in the new entrant firm market.

**Limit Price Determination**—Product differentiation as the entry barrier is explained in Fig. 17.1. Let the average costs be constant, the cost curve of LAC established firm is long-term average cost curve. The demand curve of group or the one which Bain called the best firm is DD.  $P_L$  is limit price fixed by this firm and  $Q_L$  is limit production. If firm takes  $P_L$  price then demand curve of possible entrant firm is  $D_L$  which does not allow it enter in least right market because  $D_E$  curve touches LAC on A point. That's why there is not any production level of firm which is more than the average production cost. If established firm raise the price to  $P_H$  which is entry inducing price so the production will fall to  $Q_1$ .

Fig. 13.15



This inspired possible entrant firm to enter in the market and its demand curve rises to  $DE_1$ . New firm  $Q_E$  can produce quantity of any commodity at level. That amount of  $P_L$  price which is more than the  $P_C$  is the "height" of entry gap or entry barrier, which is denoted by G in the figure.

### Summary

According to Baumol, the sale maximization firm will use the difference between the highest level and the lowest level of profit for increasing its revenue. He says this difference as 'rejected fund of profit'. "So every time the firm increases the production for increasing its total revenue, then the firm should need to use the

rejected fund of profit. This rejected fund of profit should distribute in between various inputs, markets, inwards etc. that the monetary profit will be high. This relation indicates that in sales maximization firm, the unprofitable inward and outwards should prevent, whatever total expenditure and total revenue range is." The traditional theories of firm had analysed the decision-making based on the objective of profit maximisation. As an alternative, Baumol had put forward the notion that the firms maximise sales revenue. Williamson analyses the case for a firm which it maximises the managerial utility function subject to a profit constraint. Marris in his model shows the equilibrium as a fallout of maximisation of both the owners and the managers. If three sources of entry barrier are taken together then limit price distribution becomes very complex. They can make strong each other or can dest may their effects. For example, can make large economy of scale and very high barrier of product determination entry as shown in Fig. 17.5, represents a big entry gap between high limit price PH and competitor price PC . Limit production QH is very less. Therefore, a big entry gap and less production conditions are obtained by the established firms. As a result, entry is terminated because entry barrier is very high.

### Key Words

**Balanced Growth Rate:** It that rate of growth which is equal to both the growth rate of demand for the product and the growth rate of capital.

**Iso-present Value Curve:** The locus of combinations of growth rate and sales revenue which yield a given present value.

**Managerial Indifference Curves:** Combinations of staff expenditure and 'discretionary profit', which yield the same level of utility to the managers.

**Present Value of Future Revenues:** The discounted value of future stream of sales revenue with revenue growing at the specified rate (say  $g$ ) and the discount rate  $i$ .

**Profit-staff Curve:** Different combination of staff expenditure and discretionary profit. Sales Revenue: Revenue obtained from the sales.

### Self Assessment

1. The sales maximization firm of Baumol is more real than profit maximization firm.
  - A. True
  - B. False
2. Neo-classic profit maximization theory indicates that the production does not affect by fixed cost in short run.
  - A. True
  - B. False
2. Baumol has described that the sales maximization firm can prevent from useful export and import by producing multiproduct.
  - A. True
  - B. False
4. According to Baumol, the sale maximization firm will use the difference between the highest level and the lowest level of profit for increasing its revenue

- A. True  
B. False
4. According to Marris, the valuation ratio does ..... to the growth rate of capital supply.
- A. fixed  
B. low  
C. more  
D. none of these
5. The valuated profit is average of total profit is ..... average.
- A. opt  
B. rest  
C. equal  
D. none of these Microeconomic
6. For growth of firm, managers need to get more recitation profit for ..... more funds.
- A. expend  
B. invest  
C. exchange  
D. none of these
8. .... are done for price and production in long-term.
9. .... are established least right in industry.
10. Other firms in group follow ..... price policy.
11. .... is effective in established firms
12. Bain does his Limit Price Determination Model by the condition of entrance-
- A. initiate  
B. finish  
C. interactions  
D. none of these
13. According to Bain, the time duration included in entry situation is-
- A. Short  
B. Long  
C. Zero  
D. None of these
14. There is only one possible entrant firm, which has its costs in comparison to other possible entrants-

- A. more
- B. general
- C. less
- D. none of these

15. Bain mentions ..... main sources of Entry Barriers.

- A. two
- B. three
- C. five
- D. four

### **Answers for Self Assessment**

1. A            2. A            3. B            4. A            5. A
6. A            7. B            8. Accommodation    9. Firms       10. Unification
11. Collusion    12. A            13. B            14. C            15. D

### **Review Questions**

1. Prove that given  $p$ , for a sales maximiser, sales revenue is maximum where  $e = 1$ .
- 2) How is the equilibrium position of a sales maximiser changed when there is an increase in the fixed costs of the firm? How would the same affect a profit maximiser
- 3) What happens if the variable costs increase? How would the result change for a profit maximiser? 4) Prove that the iso-present value curve is negatively sloped and the curves lying away from the origin represent higher values of  $S$ .
5. Compare the effects of the following on a profit maximiser and the utility maximiser in Williamson's model
  - a) Shift in the market demand.
  - b) Imposition of a lump-sum tax.
  - c) Increase in the profit tax rate  $t$ .
  - d) Change in fixed costs.
6. Outline the difference between Baumol's model of sales revenue maximisation and Marris model of managerial enterprise.
7. Compare Marris model with that of a profit maximiser in terms of the following:
  - a) Imposition of a profit tax.
  - b) Increase in fixed cost (FC)
  - c) Advertising and R&D expenditure.
8. What is the Bain's Limit Price Theory? Explain.
9. Describe the Bain Model



### **Further Readings**

modern microeconomics by koutsoyiannis a, macmillan

microeconomic analysis by varian, h, ww norton & company

managerial economics by dominick salvatore, ravikesh srivastava,  
oxford university press

## Unit 14: Welfare economics

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Keywords

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### Objectives

After this lecture, you would be able to

- Understand the key features of the theory of the second best.
- Distinguish between first best and second-best equilibrium.
- Describe the Pareto Optimal condition in allocation of resources
- Analyze the Pareto condition in product market and factor market
- Describe the Arrow's Impossibility Theorem in regard social welfare.
- Analyze the Arrow's Impossibility Theorem to maximize the welfare of society.

### Introduction

Welfare economics is the study of how the allocation of resources and goods affects social welfare. This relates directly to the study of economic efficiency and income distribution, as well as how these two factors affect the overall well-being of people in the economy. In practical terms, welfare economists seek to provide tools to guide public policy to achieve beneficial social and economic outcomes for all of society. However, welfare economics is a subjective study that depends heavily on chosen assumptions regarding how welfare can be defined, measured, and compared for individuals and society.

#### 14.1 Second best theory

The economic theory of the second best has been an analytical staple of welfare economics and policy analysis since Lipsey and Lancaster (1956) set forth the idea. The primary focus of the theory is what happens when the optimum conditions are not satisfied in an economic model. Second-best theory, also known as the theory of the second best, is a concept in economics that if a requirement for achieving an optimum economic situation is not satisfied, making a concerted attempt to satisfy those requirements that can be met might not be the second-best option and may be harmful.

MICROECONOMICS THEORY AND ANALYSIS -I

Lipsey and Lancaster's results have important implications for the understanding of not only trade policies but also many other government policies. Economic models consist of exercises in which a set of assumptions is used to deduce a series of logical conclusions. The solution of a model is referred to as an equilibrium. An equilibrium is typically described by explaining the conditions or relationships that must be satisfied in order for the equilibrium to be realized. These are called the equilibrium conditions. In economic models, these conditions arise from the maximizing behavior of producers and consumers.

**Equilibrium conditions:**

- (1) the output price is equal to the marginal cost for each firm in an industry,
- (2) the ratio of prices between any two goods is equal to each consumer's marginal rate of substitution between the two goods,
- (3) the long-run profit of each firm is equal to zero, and
- (4) supply of all goods is equal to demand for all goods.

In a general equilibrium model with many consumers, firms, industries, and markets, there will be numerous equilibrium conditions that must be satisfied simultaneously.

Lipsey and Lancaster's analysis asks the following simple question:

What happens to the other optimal equilibrium conditions when one of the conditions cannot be satisfied for some reason?

For example, what happens if one of the markets does not clear—that is, supply does not equal demand in that one market?

Would it still be appropriate for the firms to set the price equal to the marginal cost?

Should consumers continue to set each price ratio equal to their marginal rate of substitution?

Or would it be better if firms and consumers deviated from these conditions?

Lipsey and Lancaster show that, generally, when one optimal equilibrium condition is not satisfied, for whatever reason, all the other equilibrium conditions will change.

Thus, if one market does not clear, it would no longer be optimal for firms to set the price equal to the marginal cost or for consumers to set the price ratio equal to the marginal rate of substitution.

**14.2 First-Best versus Second-Best Equilibrium**

Consider a small perfectly competitive open economy that has no market imperfections or distortions, no externalities in production or consumption, and no public goods. This is an economy in which all resources are privately owned, the participants maximize their own well-being, firms maximize profit, and consumers maximize utility always in the presence of perfect information. Markets always clear and there are no adjustment costs or unemployment of resources. *laissez-faire* policy free trade policies is optimal policy

Tax or subsidy implemented by the government reduce economic efficiency and national welfare with a *laissez-faire* policy, the resulting equilibrium would be called first best. In real world is unlikely to be so perfectly characterized. markets have numerous distortions and imperfections. Some production and consumption activities have externality effects. Some goods have public good characteristics. Some markets have a small number of firms, each of which has some control over the price that prevails and makes positive economic profit. Governments invariably set taxes on consumption, profit, property and assets, and so on. Information is rarely perfectly and costlessly available. Now imagine again a small, open, perfectly competitive economy with no market imperfections or distortions. Suppose we introduce one distortion or imperfection into such an economy. The resulting equilibrium will now be less efficient from a national perspective than when the distortion was not present.

In Lipsey and Lancaster's analysis, the introduction of the distortion into the system would sever one or more of the equilibrium conditions that must be satisfied to obtain economic nirvana. For example, suppose the imperfection that is introduced is the presence of a monopolistic firm in an industry. In this case, the firm's profit-maximizing equilibrium condition would be to set its price greater than the marginal cost rather than equal to the marginal cost as would be done by a profit-



maximizing perfectly competitive firm. Second-best equilibria arise whenever there are market imperfections or distortions present. Since the economic optimum obtained in these circumstances would be less efficient than in economic nirvana, we would call this equilibrium a second-best equilibrium. Second-best equilibria arise whenever all the equilibrium conditions satisfying economic nirvana cannot occur simultaneously. The theory of the second best provides the theoretical underpinning to explain many of the reasons that trade policy can be shown to be welfare enhancing for an economy.

In most (if not all) of the cases in which a trade policy is shown to improve national welfare, the economy begins at an equilibrium that can be characterized as second best. Second-best equilibria arise whenever the market has distortions or imperfections present. In these cases, it is relatively straightforward to conceive of a trade policy that corrects the distortion or imperfection sufficiently to outweigh the detrimental effects of the policy itself. Whenever market imperfections or distortions are present, it is always theoretically or conceptually possible to design a trade policy that would improve national welfare. As such, the theory of the second best provides a rationale for many different types of protection in an economy. The main criticism suggested by the theory is that rarely is a trade policy the first-best policy choice to correct a market imperfection or distortion. Instead, a trade policy is second best. The first-best policy, generally, would be a purely domestic policy targeted directly at the market imperfection or distortion.

### 14.3 General Equilibrium

Partial equilibrium: Marshall-individual consumer, producer, firm, or factor's equilibrium analysis. General equilibrium – Walras and Pareto. General Equilibrium: all product and factor markets achieve equilibrium simultaneously.

- What will be the nature of this equilibrium?
- Will all economic units benefit from it?
- How can it be achieved?

#### **Assumptions:**

- Free, capitalistic market.
- Perfect competition in the product market, product prices are given
- Perfect competition in the factor market, factor prices are given.
- Equilibrium determined simultaneously in both product and factor markets.
- Other things remaining constant,
- Static, no growth.
- Diminishing returns.
- There is inter connection between product and factor markets.
- Partial equilibrium in individual markets, can lead to general equilibrium.
- Achieved through adjustments of product and factor Ps.
- All resources are allocated in an optimum manner.
- Welfare of all units is maximised.
- Laissez faire, no government interference.
- Efficient and Equitable market.

### 14.4 Pareto Optimality

Pareto Optimality: A Market situation, where in it is not possible to make one person better off, without making another worse off. Because of Optimum allocation of resources in General equilibrium. If resources are *not* allocated optimally, it is possible to increase or improve one unit's welfare without decreasing another's. Basis of Welfare Economics. Efficiency and Equity or Social Justice in general equilibrium in a capitalist free market. Efficiency: in terms of allocation of resources. Equity: in terms of distribution of income.

**Conditions for Efficiency**

Three conditions for Efficiency in the General equilibrium model:

1. Production efficiency: Maximum possible output with the given resources.
2. Consumption efficiency: Maximum utility for all consumers,
3. Product mix efficiency: optimum mix of commodities.

**Model of Pareto Optimality**

- Assume that two commodities are being produced A and B.
- Two firms M and N. M produces A, and N produces B.
- Two factors of production, K and L. Firms M and N use both factor inputs to produce A and B.
- Two consumers X and Y, who consume both commodities A and B.
- Perfect competition,
- Static analysis,
- Diminishing returns, and utility

**Production Equilibrium**

An allocation of inputs (K,L) is production efficient if it is not possible to increase the output of one commodity (A), without decreasing the output of the other commodity (B).

- Assume that there are two firms M, N.
- M produces commodity A,
- N produces commodity B.
- Both use K and L as inputs.

**Efficiency in Production**

In Fig. 14.1 Isoquants of each individual firm M and N. Rotate that of N and align the two to form a box. Both use K and L. Each tries to achieve its highest IQ. If M moves to higher IQ, then N is forced to move to lower IQ. More K, L for one firm M means less for N. So lowers its output. Firm M's isoquants are IQ1A, IQ2A, etc. Firm N's isoquants are IQ1B, IQ2B, etc. (blue lines). OM is the origin for M, and ON is the origin for N. Both firms compete for use of K and L. Each firm tries to reach its highest IQ. If M wants output of IQ4A, then N can produce only IQ1B. If N wants to produce IQ4B, then M has to produce IQ1A. Firm M's isoquants are IQ1A, IQ2A, etc. Firm N's isoquants are IQ1B, IQ2B, etc. (blue lines). OM is the origin for M, and ON is the origin for N. Both firms compete for use of K and L. Each firm tries to reach its highest IQ. If M wants output of IQ4A, then N can produce only IQ1B. If N wants to produce IQ4B, then M has to produce IQ1A. At 'f' combination, M producing IQ2A, while N is producing output of IQ2B. Is it possible to improve the situation? If they move to point 'c', then M can increase output to IQ3A, and N can maintain its output at IQ2B. (all combinations on the same IQ show the same level of output). Now M is better off, but N is not worse off.

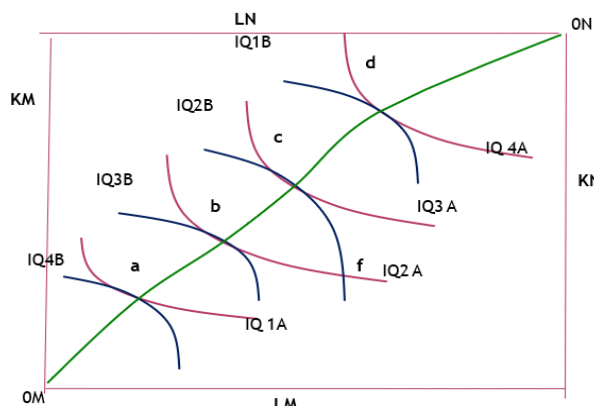


Fig. 14.1

Similarly, if they move to point 'b', then N's output increases to IQ3B, but M's output remains same at IQ2A as on point 'f'. N is better off, but M is not worse off. Such adjustments called "Pareto improvements" - when it is possible to improve the welfare of one, without reducing another's welfare. At point b and c, IQ of both firms are tangents to each other, (touch). Similarly, points a, b, c, and d. Joining together these points, gives the "Contact Curve" of production. Moving along the contact curve leads to improvement of one firm's welfare (output) but decreases the other's welfare (output). Thus, all points on the Contact curve are "Pareto Optimal" points. At each of these points, a, b, c, d, (fig. 14.1) the slopes of their isoquants are the same. Also slopes of their isocost curves are the same. We know that at equilibrium, slope of isoquant = slope of isocost. Slopes of isoquants of M and N

$$MRTS^A = MRTS^B$$

Slope of isocost of K and L for the two firms =  $w/i$

At each of the equilibrium points 'a b c d' on the contact curve,

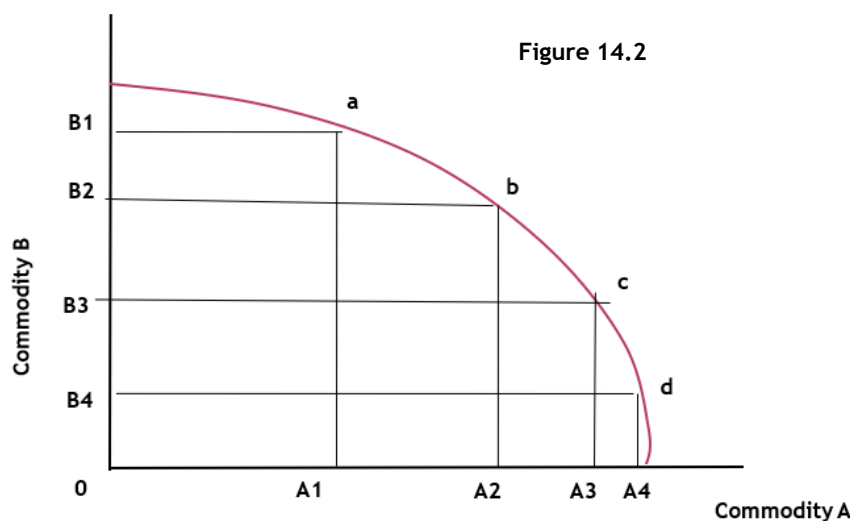
$$MRTS^A = MRTS^B = w/i$$

### 14.5 Production Possibility Curve (PPC)

Edgeworth box shows output of A and B with isoquants in *input factor space*. To convert to output factor space, the two goods should be shown on the two axis (instead of K and L). Can be done using the Production Possibility Curve (PPC), or the Product Transformation Curve (PTC). The PPC shows the equilibrium outputs of A and B with different inputs of K, L. It is the transformation of the contract curve on to the outer space. **Transformation Curve shows** alternative combinations of 2 goods that can be produced with given amounts of factor inputs. Points on Contact Curve abcd of Figure 14.2, shown in outer space. As Q of A rises, Q of B falls. Inverse relationship. PPC is convex outwards, the slope increases with increase in B. Diminishing returns.

#### Production Possibility Curve

Figure 14.2, The PPC shows how one good A is transformed into another B, by transferring resources from the production of A to that of B. PPC is concave to the origin: To produce one more unit of B, more and more of A should be given up. Shows diminishing returns. Slope of PPC: measures the Marginal Rate of Product Transformation: MRPT between the two goods. MRPT of A, B, shows the amount by which B has to fall, for A to rise, with the help of resources released by reducing B.



$$MRPT_{AB} = -\frac{\delta B}{\delta A} = \frac{MC_A}{MC_B} \tag{1}$$

MRPT is the rate at which the economy can transform one commodity into another, through reallocation of K and L. There is no unique Pareto optimum situation. All points on the PPC are Pareto optimum. All points below the PPC are not efficient.

In Perfect Competition firms equate

$$P = MC, \text{ so } MC_A = P_A, MC_B = P_B.$$

### Product Efficiency

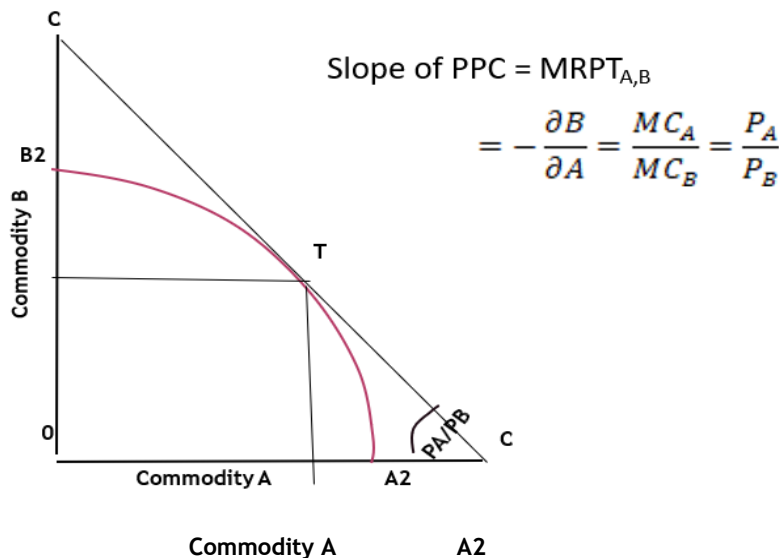


Figure: 14.3

Given product prices, production equilibrium is the point where slope of PPC = ratio of product Prices. At point T on the figure 14.3 CC is the Isocost curve, whose slope =  $P_A/P_B$ . At T,  $OA_T$  of A is produced and  $OB_T$  of B is produced.

### Producers' equilibrium, and Product Efficiency

- There is equilibrium in Consumer Market also.
- Two consumers X and Y, both consume the two goods A and B.
- Prices of both goods are given.
- Law of Diminishing MU applies.
- Income of consumers is given,
- Also tastes, preferences, etc.

Total Q of A and B fixed by producing firms M, N. If X increases his consumption of A&B, Y has to decrease his consumption. As in figure 14.5, the case of production, draw the Edgeworth box for consumption. Taking Indifference curves of consumers X and Y, for the two goods A and B. As X increases his consumption from  $IC_1A$  to  $IC_4A$ , B has to decrease his from  $ICB_4$  to  $ICB_1$ . At 5, the ICs of both X and Y intersect, with X on  $IC_1X$ , and Y on  $IC_3Y$ . Is it possible to improve this situation? If X moves to point 2, he will be on a higher IC =  $IC_2X$ , while Y will be on the same  $IC_3Y$ . So X improves his welfare (consumption), but no change in Y. X is better off, Y is not worse off. So, point 5 is not an efficient position. If Y moves to  $IC_4Y$ , then he will be on a higher IC at point 1. But X will remain on the same  $IC_2X$ . So at point 1, Y is better off, but X is not worse off. This is known as *Pareto Improvement*. All points where the two IC curves of the two consumers are tangents to (touch) each other, are points of equilibrium, = 1, 2, 3, 4. Joining them gives the Contact curve of consumption,  $OX_1, 2, 3, 4 OY$ . These are all Pareto optimal points.

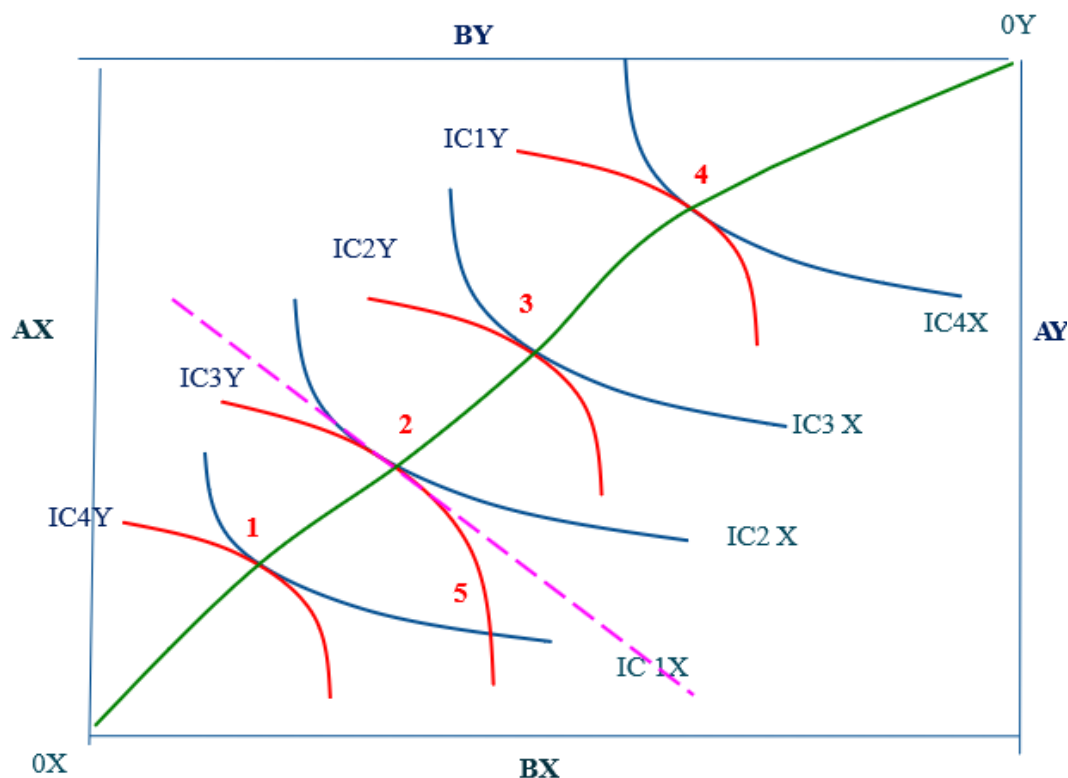


Figure: 14.5 Efficiency in Consumption

Moving from one to another point on the Contact curve, it is not possible for one consumer to increase his consumption, without another one's decreasing. But no unique equilibrium point. Take any one point on the Contact Curve, e.g. 2 with X on IC2X and Y on IC3Y. The budget line drawn to it (dotted line) shows the ratio of the prices of A and B. The slope of the Indifference curves shows the Marginal rate of substitution,  $MRS_{A,B}$ . The slopes of the two IC and that of their Budget lines are same on each point on the Contact curve. At point 2, the slope of

$$IC2X = IC3Y = PB/PA$$

$$MRS^X = MRS^Y = PB/PA \Rightarrow \text{Equilibrium}$$

And so on for each of the points on the contact curve. No unique equilibrium.

## 14.6 Arrow's Impossibility Theorem

It is named after economist Kenneth Arrow, who demonstrated it in his paper, "A Difficulty in the Concept of Social Welfare." Arrow's Impossibility Theorem states that clear community-wide ranked preferences cannot be determined by converting individuals' preferences from a fair ranked-voting electoral system. The theorem is a study in social choice and is also known as "The General Possibility Theorem" or "Arrow's Paradox." Arrow's Impossibility Theorem is an important mathematical result in the field of collective choice and welfare economics. It is a sub-field of economics and deals with how decisions are made on a collective level. The theorem comes with some important consequences for democratic processes like voting.

Arrow's impossibility theorem is a social choice theory that studies the combining of preferences, welfares, and opinions from individuals to reach a social welfare or community-wide decisions. It discusses the flaws of a ranked-voting electoral system. According to the impossibility theory, when there are more than two options, it is impossible for a ranked-voting system to reach a community-wide order of preferences by collecting and converting individuals' preference orders while meeting a set of conditions. The conditions are the requirements for a reasonably fair voting procedure and will be further discussed in the next section. For a better understanding of the theorem, here is an example that explains why individuals' preference orders cannot be converted to be a society-wide order. Let's assume there are three alternatives (options) in ranked voting: X, Y, and Z. The following table shows the voting results from 100 voters:

**MICROECONOMICS THEORY AND ANALYSIS -I**

Order of Preference	Number of Votes
X>Y>Z	45
Y>Z>X	35
Z>X>Y	20

Based on the results, option X will win since the order of X>Y>Z garners the most votes (45 voters prefer Y over Z and prefer X over Y). The order with option Z as the top preference shows the fewest number of votes, with only 20 voters preferring Z over the other two alternatives. However, if option Y is no longer an available alternative, the result will be reversed.

Order of Preference	Number of Votes
X>Y>Z	45
Y>Z>X	35
Z>X>Y	20

Order of Preference	Number of Votes
X>Z	45
Z>Y	55

The total number of votes for Z over X will be 55 (combining the votes for the orders of Y>Z>X and Z>X>Y), and the votes for X over Z is still 45. It results means that Z is socially ranked above X.

**Conditions in Arrow's Impossibility Theorem**

As mentioned above, there is a set of conditions (criteria) for a reasonably fair electoral procedure.

- It includes non-dictatorship,
- unrestricted domain,
- independence of irrelevant alternatives,
- social ordering, and
- Pareto efficiency.

**Non-Dictatorship**

Non-dictatorship means that a single voter and the voter's preference cannot represent a whole community. The social welfare function needs to consider the wishes of multiple voters.

**Unrestricted Domain**

Unrestricted domain requires all the preferences of every voter to be counted, which conveys a complete ranking of social preferences.

**Independence of Irrelevant Alternatives (IIA)**

The independence of irrelevant alternatives condition requires that when individuals' rankings of irrelevant alternatives of a subset change, the social ranking of the subset should not be impacted. The example mentioned in the section above violates the condition. To meet the IIA condition, the result should remain the same (option X should still be socially ranked above option Z) when option Y is removed.

**Social Ordering**

The social ordering condition requires that voters should be able to order their choices in a connected and transitive relation, i.e., from better to worse.

**Pareto Efficiency**

For Pareto efficiency, the unanimous preferences of individuals must be respected. The order of social preferences must agree with that of individual preferences if every voter strictly prefers one of the alternatives over another. The result should not be sensitive to the preference profile.

**Cardinal Voting vs. Ranked Voting**

Arrow's impossibility theorem only applies to a ranked-voting electoral system, but not to a cardinal-voting electoral system. In ranked voting, voters give ranked ballots and rank their choices on an ordinal scale. In cardinal voting, voters give rated ballots and can rate each choice

independently. Numerical scores can be assigned to options in cardinal voting. Compared with ranked voting, cardinal voting provides more information, which makes it possible for a cardinal-voting system to convert the preference orders of individuals into a social preference order.

### “Ways Out” of Arrow’s Impossibility Theorem

Some attempts are made to escape the impossibility theorem and investigate possibilities. Such attempts can be classified into two major categories. One includes the approaches that draw every preference profile into an alternative or social preference. The approaches try to weaken or eliminate one or more of the conditions for a fair electoral system. One example is pairwise voting, which limits the number of alternatives to two. A cardinal-voting electoral system, which conveys more information, is an example. The cardinal utility is regarded as a more reliable tool to show social welfare.

### Summary

As such, the theory of the second best provides a rationale for many different types of protection in an economy. The main criticism suggested by the theory is that rarely is a trade policy the first-best policy choice to correct a market imperfection or distortion. Instead, a trade policy is second best. The first-best policy, generally, would be a purely domestic policy targeted directly at the market imperfection or distortion. The existence of General Equilibrium relates to the behaviour of sellers and buyers and how it affects the demand and supply curves. When demand and supply curve are equal on a positive price, this is equilibrium. This price is called Equilibrium Price. The demand and supply on this price is called Equilibrium Quantity. The excess demand is zero on that price. Arrow’s Impossibility Theorem states that a ranked-voting electoral system cannot reach a community-wide ranked preference by converting individuals’ preferences while meeting all the conditions of a fair voting system. The conditions for a reasonably fair voting electoral system include non-dictatorship, unrestricted domain, independence of irrelevant alternatives, social ordering, and Pareto efficiency. The theorem does not cover cardinal-voting electoral systems.

### Keywords

- **Non-dictatorship:** The wishes of multiple voters should be taken into consideration.
- **Pareto Efficiency:** Unanimous individual preferences must be respected: If every voter prefers candidate A over candidate B, candidate A should win.
- **Independence of Irrelevant Alternatives:** If a choice is
- **Unrestricted Domain:** Voting must account for all individual preferences.
- **Social Ordering:** Each-individual should be able to order the choices in any way and indicate ties.

### Self Assessment

1. Welfare economics is the study of how the allocation of ..... and goods affects social welfare.
  - A. Capital
  - B. Land
  - C. Resources
  - D. Entrepreneurs
  
2. Second-best theory, also known as the theory of the .....
  - A. Concept
  - B. Market
  - C. second best
  - D. economy

3. In a general equilibrium model with many consumers, firms, industries, and markets, there will be numerous equilibrium conditions that must be satisfied.....
- A. Partially
  - B. simultaneously
  - C. Individuals
  - D. Firm
4. Second-best equilibriums arise whenever the market has .....
- A. distortions
  - B. imperfections present.
  - C. distortions and imperfections present
  - D. None of above
5. Lipsey and Lancaster show that, generally, when one optimal equilibrium condition is not satisfied, for whatever reason, all the other equilibrium conditions will.....
- A. Constant
  - B. change
  - C. Undetermined
  - D. Not affected
6. In a Pareto efficient equilibrium:
- A. trying to make someone better off will make someone else worse off
  - B. governments collect some tax revenue
  - C. there is a fair distribution of income.
  - D. trying to make someone better off will make someone else better off.
7. All points on the contract curve:
- A. are not Pareto efficient
  - B. are Pareto efficient
  - C. do not maximize social welfare.
  - D. are Pareto improving
8. Efficiency in production requires that:
- A. prices are equal for all firms.
  - B. marginal rates of substitution are equal for all consumers
  - C. marginal rates of technical substitution are equal for all firms
  - D. MRTS are unequal for all firms
9. Efficiency in consumption requires:
- A. that all prices are positive.
  - B. that MRS are equal for all consumers
  - C. that some goods are scarce.
  - D. that  $MRS = MRT$ .



10. An allocation of goods is Pareto-optimal in a many-person exchange economy if MRS is:
- A. decreasing for all individuals
  - B. greater for at least one individual
  - C. identical for all individuals
  - D. increasing for all individuals
11. Impossibility Theorem is related to-----
- A. Bergson
  - B. Scitovsky
  - C. Arrow
  - D. Kaldor
12. Arrow's Impossibility Theorem states that clear community-wide ranked preferences....
- A. cannot be determined by converting individuals' preferences from a fair ranked-voting electoral system.
  - B. can be determined by converting individuals' preferences from a fair ranked-voting electoral system.
  - C. Both A and B
  - D. None of above
13. Arrow's impossibility theorem only applies to a
- A. cardinal-voting electoral system
  - B. ranked-voting electoral system
  - C. ranked and cardinal voting electoral system
  - D. None of above
14. The conditions for a reasonably fair voting electoral system include.....
- A. non-dictatorship
  - B. unrestricted domain
  - C. independence of irrelevant alternatives
  - D. All of above
15. Numerical scores can be assigned to options in.....
- A. ordinal voting
  - B. cardinal voting
  - C. simple voting
  - D. ranked voting

**Answers for Self Assessment**

- |       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 1. C  | 2. C  | 3. B  | 4. C  | 5. B  |
| 6. D  | 7. B  | 8. C  | 9. B  | 10. C |
| 11. C | 12. A | 13. B | 14. D | 15. B |

**Review Questions**

1. "As a general rule of thumb, domestic policies are usually first-best policies, whereas trade policies are usually second-best policies." Discuss.
2. What do you mean by the optimum condition of exchange?
3. What do you mean by the optimum condition of factor substitution?
4. Write a note on the optimum inter temporal condition.
5. Give four the optimum condition of produces substitute
6. What is Arrow's impossibility theorem and how does it apply to the political economy?



**Further Readings**

Modern Microeconomics By Koutsoyiannis A, Macmillan

Microeconomic Analysis By Varian, H, Ww Norton & Company

Managerial Economics By Dominick Salvatore, Ravikesh Srivastava, Oxford University Press

**LOVELY PROFESSIONAL UNIVERSITY**

Jalandhar-Delhi G.T. Road (NH-1)

Phagwara, Punjab (India)-144411

For Enquiry: +91-1824-521360

Fax.: +91-1824-506111

Email: [odl@lpu.co.in](mailto:odl@lpu.co.in)